





# Clinical Education Initiative DRUG USER HEALTH ECHO™

## A FREE TELEMENTORING PROGRAM FOR NEW YORK STATE MEDICAL PROVIDERS

### ABOUT THE DRUG USER HEALTH ECHO™

The Hepatitis C and Drug User Health Center of Excellence, Clinical Education Initiative (CEI) funded by the New York State Department of Health AIDS Institute is excited to announce the Drug User Health ECHO™. This tele-mentoring program is intended for NYS medical providers with the goal to learn strategies to provide care to people who use drugs, including in the primary care setting.

### DURING CEI's DRUG USER HEALTH ECHO™ SESSIONS

- ▶ Discuss cases from your practice with Drug User Health experts
- ▶ Discuss new developments relating to your patients
- ▶ Specialists serve as mentors and colleagues
- ▶ A community of providers learn from specialists and each other

### THE RESULT?

- ▶ Learn strategies to provide care to people who use drugs, including in the primary care setting
- ▶ Boost confidence in dealing with a wide variety of clinical situations
- ▶ Forge connections with other providers who care for patients who use drugs



**CEI's DRUG USER HEALTH ECHO™**  
is held the 4th Wednesday of every month from 12:00pm-1:00pm

**FOR MORE INFORMATION** Contact Emily Scognamiglio  
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## From the Executive Vice President

By Vito Grasso, MPA, CAE

It is quite clear that our health care system is failing. We have heard rhetoric for years about how bad the system is and how desperately change is needed. Of course, there is no consensus about what changes we should make. Many reasonable recommendations for change have been lost in the weeds of political discourse because many of the best ideas include significant departure from the insurance model of administering and paying for health care. Private special interest groups have consistently blocked meaningful change because they have no appetite for reforming or retooling their own behavior regardless of how much the public might benefit.

It appears that fragmentation in health care continues to preclude consensus around any idea which would require wholesale change. Single payer in all of its iterations has been cast as a choice between socialism and capitalism. If we look at partial reform ideas like modifying payment models, we inevitably confront models which purport to associate payment with performance or value. Such payment models are replete with metrics, data reporting and plan oversight, all presumed to be essential for justifying payment based on metrics chosen by the plan and designed to cajole behavior by the physician which the plan has determined will improve its bottom line. Various medical societies have commented on these payment models and support those which benefit their own specialty. Focus on payment does not present any opportunity for actual systemic reform and certainly not any change that would directly and immediately improve treatment options or enhance benefits for patients.

While NYSAFP remains committed to single payer, we also continue to advocate for less comprehensive reform because we are realistic about the prospects of actually achieving full replacement of the insurance model. Consequently, we have recommended options to achieve some, if not all, of the reforms embraced by the single payer model.

We have supported legislation to impose limits on plan prior authorization requirements to mitigate the intrusiveness of this commonly used tool.

We have also developed a proposal for broader regulation of plan administrative procedures. Our new proposal calls for standardizing eligibility verification, patient cost-sharing, coordination of benefits, billing forms and timely and periodic payment to physicians and other providers. Consistency in these areas would significantly contain costs for practices which do business with multiple plans.

We have also recommended more robust regulation of health plans by the Department of Financial Services. This concept would focus on use of public hearings to approve plan premiums. Consumer interests would be represented in such hearings by staff of the Consumer Protection Board. Hearings would be fully transparent allowing disclosure of how plans operate and the basis upon which they allocate resources. Participation of a consumer advocate would accommodate negotiation of public benefits as part of the premium approval process to assure that plans are required to demonstrate how they apply revenue, especially new revenue from premium increases, in enhancing consumer benefit.

We have had productive discussions with legislators about these proposals. As national discussions about health care policy generally, and reform of health insurance continue to be unproductive, it is increasingly likely that states will produce solutions to some of the most vexing problems in health insurance regulation and health care delivery. Several bills have been introduced in Congress to address health insurance reforms including different versions of Medicare For All. Of particular interest to us is legislation in the House by Representative Khanna of CA (State Based Universal Health Care Act, HR 5051) which was last introduced in 2019 and would permit federal health insurance plans to participate in state public option programs. Enactment of such legislation at the federal level would eliminate a major obstacle to the NY Health Act by Assemblyman Richard Gottfried and Senator Gustavo Rivera which would establish a single payer system in NY.

It remains to be seen how the struggle to recover from the COVID pandemic will impact health care reform. The heroic response of health care professionals to the incredible stress on the system caused by the rapid and deadly proliferation of the virus engendered some public admiration for the clinical community. We have embraced many of the emergency measures authorized as part of the response to COVID including accommodations for the wider use of telehealth and the introduction of new technologies associated with treatment and protection of health care workers from exposure. Many believe strongly that our experience with the pandemic will be a boost for wider reform in health care. That may turn out to be true. As Nobel Laureate Bertrand Russell wrote: "Passionate beliefs produce either progress or disaster, not stability." We can only hope that any change will actually be an improvement.





## President's Post

By Jason Matuszak, MD, FAAFP, FMSSM

Like a butterfly escaping its chrysalis, society is preparing to emerge changed on the other side of the pandemic. Our work remains far from done. Our next challenge remains in eliminating vaccine misinformation. Each person we vaccinate is like a leaf bud on a tree getting ready to burst into its full summer foliage. The fleeting glimpses of a more normal summer and fall seem to bring normalcy just off our fingertips- we must reach out to drive the change to see it to fruition. As if a hibernating bear, we potentially have only a few months to get ready for what could be another long winter if our work is left undone.

Like the butterfly, your Academy has been hard at work behind the scenes preparing our organization for life after the pandemic. We held a virtual Lobby Day, which helped spur multiple changes in the state budget that were supported by the Academy. Preparations are nearly complete for our *second* (and hopefully last) virtual New York State Congress of Delegates. We are planning a return to in-person meetings for upcoming clusters and board meetings, and a return of our Winter Weekend. And, we have completed our comprehensive strategic planning initiative. All of the work we have completed during the pandemic has strengthened our organization and better prepared us for the challenges that lay ahead. We shall emerge a changed organization, with a new emphasis on grading the effectiveness of the NYSAFP Board and operations team, enhancing communications, and aggressively seeking out and developing the next generation of Academy leaders.

While so much emphasis nationally and locally has been focused on the suffering and death of the pandemic, the spring and summer remind us of health and vitality- of what life is supposed to be like. That is why it is so appropriate that the theme of this issue deals with sports and exercise medicine. There are a number of fantastic articles covering a broad spectrum of sports and exercise medicine, looking at injuries, illness, lifestyle and wellness. As a sports medicine physician myself, it is also fitting that this will be my last column as your President.

The articles this quarter will help us dispel popular myths, like all breathlessness with activity is “exercise-induced asthma” or that you need to refer patients for simple injuries or medical problems that

*All of the work we have completed during the pandemic has strengthened our organization and better prepared us for the challenges that lay ahead.*

every family physician has the potential to treat in their office. Even outdated ideas like the concept that adults who want to start an exercise program need to have a medical clearance performed, when the vast, vast majority do not. These are important concepts because we recognize that our patients are bursting to escape the quarantine lifestyle and re-enter the active world, to rid themselves of the COVID-19 weight gain, the anxiety, stress and lost social connections. As family physicians, we need to be ready to meet them where they are in their return to normalcy.

As our Academy returns to more of our own “normal” operations, we hope to see many of you in attendance at our Congress of Delegates in May. As you may know, the Congress determines the policies and direction of the Academy, so if there is an issue that you find near and dear to your heart make sure you review the information about submitting a resolution, testifying at a reference committee hearing or becoming a voting delegate for your county. We are updating our mission, vision and values statements and operationalizing our new strategic plan and scorecard. And, most importantly, we will continue to advocate for our family physicians, our patients and our communities throughout this pandemic and beyond.

As Dr. James Mumford assumes the presidency in May, I will join all of you in supporting him in his efforts to steer our organization past the end of the pandemic and back into normal operations, as a changed organization, a stronger organization, and an organization ready to adapt to the challenges that lay ahead. Thank you for your support this year and for continuing to be family physicians.

# Albany Report

By Reid, McNally & Savage

As the spring journal goes to print, the focus in Albany is on the ongoing Covid-19 pandemic and the 2021-22 state budget, which needs to be negotiated between the Governor and the Legislature and signed by the April 1 deadline.

NYSAFP has made it a priority to strongly oppose an across-the-board Medicaid cut, the 20% cut to the Doctors Across NY loan forgiveness and practice support, and has called for restoration of \$2.2 million in Area Health Education Centers (AHEC) funding. **The Senate and Assembly one-house budget proposals, which were released in mid-March, have rejected the proposed across-the-board Medicaid cut and restored funding for the AHEC system. The Senate proposal also rejected the cut to DANY and restored funding to last year's level of \$9,065,000 while the Assembly accepted the Governor's proposed cut.**

In addition, we continue to push back against the very problematic OPMC proposal to eliminate physician due process protections, in concert with other medical specialty societies. **The Assembly has completely rejected this proposal while the Senate rejected most provisions with the exception of the proposal to include fingerprinting and criminal background checks as part of the registration process and enhanced physician profile reporting.**

We have also expressed strong opposition to the excess malpractice proposal to cut state funding by 50% and require physicians receiving this coverage to pick up the remaining costs themselves for a total of over \$50 million. **Both the Assembly and Senate have rejected the restructuring of the excess medical malpractice program restoring \$105.1M and \$102.1M respectively and both houses have extended the program through June 30, 2022.**

For a chart detailing all health and mental hygiene proposals in the Executive, Senate and Assembly budgets, contact [penny@nysafp.org](mailto:penny@nysafp.org) for the chart via email.

Regarding updating and making telehealth policies permanent, NYSAFP leadership has been working with Senate Health Chair Gustavo Rivera and Assembly Health Chair Richard Gottfried, Assemblywoman Carrie Woerner, the prime sponsor of stand-alone telehealth legislation (A.6256 Woerner / S.5505 Rivera), and others on amendments to ensure equity and patient-centered telehealth services.

In addition, NYSAFP continues to work on the introduction and passage of universal healthcare coverage through a single payer health system represented in the New York Health Act (S.5474 Rivera / A.6058 Gottfried) which was introduced with robust sponsorship following our Advocacy Day. NYSAFP continues to push for codifying NYSIS reporting (S.44 Hoylman / S.1614 Dinowitz) for adults similar



to what is currently in place via Executive Order for COVID and influenza vaccines. We also continue to share our opposition to legislation ([S.3056 Rivera / A1535 Gottfried](#)) to eliminate collaboration requirements between nurse practitioners and physicians practicing in the same specialty.

In addition, we are working with Senator Anna Kaplan (D-Port Washington) on amendments to [her legislation \(S.534 Kaplan / A.4598 Sillitti\)](#) which would amend the public health law to require statistics on maternal deaths and injuries by race to be included in the informational material provided to prospective maternity patients at all hospitals and birth centers. This legislation is a priority of the upper house and following discussion at the recent Advocacy Commission meeting, we have expressed our position that data made available to prospective maternity patients may be misinterpreted if not provided with context accounting for many factors that contribute to adverse outcomes and may negatively distort the perception of some facilities. Additionally, we shared concern that publically reporting maternal deaths, including by race, at maternity hospitals will violate HIPPA and PHI due to the very low level of instances. We are working closely with ACOG and the hospital associations to address these issues.

### **2021 Advocacy Day**

In advance of our Advocacy Day, RMS and NYSAFP leadership met with Chairman Gottfried to discuss our 2021 priorities with a focus on telehealth and extending vaccine availability to primary care settings. These and the budget and legislative items listed above were the NYSAFP lobby day priorities for the March 1 virtual advocacy event. We thank all NYSAFP physicians, residents and students who participated in the event and made it a resounding success meeting with nearly 50 legislators. Further, we worked with EVP Vito Grasso to develop an Action Alert on these budget priorities, which was sent with the help of AAFP to all members to ask them to lend their voices to these important topics.

We would like to thank NYSAFP President Dr. Matuszak, Past-President Dr. Keber, President-elect Dr. Mumford, Advocacy Chair Dr. Abhyankar, EVP Vito Grasso and staff, the Board, the Advocacy Commission and membership for all of your support and advocacy. We look forward to continuing to work with you on NYSAFP's priorities throughout 2021, and will closely monitor activities of interest and keep members updated.

## **Upcoming Events | 2021**

**April 16**

**Deadline for Resolutions to be submitted for Congress of Delegates**

**May 16**

**Congress of Delegates opens virtually; Testimony begins**

**May 23**

**Congress of Delegates (virtual)  
Reconvenes/Concludes**

**Aug. 7-8**

**Summer Cluster  
New York City**

**Nov. 7**

**Fall Cluster Board Only  
Hilton Garden Inn  
Albany Med.  
(Commissions to meet virtually prior to Nov. 7)**

## **2022**

**Jan. 13-16**

**Winter Weekend and  
Scientific Assembly  
Saratoga Hilton  
Saratoga Springs**

**Feb. 27-28**

**Winter Cluster & Lobby Day  
Renaissance Hotel, Albany**

For updates or registration information for these events go to [www.nysafp.org](http://www.nysafp.org)

# Recognition and Management of Sports Related Concussion for the Family Physician

By Charles Litchfield, MD, MS; Patrick Cleary, DO, CAQSM; Anter Gonzales, MD, FAAP, CAQSM; Derek Ho, DO, CAQSM, FAAPMR; Mohammed Emam, MD, CAQSM, RMSK; Frank Nguyen, DO and Christine S. Persaud MD, MBA, CAQSM, FAAFP

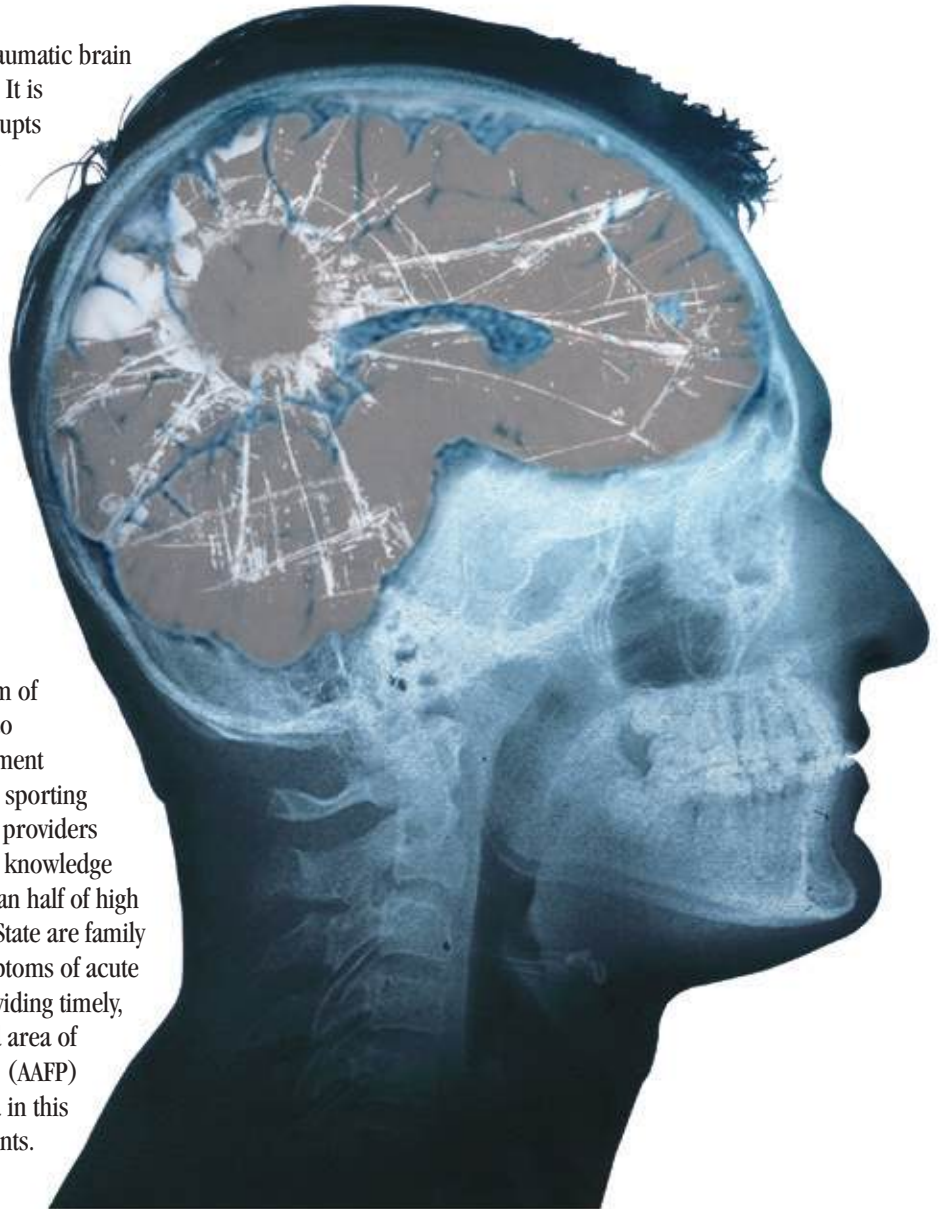
## Introduction

Sport-related concussion (SRC) is a mild form of traumatic brain injury (TBI), which accounts for 80%-90% of all TBI.<sup>1</sup> It is caused by any bump, blow, or jolt to the head that disrupts the normal functioning of the brain.<sup>2</sup> SRC can manifest with a variety of symptoms, but the overarching theme is an impairment in cerebral function. In the United States, SRC occurs with an incidence of 1.8 – 3.6 million per year,<sup>3</sup> although these estimates are likely conservative given that cases are enumerated based on ED visits and many patients with concussions are either seen in the outpatient setting or never seek care. The healthcare burden of concussion is significant and is estimated to be \$60 billion annually when including direct and indirect costs.<sup>4</sup> Adept diagnosis and treatment can reduce this burden and improve patient care.

The recognition and management of SRC is a vital component of the family medicine physician's spectrum of practice. Patients with concussion most often present to their primary care provider for diagnosis and management following a suspected injury.<sup>1</sup> Whether on the field at a sporting event or in the office following a potential concussion, providers can potentially save a life by having the basic tools and knowledge to recognize this clinical diagnosis. Given that more than half of high school team physicians for varsity sports in New York State are family physicians,<sup>5</sup> our ability to recognize the signs and symptoms of acute and chronic concussion syndromes are central to providing timely, patient-centered care. Additionally, as a recommended area of training in the American Academy of Family Physicians (AAFP) residency curriculum,<sup>6</sup> trainees need to be well-versed in this topic both for their board exams and their future patients.

## Recognition and Diagnosis

To avoid misdiagnosis, SRC should be suspected with any trauma to the head, regardless of whether the patient was wearing a helmet at the time of the injury. A sideline evaluation should include a SCAT-5 (for patients 12 and younger, use the Child SCAT-5) examination looking for any red flags and observing the patient's behavior and cognitive function. At any point during the evaluation, if suspicion for concussion is evident, the athlete should be kept out of play for the remainder of the match pending full evaluation. Concerning features (listed in Table 1) should prompt consideration for urgent transport to a higher level of care. Additional components of the on-field assessment include using a Glasgow Coma Scale and asking pertinent orientation questions about the current opponent and score of the match to better assess cognition and memory. The on-field



**Table 1: Signs/symptoms to prompt transfer to higher level of care<sup>25</sup>**

### RED FLAG signs/symptoms in concussion

- Neck pain or tenderness
- Loss of consciousness
- Double vision
- Deteriorating consciousness state
- Weakness, tingling, or burning of extremities
- Vomiting
- Severe or increasing headache
- Increasingly restless, agitated, or combative
- Seizure or convulsion

assessment must also include a cervical spine examination; patients who are not fully lucid are treated as though they have a cervical spine injury until proven otherwise.

Once a concussion is recognized, an athlete must not return to play until cleared by a medical professional. If a player who has suffered a brain injury has another head impact prior to fully healing from the initial injury, he or she is at increased risk of developing Second Impact Syndrome (SIS), a life-threatening swelling of the brain. While rare, SIS happens most frequently in male high school football players in the first 7-10 days after the initial trauma.<sup>7, 8</sup>

Follow up evaluation is performed either in the office or in an athletic training room. A more in-depth evaluation is warranted to fully assess the patient's symptoms to develop the best treatment plan. This includes a history of SRC and previous time courses of recovery. A full symptom evaluation (Table 2) should be done with emphasis on a "0" value being the athlete's pre-injury level for each symptom (e.g., someone with a headache that is no worse than their chronic headaches would score a 0). Additionally, cognitive testing of orientation, memory, and concentration should be evaluated. A full neurologic exam should be done with special attention to the vestibular system. The second portion of the SCAT-5 can be utilized for this evaluation, including normalized balance testing using the modified balance error scoring system (mBESS). This is performed with the athlete standing on a firm surface without shoes, with hands positioned on hips and eyes closed in three different stances as shown in Figure 1. For each stance, the athlete is timed for 20 seconds and cited up to 10 points for any of the following: hands lifted off iliac crests, opening eyes, step/stumble/fall, >30 degrees of hip abduction, lifting forefoot or heel, or remaining out of test position for >5 seconds. If multiple errors occur simultaneously, only one point is attributed, and the athlete is allowed <5 seconds to return to the starting position before time resumes. If the athlete is not able to achieve the starting position, the maximum 10 points is scored for that stance. The mBESS test should be performed with a spotter present to prevent inadvertent injury. The same battery of tests can optionally be repeated on a softer foam surface for greater sensitivity. Performance is most helpful when compared to age-based normative values.<sup>9</sup>

Vestibular/oculomotor motor screening (VOMS) assessment tests the provocation of headache, nausea, dizziness, and fogginess following specific tasks. The patient is tested for smooth pursuit, saccades, convergence, vestibular-ocular reflex, and visual motion sensitivity. Following each of the five tasks, symptoms are re-assessed on a 10-point scale of severity. Both the VOMS and mBESS are validated tools in SRC management to monitor recovery and inform return to school and return to play decisions. The VOMS test, when performed within the first three days post-SRC can aid in predicting time course to recovery for athletes.<sup>10</sup>

**Table 2: Symptom severity score<sup>25</sup>**

	Base-line	Mild		Moderate		Severe		
Headache	0	1	2	3	4	5	6	
"Pressure in head"	0	1	2	3	4	5	6	
Neck pain	0	1	2	3	4	5	6	
Nausea or vomiting	0	1	2	3	4	5	6	
Dizziness	0	1	2	3	4	5	6	
Blurred vision	0	1	2	3	4	5	6	
Balance problems	0	1	2	3	4	5	6	
Sensitivity to light	0	1	2	3	4	5	6	
Sensitivity to noise	0	1	2	3	4	5	6	
Feeling slowed down	0	1	2	3	4	5	6	
Feeling like "in a fog"	0	1	2	3	4	5	6	
"Don't feel right"	0	1	2	3	4	5	6	
Difficulty concentrating	0	1	2	3	4	5	6	
Difficulty remembering	0	1	2	3	4	5	6	
Fatigue or low energy	0	1	2	3	4	5	6	
Confusion	0	1	2	3	4	5	6	
Drowsiness	0	3	2	3	4	5	6	
More emotional	0	1	2	3	4	5	6	
Irritability	0	1	2	3	4	5	6	
Sadness	0	1	2	3	4	5	6	
Nervous or anxious	0	1	2	3	4	5	6	
Trouble falling asleep	0	1	2	3	4	5	6	
TOTAL number of symptoms							of 22	
Symptom severity score							of 132	
Do your symptoms get worse with physical activity?						Y	N	
Do your symptoms get worse with mental activity?						Y	N	
If 100% is feeling perfectly normal, what percent of normal do you feel?						_____ %		

**Figure 1: mBESS stance positions<sup>9</sup>**



continued on page 12



## Management

Initial management includes an evaluation of symptoms at rest; if no symptoms exist, then the player may begin a graded return to school, followed by a return to sport. It is important to note that a full return to school should be completed prior to consideration of return to sport<sup>11</sup>. The rate of return and sensitivities of each athlete will be different, and each patient must have an individualized plan to return to full activity. Student athletes who have sustained concussions will undergo a gradual return to academics, which may include a reduced class schedule, extra time to complete assignments, and delay of exams until symptoms have resolved. Regular communication between the clinician and school personnel is imperative to ensure a gradual and smooth transition for the student athlete. Once participating fully in academics, a graded return to play may begin with only gentle, non-contact exercise (Table 3). Trained physical therapists or athletic trainers can play a significant role in assisting with a graded return to play and may assist with monitored increases in activity during the recovery period.<sup>12</sup> It was previously thought that athletes needed to undergo a “cocooning” period following an SRC where all stimuli were minimized; this has recently been shown to prolong SRC symptoms and updated recommendations include symptom-driven activities and scholarly engagement after a brief 24-48 hour rest period.<sup>13</sup> Return to activity should be guided by the patient’s symptoms and continuously maintained at sub-symptomatic levels to promote continuous recovery.

## Symptom Resolution Timeline

Typical duration of symptoms following SRC is 2 weeks in adults<sup>14</sup> and 4 weeks in children;<sup>15</sup> 80%-90% of patients experience resolution within this time period, and symptoms that persist beyond this time point are termed persistent post-concussive syndrome (PPCS). Numerous factors have been investigated to objectively evaluate who is more likely to fall into this category with little reliable predictability to date. Of note, factors that have been shown to predispose a patient to PPCS are listed in Table 4<sup>14-17</sup> and are composed of both modifiable and non-modifiable risk factors. When patient symptoms proceed beyond the typical time course, it is helpful to differentiate the source of their symptoms because persistent physiologic injury due to neurotransmitter alteration, neuronal ion transport dysregulation, glucose metabolism, and cerebral blood flow changes are less common factors in PPCS<sup>18</sup> and are largely responsible for the more acute symptoms of concussion. Persistent symptoms are most commonly due to a cervical injury, vestibular injury, or a post-traumatic migraine, each of which stand to benefit from more targeted therapy. To assist in the rehabilitation and also differentiate persistent physiologic perturbation versus other injuries as listed above, specialized centers can perform protocolled treadmill testing using the Buffalo Concussion Treadmill Test (BCTT)<sup>19</sup> which acts to both define an aerobic, sub-symptom threshold for supervised exercise therapy and can also help to distinguish the main etiology of PPCS based on the athlete’s exercise tolerance and symptom profile during increasing aerobic load. Additionally, when performed within 10 days of injury in adolescents who suffered a concussion, the threshold heart rate has been shown to aid in predicting likelihood of PPCS.<sup>20</sup> Patients with lingering symptoms should be referred to physicians specializing in the care of sport-related concussions because a broad and multidisciplinary team is instrumental in addressing all components of an athlete’s recovery. Such a team is typically composed of sports medicine physicians, sports neurologists, physical therapists specializing in vestibular therapy, and a psychiatrist experienced in concussion care and commonly associated mood alterations.

**Table 3: Graded Return To Play<sup>11</sup>**

Stage	Description	Objective
1	Symptom-limited activity	Reintroduction of normal activities of daily living. Symptoms should not worsen with activity.
2	Light aerobic exercise	Walking, stationary biking, controlled activities that increase heart rate.
3	Sport-specific exercise	Running, skating, or other sport-specific aerobic exercise avoiding risk of head impact.
4	Non-contact training drills	Sport-specific, non-contact training drills that involve increased coordination and thinking. Progressive introduction of resistance training
5	Full contact practice	Return to normal training activities. Assess psychological readiness.
6	Return to sport	

**Table 4: Risk factors for Prolonged Postconcussive Symptoms<sup>14-17</sup>**

Risk Factors for Prolonged Postconcussive Symptoms
<ul style="list-style-type: none"> <li>– Subacute headache</li> <li>– Depression after injury</li> <li>– Pre-injury mental health problems</li> <li>– Female gender</li> <li>– Loss of consciousness</li> <li>– Initial symptom severity score</li> </ul>

## Prevention

While many modalities have been developed to address treatment of SRC, the greatest opportunity to alleviate the burden of this condition lies in prevention of its occurrence. It is certainly not possible to prevent all SRC, but attempts can be made to reduce the incidence and severity. The main areas of focus for prevention have included rule changes, enforcement of existing rules, neck strengthening, technique changes, and equipment modification. To date there has not been strong evidence related to either use of mouthguards or helmets in preventing concussion, although they are well known to prevent dental trauma and skull fracture, respectively.<sup>21</sup>

## Ongoing Research in Concussion

On the horizon of concussion care are several emerging technologies that are still under investigation and their utility has yet to be fully elucidated, although some show initial promise. Attempts to delineate objective biomarkers have proven difficult to date, but there has been intriguing work looking at tau proteins, specifically when measured at the six hour timepoint following a concussive injury. Levels in athletes who experienced a shorter return to play were significantly lower compared to those with a longer return to play indicating that this could aid in concussion and return to play prognosis.<sup>22</sup> Hyperbaric oxygen therapy has shown some recently promising results in treatment of PPCS in a small randomized controlled cross-over trial.<sup>23</sup> A recent review of this topic has not demonstrated sufficient evidence to incorporate this as a management option except when patients have failed other first line treatments.<sup>24</sup>

## Embedded links:

SCAT-5

<https://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097506SCAT5.full.pdf>

Child SCAT-5

<https://bjsm.bmj.com/content/bjsports/early/2017/04/26/bjsports-2017-097492childscat5.full.pdf>

VOMS

<https://www.youtube.com/watch?v=yQI2HRXCEs8&feature=youtu.be>

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# TWO VIEWS: Return to Sport

## VIEW ONE

### SPORT PARTICIPATION & PRE-PARTICIPATION EVALUATION DURING COVID-19 PANDEMIC

By Utsav Hanspal MD, MPH, CAQSM

The 2019 coronavirus disease (COVID-19) outbreak has not only posed a serious health threat to the world, it has also posed enormous challenges for the world of sport and exercise. While initially believed to be a pulmonary disease manifesting as pneumonia in most individuals, it is now known that COVID-19 is a multi-organ disease with potential long-term sequelae, also known as long-COVID or chronic COVID syndrome.<sup>1</sup> This poses especially worrying concerns for athletic individuals as any cardiorespiratory sequelae can become life threatening, warranting a comprehensive examination and clinical evaluation. There is some early, limited, and emerging data with the aid of cardiac magnetic resonance imaging to suggest that myocarditis may be prevalent in athletes recovered from COVID-19.<sup>2</sup> When identified, this calls for a temporary disqualification from all sport and exercise for a period of 3-6 months. These concerns highlight the need for embracing a systematic approach to the pre-participation evaluation in New York state and across the country. This article will deal with the most up-to-date recommendations for sports and exercise clearance in a post-COVID world, emphasizing the joint efforts of the National Federation of State High School Associations (NFHS) and the American Medical Society for Sports Medicine (AMSSM). The aim will be to guide sports medicine and primary care physicians in providing the most comprehensive advice to their active patient population.

### PRE-PARTICIPATION EVALUATION

As briefly outlined above, the potential deleterious and long-term effects of COVID-19 on athletes is a major concern for the field of sports medicine. However, there is scant data for this amongst the athletic population.<sup>3</sup> Many of the concerns are deduced from hospitalized, older population with comorbid conditions. The utility of preventative visits remains controversial, with the pre-participation evaluation (PPE) being no exception. The purpose of the PPE during COVID-19 is identical to those published in previous PPE Monograph fifth edition (PPE5).<sup>3</sup> The AMSSM recommends that sports medicine physicians or primary care providers with expertise in the care of athletes should perform PPE to determine medical eligibility.<sup>3</sup>

### TIMING, SETTING & STRUCTURE

1. Ideally, a PPE should be performed every 2-3 years in school-aged children, although most states, including NY, tend to do this annually.<sup>3</sup>
2. The American Academy of Pediatrics (AAP) recommends that there should be no delay in either the PPE or well-child checkups during COVID.<sup>3</sup>
3. Group physicals are not recommended due to social distancing guidelines.<sup>3</sup>

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## VIEW TWO

### SAFE RETURN TO PLAY AFTER COVID: CARDIAC CONSIDERATIONS

By Sarah Hudson, MD; Dominic DeFelice, MD and Jasdeep Bajwa, DO

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has rapidly emerged as a worldwide cause of severe respiratory disease in the adult population. Initial published data suggested that the clinical manifestations in children are less severe compared with those in adults.<sup>3</sup> However, a new syndrome associated with SARS-CoV-2 infection has been reported in children in increasing numbers. This syndrome, termed "Multisystem Inflammatory Syndrome in Children" (MIS-C) is characterized by persistent fever and is frequently associated with abdominal pain, vomiting, diarrhea, rash and conjunctivitis. Even though MIS-C presents with multiorgan injury, it predominantly involves the cardiovascular system.<sup>1</sup> Children with MIS-C will need close clinical follow-up with cardiology. Due to potential concern for MIS-C and coronary artery aneurysm (CAA), it has been recommended that all children with MIS-C undergo repeat echocardiograms at a minimum of 7-14 days and then 4-6 weeks after the initial presentation.<sup>2</sup> Children with LV dysfunction and CAAs will require more frequent echocardiograms. Although LV function improves rapidly in most MIS-C patients, the long-term complications of myocardial inflammation in this syndrome are not known and may include myocardial fibrosis and scarring that has been seen in other forms of pediatric myocarditis.<sup>2</sup>

Keeping these sequelae in mind, there are potential risks and pitfalls regarding the subject of return to sports for young athletes. Youths who have recovered from COVID-19 should be cleared for a return to sports by their physician and undergo evaluation for cardiac symptoms such as chest pain, shortness of breath, fatigue, palpitations or syncope. A positive cardiac screen or other concerning findings should prompt an electrocardiogram (EKG) and potential referral to a pediatric cardiologist.<sup>4</sup> Children and adolescents who have or have recovered from MIS-C must be treated as though they have myocarditis and restricted from exercise and participation for three to six months.<sup>4</sup> They must be cleared to return to sports by their pediatrician and/or pediatric medical subspecialist, preferably in consultation with a pediatric cardiologist. Results from cardiac testing (EKG, Echocardiogram, Holter monitor, etc.) need to have returned to normal before the child or adolescent can resume activity.<sup>4</sup> While the incidence of myocarditis is lower in the pediatric population compared to the adult population, myocarditis is known to be a cause of sudden death during exercise in the young athletic populations. Similar to other forms of myocarditis, providers caring for patients who have had a COVID infection should be confident there is no myocardial injury prior to clearing athletes to participate.<sup>5</sup> Given the unknown long term consequences of this virus and its effects on the cardiovascular system, even in pediatric populations with milder symptoms, the potential for pitfalls would be much greater if there is not a systematic protocol in place.

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4. PPEs should be performed at the athlete's medical home for continuity of care.<sup>3</sup>
5. For active infections or recent symptoms, a clinical or laboratory diagnosis of COVID-19 should be pursued. The PPE should be postponed until the athlete is symptom free for at least 2 weeks.<sup>3</sup>
6. Established masking and social distancing guidelines must be followed by all parties including the athlete, parent, or guardian.<sup>3</sup>
7. Virtual visits may be implemented for athletes in underserved communities. Careful review of payment rules for commercial plans is advised as virtual care visits for PPE are often not covered or reimbursed.

While athletes are generally considered healthy, most of them afflicted with COVID-19 will likely endure a minimally symptomatic course of illness. However, despite this, there may be concern for underlying cardiopulmonary illness that is asymptomatic at rest and thus clinically silent.<sup>3,4</sup> In addition, many athletes may also have underlying health problems like asthma, obesity, and diabetes that place them at a higher risk of severe COVID-19 infection. As a result, both the NFHS and AMSSM recommend the addition of a supplemental questionnaire to the preparticipation screening. Figure 1, also summarizes these recommendations in an easy-to-follow flowchart.

Additionally, any athlete who has had a **positive COVID-19 test** at any time must be evaluated by

their medical provider prior to sports participation.<sup>3</sup> This evaluation should focus on any active or residual symptoms including screening with the aforementioned questionnaire. Written clearance prior to beginning sports is advised.<sup>3</sup> A 12-lead ECG is advised.<sup>3</sup> If ECG is abnormal or shows new repolarization changes compared to a prior ECG, then additional evaluation is warranted. This must include an echocardiogram and exercise test in conjunction with a sports cardiologist.<sup>3</sup> The consideration for further evaluation also applies to those of suspected COVID-19 symptoms without a confirmatory positive test.

Those with **mild to moderate disease (i.e. managed at home)** should also similarly undergo screening for any residual symptoms as well as the questionnaire. Any positive findings should trigger a specialist consultation (sports medicine or cardiology) and an ECG to rule out myocarditis which is required prior to clearance. ECG findings suggestive of viral-induced myocardial injury include pathological Q waves, ST segment depression, (new) diffuse ST segment elevation, and T-wave inversion.<sup>3</sup> Abnormal ECG findings must be further evaluated by echo-cardiogram and exercise test in conjunction with a sports cardiologist.<sup>3</sup>

Athletes or active individuals with **severe illness (i.e. hospitalization)**, have the highest risk for underlying cardiopulmonary complications including arrhythmias, myocarditis, heart failure, sudden cardiac arrest (SCA), and pulmonary embolism.<sup>3</sup> They warrant a comprehensive cardiac evaluation in consultation with a cardiologist. Their evaluation must include an

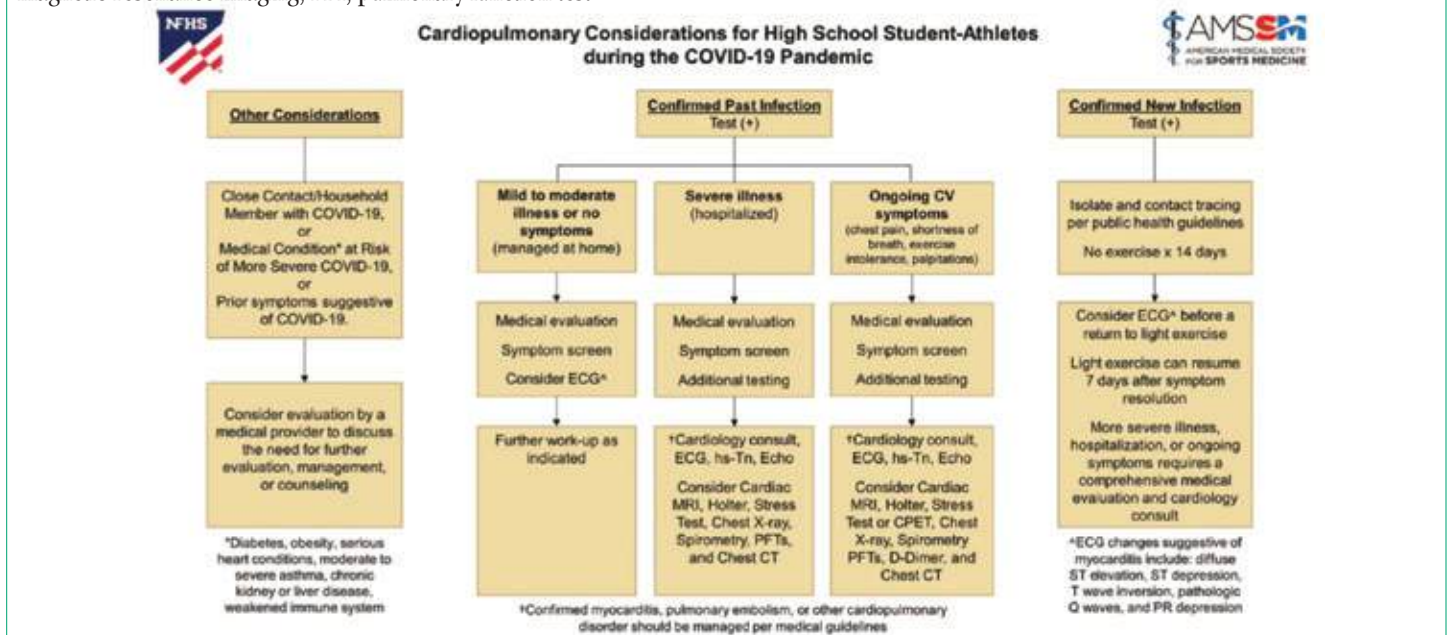
## COVID-19 SUPPLEMENTAL QUESTIONNAIRE<sup>1</sup>

Any positive response should trigger an evaluation by a medical provider.

1. Have you had any of the following symptoms in the past 2 weeks?
  - a. Fever
  - b. Cough
  - c. Shortness of breath or difficulty breathing
  - d. Shaking chills
  - e. Chest pain, pressure, or tightness with exercise
  - f. Fatigue or difficulty with exercise
  - g. Racing heart rate
  - h. Unusual dizziness
  - i. Loss of taste or smell
  - j. Sore throat
  - k. Nausea, vomiting, or diarrhea
  - l. Unusual rash or painful discoloration of fingers or toes
2. Do you have a family or household member with current or past COVID-19?
3. Do you have moderate to severe asthma, a heart condition, diabetes, chronic kidney or liver disease, or take medication or have a medical condition that weakens your immune system?
4. Have you been diagnosed with or tested positive for COVID-19 infection?

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**Figure 1<sup>1</sup>:** Cardiopulmonary considerations for high school student-athletes during the COVID-19 pandemic. CPET, cardiopulmonary exercise test; CT, computed tomography; CV, cardiovascular; ECG, electrocardiogram; Echo, echocardiogram; hs-Tn, high-sensitivity troponins; MRI, magnetic resonance imaging; PFT, pulmonary function test





Given the potential for these adverse outcomes, we aim to provide a management framework for the primary care physician tasked with evaluating youth athletes for return to play. It is recommended that all youth diagnosed with COVID be seen by a physician for clearance before returning to sports.<sup>5</sup> Based on an American Academy of Pediatrics (AAP) guideline statement published in September and updated in December 2020, there are three groups of COVID-recovered patients to consider. See Table 1. The first are youth who were asymptomatic or had mild symptoms. These patients should be held from play for a minimum of ten days from their positive test result and a minimum of 24 hours after symptom resolution without use of fever-reducing medications.<sup>6</sup> Patients who had severe disease, defined as requiring hospitalization, having abnormal cardiac test results during the acute phase of the illness, and/or suffering from MIS-C should be held from play for at least 3-6 months.<sup>6</sup> These patients require normalization of their cardiac testing before return-to-play and should be cleared by a pediatric cardiologist. Of paramount concern is myocarditis, a risk factor for sudden cardiac death during exertion. If present, this must be proven to have resolved before returning to sports.<sup>7</sup>

The third and final group is a bit more difficult: youth who had “moderate” COVID illness. This term is not clearly defined but naturally falls somewhere between mild and severe disease.

A red flag in these patients is the presence of cardiac symptoms including fatigue, chest pain, palpitations, shortness of breath, or syncope. Youth in this category require cardiac testing including at minimum an EKG and should be referred to pediatric cardiology before returning to sports.<sup>6,7</sup> These patients are at significant risk not only from a cardiac standpoint, but also because they are more likely to be missed. Primary care physicians should pay particular attention to these review of system questions and have a low threshold to refer to pediatric cardiology. Those with moderate symptoms and negative cardiac testing require 10 days of rest from their positive test and at least 10 days of rest after symptoms resolution off of fever-reducing medications.<sup>6</sup> The algorithm in Figure 1 can be used to risk-stratify youth athletes.<sup>7</sup>

**Table 1: AAP COVID-19 Symptom Definitions<sup>10</sup>**

Mild: <4 days of fever >100.4°F, < 1 week of myalgia, chills, and lethargy
Moderate: ≥4 days of fever >100.4°F, ≥ 1 week of myalgia, chills, or lethargy, or a non-ICU hospital stay and no evidence of MIS-C
Severe: ICU stay and/or intubation, or multisystem inflammatory syndrome in children (MIS-C)

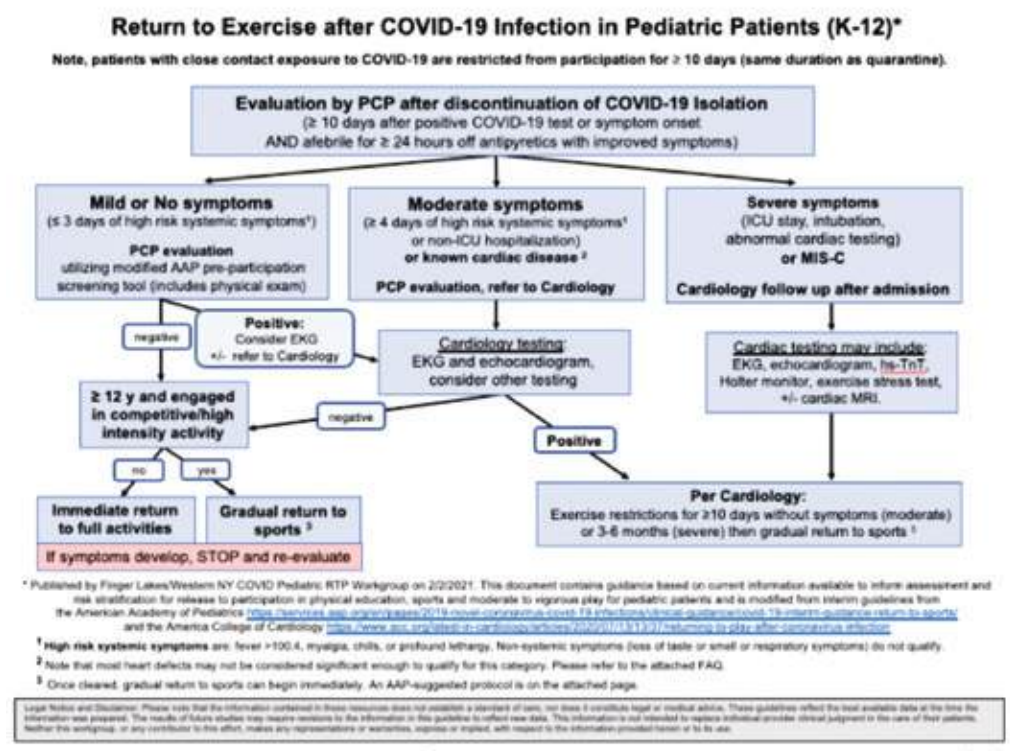
Several additional factors to consider are the type of sport being played and the climate (for outdoor activities). Low intensity sports such as bowling or golf are thought to be less risky from a cardiac

standpoint than high intensity sports such as soccer, football, or basketball. Athletes in the latter sports may require more careful clearance and a graduated return to play.<sup>7</sup> Also, it should be noted that during the COVID pandemic, many youth athletes have spent a significant amount of time away from sports and may be deconditioned. This, combined with a diagnosis of COVID, puts athletes at more risk for exertional heat stroke (EHS). A 10 to 14- day gradual progression of physical exertion in a hot environment has been shown to offer a risk reduction of 55% for EHS.<sup>8</sup>

In an evolving pandemic with guidance from local and national experts sometimes differing in details, it becomes critical for schools and health care experts to collaborate in the interest of the safety of individuals and communities. In the Finger Lakes region of central/western New York, we have been incredibly fortunate to have an active and involved partnership of key stake-holders, spearheaded by the community health research/planning organization Common Ground Health. In July of 2020, Common Ground convened the Finger Lakes Reopening Schools Safely Task Force to ensure the physical and emotional health and safety of students and their families. The Task Force subgroups meet regularly to provide guidance to schools and communities throughout the region. The Health & Medical Advisory Workgroup, comprised of district school administrators, local health department staff, ACO leaders, pediatricians and family physicians, met regularly to sift through the rapidly evolving evidence and create guidelines that took into account expert opinion statements from AAP<sup>5,6</sup> with awareness of local primary care and pediatric cardiology referral pathways and resources. This kind of collaborative partnership can be leveraged in any region and can take into account local/regional strengths and barriers when developing work-flows and guidance when there are not yet concrete evidence-based recommendations.

The algorithm in Figure 1 was developed by the Task Force advisory group, in conjunction with Golisano Children’s Hospital. It took into account

**Figure 1.** Obtained from Finger Lakes/Western NY COVID Pediatric RTP Workgroup on 2/2/2021<sup>9</sup>





ECG, cardiac enzymes (troponin), Holter monitoring, cardiac stress test, or cardiac magnetic resonance as clinically indicated.<sup>3</sup> Pulmonary evaluation with or without pulmonology consultation is also recommended. The goal of this would be to ensure pulmonary fitness which may be assessed with pulmonary function tests, chest radiographs or CT scan to rule out structural damage or other intrathoracic pulmonary pathology.

Athletes with **ongoing symptoms or active disease** must not be cleared for any sports participation. Once asymptomatic and after the appropriate quarantine, they must be cleared medically as described above ensuring cardiopulmonary complications are ruled out. If identified, cardiopulmonary issues should be managed according to established treatment protocols. For additional information on myocarditis, please refer to a dedicated article in this edition of the journal.

### SPECIAL POPULATIONS

**Pregnant Athlete:** Exercise and physical activity during pregnancy has demonstrable health benefits for both the mother and fetus. However, pregnancy poses increased risk for severe COVID-19 illness.<sup>5</sup> Pregnant athletes must take all precaution to avoid contracting the virus (masking and social distancing) and immediately inform their obstetric provider of any symptoms.<sup>5</sup>

**Diabetic Athlete:** Diabetes is an immunocompromised state and thus predisposes individuals to severe COVID-19 infection. Athletes with diabetes may present with subtle manifestations as opposed to classic symptoms associated with the disease.<sup>6</sup> These subtle findings include elevated blood glucose, fatigue, polyuria and polydipsia.<sup>7</sup>

**Hypertensive Athlete:** Despite the interaction between the SARS-COV-2 virus that causes COVID-19, and ACE2, hypertensive athletes with COVID-19 should continue ACE-I, angiotensin receptor blockers, or other medications unless they have hypotension or hypokalemia.<sup>3</sup> Their use is not associated with worse outcomes.<sup>8</sup>

**Asthmatic Athlete:** Worsening asthma symptoms, particularly in a previously well-controlled athlete, may be an early sign of COVID-19 infection and should prompt antigen testing.<sup>3</sup> Athletes with asthma should continue their usual medications as prescribed.<sup>3</sup>

**Obese Athlete:** Obesity is a risk-factor for severe illness from COVID-19 and associated with a higher risk of death. Of note, there is no association between obesity and the risk of contracting the disease. While obesity is defined on the basis of BMI, athletic participation should not depend exclusively on BMI. This is not simply because BMI scales can be misleading in the case of well-developed, muscular athletes, but also because sports participation should take into account an athlete's overall risk-to-benefit ratio for engaging in physical activity.<sup>3</sup>

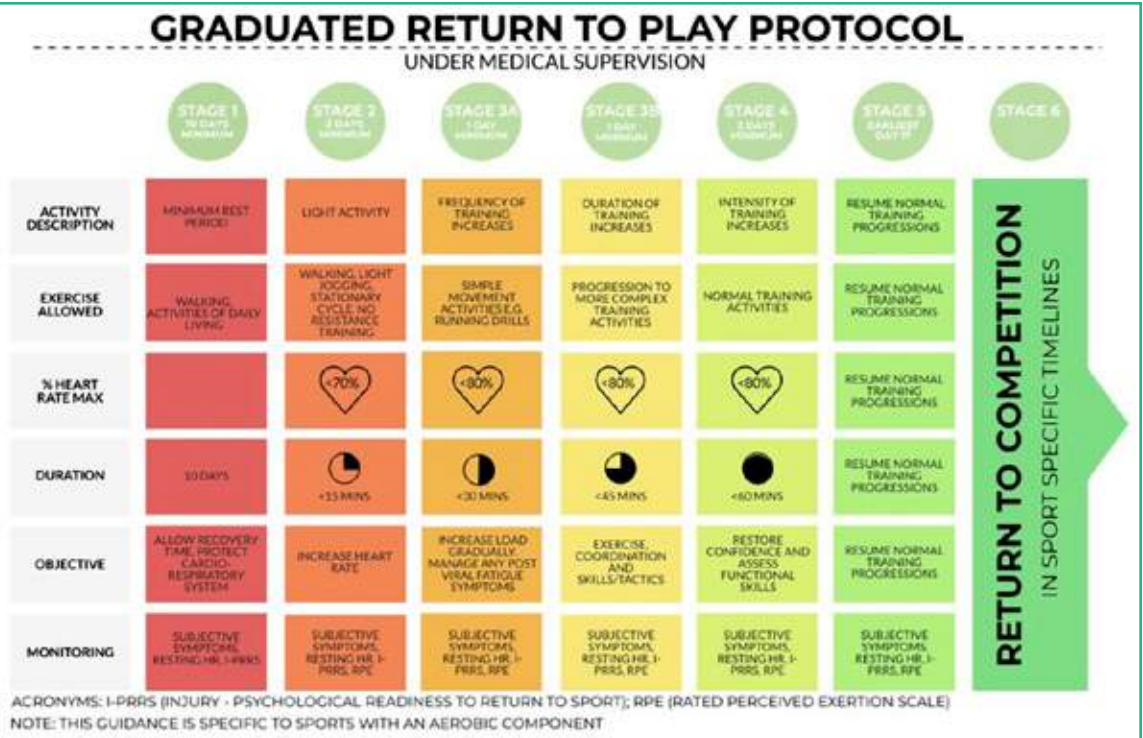
**Sickle Cell Trait:** According to the CDC, while sickle cell disease is considered a higher risk condition with adverse outcomes from COVID-19 infection, sickle cell trait (SCT) is not.<sup>6</sup> Therefore, no special recommendations exist for athletes returning with SCT.<sup>6</sup>

### SPORT PARTICIPATION

A key component of the initial statement on risk of COVID-19 during high school sports published jointly by the NFHS and Sports Medicine Advisory Committee (SMAC) was to categorize sports as high, moderate and low-risk based on infection risk.<sup>9</sup> This initial recommendation was based on contemporary understanding of coronavirus transmission with an emphasis placed on avoiding close contact and sharing equipment.<sup>2</sup> Since then, the understanding of viral transmission has evolved to the point where a simple classification as that is rendered obsolete. No individual or team sport can be exclusively classified as low, moderate or high-risk based on current evidence.<sup>9</sup> The following factors are important determinants of COVID-19 transmission in high school athletics:

1. Current community infection rates appear to be the strongest predictor for high school athletes being infected, and proven cases of direct transmission of coronavirus in the athletic setting remain relatively rare.<sup>9</sup>
2. Participants in non-contact sports show lower rates of COVID-19 than contact sports.
3. Participants in outdoor sports show lower rates of COVID-19 than indoor sports.
4. Face mask use while participating in indoor sports results in COVID-19 rates comparable to the rates found in outdoor sports.
5. The majority of sports-related COVID-19 transmission does not appear to occur during sports participation, but from social contact.

**Figure 2:** Graduated Return to Play (GRTP) Protocol after COVID-19 Infection<sup>11</sup>



## EMERGENCY ACTION PLAN

Because of the inherent and presumed risk of sudden cardiac arrest (SCA) associated with COVID-19, all schools must be prepared with a well-rehearsed Emergency Action Plan (EAP) for all sports and venues to respond to SCA.<sup>4</sup> Every school must maintain an on-site automatic defibrillator (AED), to be retrieved and used within 3 minutes of collapse. The AEDs must be maintained according to manufacturer guidelines, and should include monthly readiness checks and scheduled battery replacement. Potential first responders must be trained in prompt recognition of SCA, use of an AED as well as effective cardiopulmonary resuscitation (CPR).<sup>4</sup>

## RETURN TO PLAY GUIDELINES (AFTER COVID-19 INFECTION)

Specific recommendations on return to play have been developed by a panel of international experts and published in the British Journal of Sports Medicine.<sup>10,11</sup> Due to a risk of cardiorespiratory, hematological and renal complications, it is best practice to follow a graduated resumption of training, paying attention to physical and psychological factors after COVID-19 infection. A graduated return to play (GRTP) protocol is a progressive program that institutes physical activity in an incremental fashion. This is represented in Figure 2. Key considerations prior to commencing a GRTP protocol include:<sup>11</sup>

- An athlete's ability to complete activities of daily living and walk 500 meters on a flat surface without excessive fatigue or breathlessness.
- The athlete must have had 10 days of rest from symptom onset **and** be at least symptom free for 7 days. In addition, they must be off all medications including acetaminophen.
- If any symptoms occur (including excessive fatigue), the athlete must return to the previous stage. They can only resume the GRTP after an asymptomatic period of at least 24 hours.

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regional availability of specialty services as well as school needs and the availability of the primary care task force. A regional forum was held to review this with key stakeholders and field questions related to the work-flow.

In order to help children and adolescents safely return to exercise and physical activity after COVID infections, parents and primary care clinicians must first be aware of the need for evaluation. Pathways for referral in the case of abnormal or concerning screenings must be clearly understood, and must take into account local availability of consultants. Partnership between health care providers and school administrators will garner mutual trust and understanding. The improvement in telemedicine capability and reimbursement during the COVID pandemic may have improved availability for assessment in some places, though the need for specialized testing including pediatric EKG/echocardiogram does impose limitations. Creating forums for local/regional inter-professional communication will improve mutual respect and understanding of challenges and barriers. Working together, we can create more effective pathways to a healthy and safe student participation in physical activity.

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10. AAP COVID-19 Interim Guidance: Return to Sports and Physical Activity, 3/1/2021 (<https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/covid-19-interim-guidance-return-to-sports/>)

**Sarah Hudson, MD** is an Assistant Program Director for the Brown Square residency site at URMG Department of Family Medicine. She has served on the Finger Lakes Region Reopening Schools Safely Health & Medical advisory workgroup since September 2020.

**Dominick DeFelice, MD** is a 3rd year family medicine resident with interests in sports medicine and behavioral health. He specifically has interest in expanding resident training in point of care ultrasound (POCUS) and looks to complete a primary care sports medicine fellowship after residency.

**Jasdeep Singh Bajwa, DO** is a 2nd year family medicine resident with interests in medical education and clinical reasoning. His passion for medical education extends from medical students and other learners, to teaching his patients to better understand their conditions and management.

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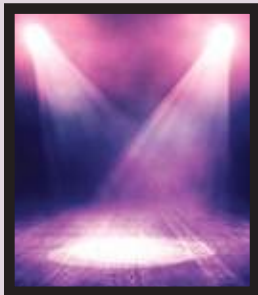
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## IN THE SPOTLIGHT

### NYSAFP Congress of Delegates – Virtual

Notice is hereby given that the 73rd Congress of Delegates (COD) of the New York State Academy of Family Physicians will convene on **Sunday, May 16th at 8:00 AM** as a **virtual meeting**. In light of COVID 19 and accompanying guidelines, NYSAFP has made the decision to conduct the 2021 Congress of Delegates virtually.

In order to conduct the Congress as a virtual event it will be necessary to complete as much work as possible prior to publication and consideration of reference committee reports. Consequently, resolutions will be published, and instructions will be provided regarding how members may comment on resolutions electronically.

Comments on resolutions will be accepted until 11:59 PM on Thursday, May 20th. The reference committees will meet on Saturday, May 22nd to prepare their respective reports. The reports will be available online as soon as possible that afternoon.

The Congress will reconvene virtually on **Sunday, May 23rd at 8:00 AM** to conclude business.

### NYSAFP Members Receive Recognition

**Dr. Naz Khan** was selected by the AAFP to join the next cohort of the Women's Wellness Through Equity and Leadership (WEL) Project as one of the five family physicians representing the AAFP. The WEL Project is funded by The Physicians Foundation and is a collaborative effort of 10 of the nation's leading medical organizations including AAFP. The project's overall purpose is to help improve organizational structures, build individual skills of female physicians, and develop a new wave of female physician leaders resulting in a healthier, more equitable work experience. Congratulations Dr. Khan!

**Dr. Anita Ravi** was selected by the National Minority Quality Forum (NMQF) as one of its 40 Under 40 Leaders in Minority Health for 2021. Annually, since 2016, NMQF has selected 40 minority health leaders under the age of 40 who have been leading the charge to better patient outcomes and build sustainable healthy communities. These leaders are clinicians, patient advocates, researchers and policy makers. Despite the unexpected trials in health care in 2021, these 40 leaders persevered in strengthening their communities and reducing health disparities. Congratulations Dr. Ravi!

# Steps in the Right Direction: Musculoskeletal Ketorolac Applications

By Stanley R. Hunter, MD, CAQSM; Caroline J. Lee, MD; Karyssa Bowron, MD and B. Max Kammerman, MD, CAQSM

## Background

Osteoarthritis (OA) is the most common joint disease in the United States and is expected to continue to rise in incidence due to increases in average age and obesity.<sup>26,17</sup> Knee OA affects 37% of people over age 60, of whom approximately one third are symptomatic.<sup>26</sup> Current treatments of OA employ a combination of oral analgesics, weight management, physical therapy, various types of joint injections, and radiofrequency nerve ablation. Joint replacement is a common endpoint after conservative treatment, and while arthroplasty has a high success rate, it is expensive and some patients are poor surgical candidates. Conversely, arthroplasty in younger patients is not ideal as they are likely to outlive the replaced joint.

The practice of injecting arthritic joints with cortisone dates back to the 1950s.<sup>18,24</sup> The mechanism is complex with anti-inflammatory effects from inhibition of prostaglandins, prostacyclins, thromboxane, and leukotrienes, as well as modulation of protein synthesis and breakdown.<sup>16,24</sup> It typically induces analgesia within a few days. The duration of benefit from cortisone injections is both controversial and variable, with estimates from 1 week to 6 months.<sup>18</sup> Interestingly, the intra-articular metabolic effect of corticosteroids is substantially shorter than the clinical effect, ranging from one to 3 weeks depending on the specific steroid.<sup>24</sup> At doses below about one third of typical clinical doses, some corticosteroids appear to be chondroprotective both histopathologically and radiographically.<sup>24</sup> At clinical doses, deleterious effects become evident after about 2 to 8 injections, depending on steroid and dose.<sup>24</sup> Side effects of cortisone injection may include cutaneous atrophy or depigmentation, local tendon and ligament atrophy, elevated blood pressure, hyperglycemia, immunosuppression, periarticular calcification, weakening of bone, and acceleration of cartilage loss.<sup>18,19,11</sup> Due to the potential for accelerating degeneration, it is common to limit cortisone injections to once per three months per joint.<sup>18</sup>

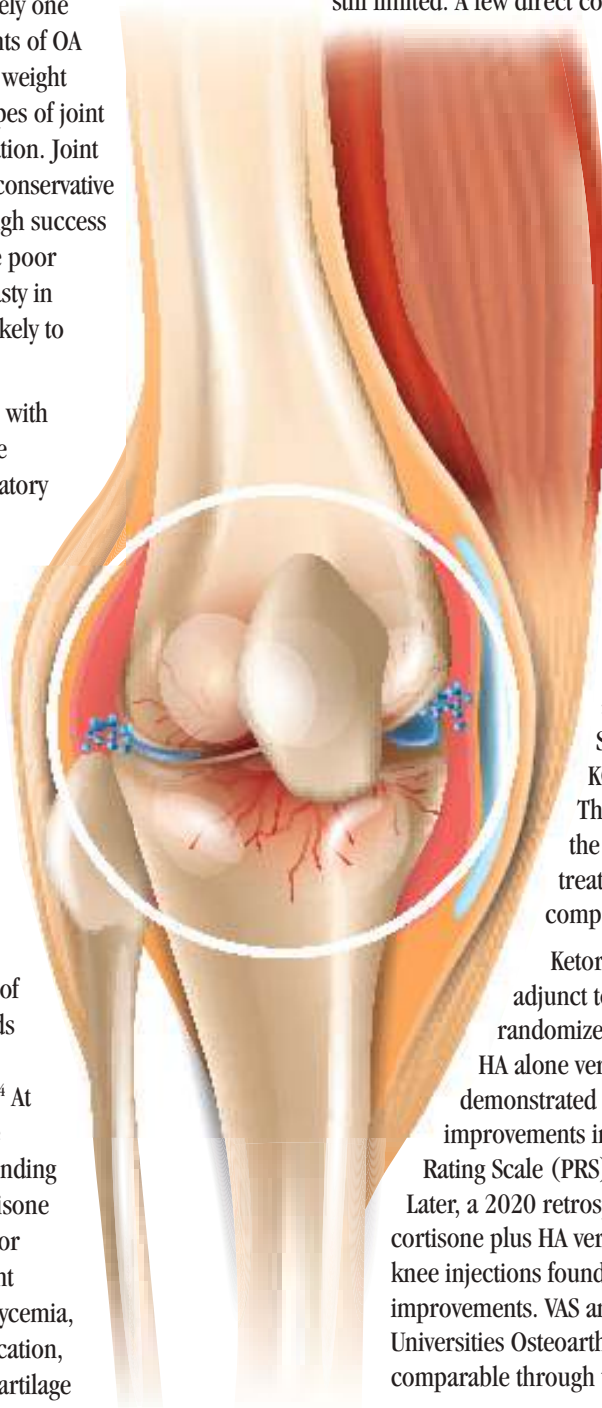
## Evidence Comparing Ketorolac to Cortisone in Osteoarthritis

Ketorolac has been compared to cortisone as a local injectant for a variety of musculoskeletal applications, but studies on this topic are still limited. A few direct comparisons of cortisone and ketorolac as intra-articular or intra-bursal injections provide valuable clinical information. A variety of other studies evaluate ketorolac against cortisone in conjunction with another treatment such as hyaluronic acid or for an amalgam of loosely related conditions such as “sprains” at any location. The studies generally show findings of similar efficacy in these uses.

Osteoarthritis is the most common reason for injecting joints with cortisone, and a prospective randomized study in 2021 compared intra-articular ketorolac against triamcinolone for 52 hips and 58 knees with osteoarthritis.<sup>8</sup> Outcomes were measured with the Hip Injury Osteoarthritis Outcome Score (HOOS) and Knee Injury Osteoarthritis Outcome Score (KOOS), as well as the HOOS JR, KOOS JR, and Visual Analog Scale (VAS). There was improvement at one week through the conclusion of the 3-month study for both treatments, and overall ketorolac had a comparable effect to triamcinolone.

Ketorolac appears to be a safe and beneficial adjunct to hyaluronic acid (HA) injection. A 2011 randomized trial treating knee OA with intra-articular HA alone versus combined HA and ketorolac demonstrated significantly earlier and larger improvements in Visual Analog Scale (VAS) and Pain Rating Scale (PRS) in the combined ketorolac-HA branch.<sup>13</sup> Later, a 2020 retrospective comparison of 42 patients with cortisone plus HA versus 42 patients with ketorolac plus HA knee injections found both groups had significant and similar improvements. VAS and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores were comparable through the 3-month observation period.<sup>25</sup>

Investigating small joint injections, a retrospective study looked at thumb carpometacarpal joint OA treated with ultrasound-guided



injection of combined ketorolac and HA versus HA alone. Visual Numeric Scale (VNS) and Disabilities of the Arm, Shoulder, and Hand (DASH) showed the combined injection provided faster improvement in pain and function.<sup>11</sup> By the 3 and 6 month evaluations, the two groups had converged to similar benefit.<sup>11</sup>

It appears that for OA ketorolac is comparable to cortisone in both effect and duration and it is useful as an adjunct to hyaluronic acid.

## Evidence Comparing Ketorolac to Cortisone in Musculoskeletal Soft Tissue Injections

Ketorolac has been compared to cortisone for subacromial shoulder injections. A randomized trial showed patients who received subacromial ketorolac injections for subacromial impingement syndrome had a greater improvement on the UCLA Shoulder Rating Scale, better forward flexion range of motion, and better patient satisfaction compared to triamcinolone injection.<sup>15</sup> Two later studies did not make comparisons of range of motion or strength but did conclude that improvements in VAS scores in the steroid and ketorolac subacromial injection groups were equal.<sup>21,7</sup>

Ketorolac has been injected around tendons and ligaments where cortisone is avoided due to risk of rupture.<sup>16,14</sup> A randomized trial involving 144 patients diagnosed with a local inflammation, strain, sprain, tendinitis, tenosynovitis, or bursitis compared ketorolac to triamcinolone at time points from one hour to 7 days and at several different doses. They concluded that ketorolac was non-inferior to triamcinolone at every concentration and time point.<sup>20</sup>

## Contraindication and Safety

Systemic NSAIDs are often used to treat OA and risks and contraindications of intra-articular ketorolac are similar to oral or systemic NSAIDs. Contraindications include poor renal function, gastrointestinal NSAID intolerance, bleeding disorders, and use of warfarin or other anticoagulants.

The side-effects of NSAIDs on gastrointestinal, coagulation, renal, and cardiovascular systems have several related mechanisms. Prostaglandin and thromboxane pathways mediate gastrointestinal mucosal protection, platelet adhesion, and vasoreactivity. Gastrointestinal side-effects increase linearly with dose and duration of treatment and occur through both local irritation and systemic mechanisms.<sup>14</sup> Bleeding risks increase with interaction with anticoagulants, but in healthy individuals without interacting medicines, a single 60 mg ketorolac injection increases bleeding time by about 50% at 4 hours after injection.<sup>14</sup> Renal effects of NSAIDs vary depending on the type of renal disease with more susceptibility when there is poor afferent blood flow, which creates prostaglandin-dependent renal function.<sup>14</sup> Cardiovascular effects are hypothesized to be related to oxidative stresses, impaired endothelial function, and increased blood pressure.<sup>14</sup>

There are no pharmacokinetic studies for intra-articular injection, but ketorolac is cleared both renally and hepatically with a consistent half-life of 6.5 hours whether administered by intramuscular, intravenous, or oral routes.<sup>14</sup> Although the pain relief after localized musculoskeletal injection can last much longer, ketorolac seems to be cleared quickly from the body. Intramuscular ketorolac has analgesic onset within 10 minutes and maximum concentration and

analgesia at 45 minutes.<sup>14</sup> Oral ketorolac uptake is even faster, with peak serum concentration at 20 minutes.<sup>14</sup> Given similarly rapid bioavailability through all other routes, combined with the fact that a large fraction of landmark-guided joint injections are known to be inadvertently delivered extra-articularly, we suggest treating the side-effects and contraindications to articular ketorolac injections as similar to those of intramuscular or intravenous injections.<sup>5,6,22</sup>

As a substitute for cortisone injection, intra-articular ketorolac injection would most likely be used once every few months, which mitigates side-effect potential. Parenteral ketorolac administration for less than 5 days has been estimated to have the same rate of renal failure as parenteral opioids, suggesting short-term use is relatively safe for kidneys.<sup>11</sup> We do not know of data quantifying the gastrointestinal effects of articular NSAID injection, but they may be milder than enteric administration or intramuscular injection given that the injectant is delivered into a synovial capsule, thereby avoiding local gastric irritation. It is hypothesized that the favorable benefit-to-risk ratio of parenteral and specifically intra-articular ketorolac may be from increased local and decreased systemic concentrations.<sup>13,11,19</sup> Based on the intermittent infrequent exposure to ketorolac as an intra-articular cortisone replacement, it is likely to have less systemic toxicity than daily oral NSAIDs.

The clinical trials we reviewed all suggest low risk with intra-articular ketorolac injection and none reported any significant adverse events, although these clinical trials were not designed to detect long-term effects. One study noted a 12% incidence of temporary pain within a few hours of ketorolac injections performed without local anesthetic.<sup>13</sup> Administration along with anesthetic would presumably avert this. Both ketorolac and cortisone are commonly administered with a small amount of local anesthetic. This transient pain was not noted in other trials.

Studies have not shown detriment to local tissue from intra-articular NSAID injection.<sup>11</sup> We know of no *in vivo* studies of tissue integrity in human tissues after ketorolac injection. A 2004 study compared the histopathological effects of ketorolac injection in rabbit hind knees to a saline control as well as to morphine.<sup>4</sup> At 1, 2, and 10 days after injection the rabbit knees were analyzed for articular cartilage inflammation, synovial membrane inflammatory cell infiltration, synovial membrane cell hyperplasia, and synovial membrane cell hypertrophy. Saline injection did not cause histopathologic or inflammatory changes. Ketorolac caused mild to moderate inflammatory and histopathological changes that peaked at or before 10 days, post-injection. Morphine caused greater inflammatory and histopathologic changes than ketorolac, but the authors concluded that all the injectants were safe for intra-articular use.<sup>4</sup> A similar study of ketorolac injection in conjunction with hyaluronic acid in rats showed only mild temporary inflammation and overall good tolerance.<sup>9</sup>

A 2013 *in vitro* study of human chondrocytes and tenocytes showed that compared with control cells kept in fetal bovine serum, cells treated with combined ketorolac and platelet-rich plasma (PRP) demonstrated even higher viability than cells treated with PRP alone, while cells treated with methylprednisolone demonstrated much

continued on page 24



lower viability, regardless of the presence of PRP.<sup>1</sup> The modulatory effect NSAIDs have on cyclooxygenase, lipoxygenase, and reactive oxygen species were proposed as a mechanism whereby ketorolac improves cell viability. The authors suggest that to the extent this represents *in vivo* activity, ketorolac may provide analgesia with a lower risk of tissue atrophy than cortisone.<sup>1</sup>

The current literature thus suggests intermittent intra-articular ketorolac injection has lower systemic toxicity than chronic regular NSAID use and lower toxicity to local cartilage and tendon than cortisone. Although the amide anesthetics that are commonly co-injected with ketorolac or cortisone to block temporary post-injection pain flares have some potential toxicity, the local tissue advantages of ketorolac over cortisone may allow more frequent use.<sup>12</sup> Until further research is done, the maximal frequency of intra-articular ketorolac will depend on patient comorbidities, clinical judgement, and the practicality of repeat office visits for injections.

### Compelling Clinical Situations for Ketorolac over Cortisone

Certain clinical situations provide compelling indications for ketorolac over cortisone. In patients concerned about accelerating degeneration, and in all young patients, we feel ketorolac is a better initial injectant with cortisone as a second-line alternative.

Ketorolac is preferable in patients who may need surgery. Cortisone injections have been associated with higher postoperative infection rates in arthroplasty and higher repair failures and revision rates in rotator cuff repair. Increased surgical risks may last more than a year after steroid injection.<sup>23,10</sup> Many surgeons prefer not to operate within several months of a same-site cortisone injection, so avoiding cortisone keeps open other treatment options.

Whereas periarticular calcification is a potential adverse effect of cortisone injections, NSAIDs prevent heterotopic ossification.<sup>3</sup> This suggests a potential role for ketorolac injection at sites of calcific tendinosis to mitigate calcium deposition. Studies are needed to explore whether the benefit extends to local injections at sites of tendinosis, but existing data already suggest ketorolac may be more effective for tendinitis and subacromial impingement in general.<sup>7,15,21</sup>

Ketorolac in conjunction with hyaluronic acid reduces the time until clinical improvement and perhaps increases the magnitude of clinical improvement. It is possible that the relatively slow onset of relief from hyaluronic acid injections leads to some patients underestimating the effect or misattributing the effect to something else and opting out of continuing beneficial HA treatment.<sup>11</sup> Reducing this nocebo effect may be a benefit of combining hyaluronic acid with ketorolac.

Ketorolac may work as an adjunct to cortisone injections, increasing benefit in patients with insufficient response to cortisone alone, or as an in-between “booster” injection for patients who have less than 3 months of relief from cortisone. Research on ketorolac in combination with cortisone is needed.

Ketorolac is a less expensive injectant than cortisone and given the ubiquity of musculoskeletal injections, there may be cost savings in replacing cortisone with ketorolac.<sup>2</sup>

### Conclusion

There is a paucity of prospective research comparing ketorolac to corticosteroid for local musculoskeletal injection, but what evidence exists collectively suggests ketorolac has similar efficacy. No prospective, retrospective, or animal studies show substantial adverse events with intra-articular, intra-bursal, or peritendinous injection of ketorolac. Although more prospective trials are needed, given the known detriments and contraindications to cortisone, the safety of ketorolac, and early data suggesting clinical equivalency, a transition to using more ketorolac and less cortisone in clinical practice may already be supported.

### Summary

- Ketorolac as an intra-articular injection appears to be safe. (Level I.)
- Ketorolac is at least as effective as cortisone for subacromial injection. (Level I)
- Ketorolac as an intra-articular injection for osteoarthritis appears similarly efficacious to cortisone. (Level II)
- Certain clinical situations such as young patients and patients with contraindications to cortisone present opportunities to improve practice by injecting ketorolac instead of cortisone. (Level III)

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# Why We Cannot Accept America's Physical New Normal

By Dina Elnaggar MD, MS, CAQSM; John Nunez PT, DPT, CSCS and Ashley Witson PT, DPT

The costs related to musculoskeletal disease are estimated to be \$77 billion annually.<sup>1</sup> It is my suspicion that the number is actually much higher. Throughout my training, I have learned to encourage my patients to be more active. Yet, as a practicing sports medicine physician, the common trend among my patients is that they are all active in different ways. They often try to work through their musculoskeletal disease and injuries on their own until they end up in my office. The use of over the counter medications and self-prescribed exercises have failed. By the time they seek evaluation, their pain is no longer controlled. This is often an ominous sign of musculoskeletal disease which requires a long recovery. They express defeat, as if they should have known how to get themselves better on their own. I have learned that there is now a greater need for musculoskeletal disease prevention than ever before, and prevention needs to start earlier than I previously expected.

Year after year, my practice has been seasonal. It predictably ebbs and flows with high school and college athletic seasons. Last year, I held my breath waiting for my practice to come to a screeching halt. What transpired is beyond what I could ever have imagined. I have been seeing more debilitating injuries than ever before. I have examined a steady influx of severe cervicalgia. I've treated shoulder impingement and rotator cuff dysfunction with such advanced progression that patients cannot lift their arms. I have patients experiencing tennis and golfer's elbow at the same time and a flow of runners rupturing gluteus medius tendons. I've worked with more high school athletes with patellofemoral pain syndrome than I can count, and I have seen an exponential rise in lower limb stress fractures. The multitude of patients with disabling lower back pain is essentially ubiquitous.

I had never heard of the diseases that I diagnose day after day until my sports medicine fellowship. So who does this battery of injuries affect? I treat individuals as young as 3 and as old as 93. Healthy teenagers working at ice cream parlors have the same chronic overuse injuries that I see in electricians and welders. During golf season, I see severe back, shoulder, and elbow injuries in every possible demographic. I've seen multi-sport athletes have unrelenting back pain while sitting at their computers. I have treated teachers and accountants whose cervical radiculopathy prompt emergency room visits. I've treated moms of five children, elderly folks who love to garden, ultra-marathoners, professional athletes and everything in-between. Regardless of age or occupation, a common thread among my patients is that they are all active in some way.

Encouraging patients to walk 30 minutes per day for injury prevention seemed arbitrary day after day. Patients spend thousands of dollars on trying to fix themselves. They look to gym memberships, braces, orthotics, straps, creams, oils, massages, and personal trainers for help. They seek the help of physical therapists, chiropractors, and acupuncturists for pain relief. Most often, they look to doctors to get the latest injections and MRIs. Patients are more well versed in fusions, grafts, microdissectomies, epidural injections, rotator cuff repairs, distal clavicle excisions, lateral vs anterior hip replacement techniques, knee arthroscopy and knee replacements than I ever was coming out of medical school. They "pre-fuel" for the latest workouts and replenish themselves with the latest diet craze. They stop eating at night, cut out carbs, and put turmeric in everything. They feel as if they cannot win, and they keep getting injured.





I sense their frustration. Things such as severe lower back pain make them stop their activities in fear that they'll make things worse. "Doc, what did I do wrong? I've been trying to be active." My response is always: "Your injury is a result of you being an upright vertebral organism with a long lifespan. You have back pain while sitting at your computer but you stopped running. We rely on "muscle memory" too much. And muscles constantly forget and they have to be re-taught."

I replaced my stack of concussion return to sport handouts with exercise fact sheets. I now educate individuals on proper squatting techniques, gluteus medius strengthening, quadriceps strengthening, and upright rows. These exercises have become part of my "building resilience protocol." I now prescribe and supply the use of Therabands in my clinic. I discourage the use of passive modalities such as posture straps and back braces. I have to explain to patients that standing desks are not the ultimate solution to back or neck pain. I often remind them that awareness of posture and movement does matter.

I tell my patients to imagine Fabio Lanzoni or Johnny Bravo. A lot of them laugh because of their ostentatious posture but I believe they have it right. They work hard on their physiques, engaging their core muscles while walking up and down the boulevard, and they engage their core even more while they are standing still. In the clinic, I will squat down and show them how people in Southeast Asia sit low to the ground with their spine in alignment.

I re-emphasize what elders used to say at the dinner table: "Sit up straight." It surprises me how bizarre of a saying this seems to be nowadays. High school students look at me in shock as if I just told them to wear a neon light on their heads. People in office environments tell me how weird they feel when they sit up straight with their shoulders back. Tall patients often have chronic neck and back pain from crouching down to prevent drawing attention to themselves. Many athletes do the same. We often go on to discuss posture, pain, self-esteem, confidence, and how it relates to performance.

Our patients need a new perspective on wellness and pain. They need to understand that proactivity is key. Over the years, I have found camaraderie with my local physical therapists. Together, we discuss creating resiliency among patients and we work as a team to decrease the likelihood of injury or disease through proactive measures. We've noted that reactive healthcare has scared many individuals away from the healthcare system.

Our system has many roadblocks preventing a proactive approach to injury and illness prevention. Insurance carriers often fail to reimburse for treatment plans preventing disease or injury. As a healthcare provider, have you ever thought about the first line of defense such as physical therapy? If so, when has it crossed your mind?

Insurance carriers often fail to reimburse for physical therapy until a patient experiences greatly impaired function and disability. I believe this process needs to change. Physical therapists are at the forefront of preventative musculoskeletal medicine. They are observers of movement, pain scientists, and realists in the realm of musculoskeletal health. They can assist patients in learning about their bodies and preventing injuries before they reach decreased functionality and disability.

In my opinion, the best physical therapists work "outside of the box." They provide one on one, out of network care so that patients don't have to experience great disability and decreased function prior

to receiving treatment. With this style of physical therapy, patients are not limited in what they can receive based on current insurance standards. They are licensed to treat individuals without a physician referral. Their expertise lies not only in rehabilitation but in knowing the signs and symptoms of when a referral is warranted to an appropriate medical provider. Not only do they use their time to help patients explore their health, but to make the best plan for injury prevention and future performance. And believe it or not, the cost often ends up being the same. Instead of paying \$60 co-pays twice per week for 6 weeks for traditional PT with one therapist per six patients, out of network cost with the group I work with is \$140 for a one-on-one session once every other week.

As healthcare providers, we keep up to date with the latest journal articles and literature throughout our careers. We discuss the best ways to improve musculoskeletal disease and injury prevention. Our questions to primary care physicians of all types are:

- Have you thought this may warrant a preventative medicine referral?
- Have you considered recommending a physical therapy or sports medicine evaluation before prescribing a 30 minute-a-day walking program to ensure patient success?

The following questions are recommended for primary care and sports medicine physicians during routine health, sports, and occupational physicals to help determine the need for a physical therapy referral:

1. Can you roll over in bed without difficulty or pain?
2. Can you get on and off of the floor without assistance/difficulty?
3. Do you have difficulty or pain ascending or descending stairs?
4. Can you stand > 30 minutes without difficulty or pain?
5. Can you walk for >30 minutes without difficulty or pain?
6. Can you pick up a bag of groceries or laundry basket without difficulty or pain?
7. Can you stand up or sit down from a chair without using your hands?
8. Can you drive your car for prolonged periods without pain?
9. Do you have pain daily?
10. Have you stopped doing things you love because of pain or fear or pain?
11. Can you get something off of the top shelf in a cabinet without pain?
12. Do you avoid any necessary daily activities because of difficulty or pain?

Feldman Physical Therapy and Performance, 2021

The missing link between prevention and treatment is the understanding that we have to physically carry ourselves, and it takes a lot of muscle engagement. Encouraging patients to actively engage their muscles in order to maintain a sitting or standing posture is emerging as a cost effective way to prevent and treat disabling, chronic and acute musculoskeletal injuries.

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**John Nunez, DPT, CSCS** studied at New York Medical College, where he earned his Doctorate in Physical Therapy in 2013. He joined Feldman Physical Therapy and Performance to focus on one on one care and to provide the best to all of his patients. He completed his first Ironman triathlon in Florida in 2013 and continues to train for upcoming competitions. He has a passion for endurance events and loves to help athletes of all ages return to their passion.

**Ashley Witson, DPT** is a 2014 graduate of the American International College, Doctor of Physical Therapy Program in Springfield, Massachusetts. Her drive to help others developed after sustaining numerous injuries during her collegiate soccer career, and she has worked in various settings of the physical therapy profession including outpatient orthopedics and sports medicine, neurological rehabilitation, pre and post-partum rehabilitation and acute care. Her interests include sports rehabilitation and performance, post-concussion rehabilitation, women's health, RED-S, and motorsports injury and performance. She joined the Feldman Physical Therapy & Performance team in 2018.

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# Exploring the Ancient Indian Arts and Movement Therapy

By Varudhini Reddy, MD

What does dance mean to you? Last Saturday's salsa night, a trip to the opera, or Zumba at the gym? To some, dance is celebrating with their friends, to others it's watching ballet at the theater, and finally to others it's part of their daily routine. Dance is an aesthetic art form that involves a series of purposeful movements that allow for expression through the dancer. The origins of dance can be traced back to ancient times where dance was used as a tool for creative nonverbal expression among communities to convey religious concepts and explain astronomical phenomena. Dance was deeply embedded in various cultures and religions across the world from the Ancient Greeks in Sparta to temple dancers in India. In India, this ancient art form was practiced throughout religious temples to convey stories. Other folklore dances brought communities that spoke different languages together during times of celebration as well as crises.

Dance has evolved throughout history due to its immortal nature which stems from the expression of ideas and thoughts without the use of words. In fact, dance was practiced before the written word was developed, serving as an important form of storytelling. Communities that spoke different languages remained connected to higher knowledge through this art form. Most importantly however, transcendence through dance was not only demonstrated at the collective level, but also at the individual level. Dance holds the power to unite the body, mind, and soul and was practiced by saints and priests across the world to access spiritual knowledge. Those who suffered from unknown illnesses would appear before temples in India. Dance's ability to allow for mind-body healing was promoted by those treating the ill including ancient Ayurvedists.<sup>3</sup> Evolving research has depicted the potential benefits of dance movement in those who suffer from physical and mental disorders, such as pain and depression. Dance movement therapy evolved as a therapeutic intervention that allows for integrative mind-body healing among those suffering from disorders, where standard verbal or physical therapies prove to be insufficient.<sup>5,14</sup>

Dance movement therapy, or DMT, as defined by the American Dance Therapy Association is the psychotherapeutic use of movement and dance to support intellectual, emotional, and motor functions of the body.<sup>2,10</sup> Movement serves as a medium for nonverbal communication that allows a therapist to work with their client. Early dance movement therapist and pioneer, Blanche Evan, emphasized dance to be a significant tool to unite the body with the psyche to allow for therapeutic change. The therapeutic benefits of dance movement therapy were studied as a form of psychotherapy for adults who suffer chronic illnesses, such as depression.<sup>12</sup> In 1916, Carl Gustav Jung first recorded the concept of dance as a form of psychotherapy, while working in collaboration with Toni Wolff, in an

original paper.<sup>7</sup> Jung's research regarding active imagination held that art had therapeutic value in bridging the gap between the unconscious and conscious mind. The concept of dance as a form of psychotherapy or "active imagination" was explored by a few psychoanalysts, but remained largely unknown until the 1960s, after Jung's original paper was published in 1957. Mary Whitehouse then emerged as an early pioneer of dance therapy and "active imagination in analysis" in the 1960s.<sup>17</sup> In the United States, Marie Chace, now recognized as one of the founders of the modern professional dance therapy movement, became the first president of the American Dance Therapy Association in 1966.<sup>2,10</sup>

Many studies have shed light on the potential beneficial effects of dance movement therapy across various populations suffering from a variety of chronic illnesses. A meta-analysis studied the effectiveness of dance movement therapy and dance interventions among psychological health outcomes and found that the use of DMT held significance in increasing quality of life and decreasing clinical symptoms such as depression and anxiety.<sup>13</sup> In addition, a systematic review of 817 studies with meta-analysis of eight studies after inclusion criteria were met, concluded that DMT served as an effective intervention in treatment of adults with depression.<sup>12</sup>

Not only does dance movement therapy represent a potential treatment option among the creative arts therapies among depressed adult patients, it has also been explored among the elderly suffering from Alzheimer's disease and dementia. Today, 5.8 million Americans age 65 and older have Alzheimer's dementia, which may grow to 13.8 million by mid-century.<sup>1,11</sup> Alzheimer's disease is a gradually progressive illness that initially affects memory and language with symptoms including poor memory, apraxia, language difficulties, and executive dysfunction. Medications, such as cholinesterase inhibitors, may slow progression of the disease, however there is no cure. In addition, as this disease affects

the elderly population, patients may also often suffer from other comorbid medical illnesses that contribute to their physical function decline. As the burden of care of this population of patients increases with a shortage of dementia care specialists, more emphasis is placed on family care practitioners to maximize quality care for these patients with cost-effective treatment options.

Appropriate symptom management and holistic care may improve patient safety, maximize functional abilities, and help patients maintain a form of independence. Holistic care may also strengthen caregiver and patient relationships at a vulnerable period of time in these patients' lives as they reach their final stage. While these patients withdraw from their surroundings, patients become at higher risk for harm such as falls and malnutrition, and often die from preventable complications related to infection, dehydration, and malnutrition.<sup>1,11</sup> In



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addition, depression may impact these patients, increasing barriers to treatment. Depression may also present additional challenges in treatment due to medication side effects.<sup>4</sup> Because DMT does not require complex cognitive or linguistic skills for the patient, it holds value as a treatment option for these patients to foster communication, promote safety, and enhance functional ability. By closing gaps in communication through the use of DMT, providers may be better able to meet these patients' needs throughout their end of life care.

In a recent randomized controlled trial, 204 patients who were diagnosed with dementia were given DMT or exercise interventions.<sup>16</sup> The patients who received DMT were found to have a significant decrease in depression, mood, loneliness, and an improvement in daily functioning. Because DMT shows benefits in patients suffering from chronic illnesses, it has remained a topic studied across multiple disciplines. However, insufficient research evidence exists for DMT to be used in clinical recommendation guidelines for family physicians treating patients with dementia. The results of Rainbow's study reflect positive effects of DMT in the dementia patient population and researchers recommend that further research should be considered.

DMT continues to be utilized for its positive effects in skilled nursing facilities, assisted living facilities, and psychiatric hospitals to promote wellness among patients. Participation in dance classes by patients who suffer from Alzheimer's disease by trained professionals has also shown to help maintain function and increase socialization, while supporting positive emotional expression.<sup>13</sup> Dance movement therapy offers resourceful skills and medium of expression to elderly individuals experiencing degradation of their bodies and confronting mortality.<sup>8,9</sup>

Additional awareness should be brought to the ancient performing arts and its positive effects on dementia patients. Dance has demonstrated the ability to surpass social and cultural barriers for centuries. In India, hundreds of languages are spoken, dozens of religions are practiced, yet cultural traditions like dance bring people together to understand a common message. Many of the ancient Indian dance art forms utilize the combination of movement, gestures, and music to depict a story or narrative in order to elicit a reaction from the audience and convey meaning. The expression of emotion through gestures and movement from dancer to audience, and the practice of storytelling is emphasized in this ancient art form. The ability to tell a story or even convey thoughts may prove to be difficult for dementia patients as they cannot verbally express themselves. Dance interventions emphasizing aspects of this ancient art form may hold benefits in this population while closing gaps to communication.

In addition, much like a dancer has the ability to reach a single individual or a group of individuals at the same time, therapists may also work with their clients selectively and/or within a group such as in a nursing home. The therapeutic benefits of simply watching a performance that tells a story, should be further researched as a technique among therapists treating elderly patients with decreased mobility. The simple observation of a dancer's movements and expressions activates mirror neurons and overlapping cognitive and motor neural networks in the observer, and research studies have shown that similar neural networks are activated in the planning and conduction of movement.<sup>6,15</sup> Researchers have found that simply thinking about moving activates similar networks involved in the actual conduction of movement.<sup>6,15</sup> Dance interventions such as watching a performance may have potential benefits in this population.

Therapists who provide DMT are found in community and health and wellness centers, hospitals, eldercare facilities, and more. Family physicians are often the first provider to recognize decline in their patients and are key in recommending therapies and treatments for their elderly patients. Dance movement therapy offers a cost-effective treatment option for their elderly patients and may help improve their quality of life.

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**Varudhini Reddy, MD** graduated from the Ross University School of Medicine and completed a family medicine residency internship. While growing up in Delaware, she received 8 years of Indian classical dance training in the art of Bharatnatyam, and her first performance was on the grounds of the Hindu Temple of Delaware at the age of five. Varu has spent many years training and performing at state and national events as a solo Bollywood and classical dance choreographer, and as a member of the University of Delaware's Kamaal Dance Team. Her passion is spreading awareness of the therapeutic benefits of dance through blogging.

# To the Editor:

## Subject: Legalization of recreational THC (marijuana) in NYS

At the time of writing, it appears very likely that recreational marijuana will become legal in our state. Family physicians should prepare to participate in the most important part of the process – the crafting of rules and regulations which will specify the most important details of the new law. Those details will control the marketing, packaging, and “serving sizes” of THC (the principle “recreational” cannabinoid of marijuana). In my work in public health, I have given several lectures on the experiences of those states which have legalized THC before us. Experience has shown that, when this is done badly, overdoses, suicides, psychosis and ingestion by children will occur.

A law merely states, in broad strokes, that it is legal in NYS to market THC. It is the rule and regulation making part of the process that provides the operational details.

*We need to prepare ourselves to voice our opinions and concerns about such things as ensuring:*

- Packaging and product shapes are not attractive to children and adolescents.
- “Serving sizes” are reasonable and do not require splitting a portion into impractical pieces to be able to ingest a safe size.
- “Dosing” information on ingestibles accurately reflect the onset and duration of action to be expected in order to prevent overdoses.
- Precautions need to be spelled out with instructions for appropriate action should untoward effects occur. These should include effects on mood and impulse control as well as operating machinery and motor vehicles.
- Marketing is not attractive to children and adolescents and is limited to acceptable venues and times to limit exposure to inappropriate populations.
- Surveillance of outlets is conducted to identify retailers not in compliance (as we do now for tobacco).

There are many other areas of concern. Should your group wish a presentation on this topic I am available to do them remotely. Educate yourself and speak out. But even if you don't have time to get the details, voicing your concern when you hear of public testimony being solicited can help.

Thank you.

Sincerely,

William Klepack, MD  
Medical Director Tompkins County Health Department  
wklepack@tompackins-co.org



# Breathlessness in Athletes

By Andrew Getzin, MD, FACMS, RMSK; Adrian Western MS, ATC; Anthony Spinelli, ATC, CCEP, CSCS and Robert Strominger, MD

During exercise, both trained athletes and people who exercise recreationally, commonly report shortness of breath (SOB) that can affect their exercise or performance goals.<sup>1</sup> The etiology of the SOB can be elusive when based solely on patient history and physical exam. Consequently, patients, particularly young athletes, are often empirically diagnosed with and treated for exercise-induced bronchospasm (EIB) despite no objective evidence.<sup>2-5</sup> Family physicians should be aware of a common cause of SOB with exercise called exercise-induced laryngeal obstruction (EILO) that masquerades as EIB.<sup>6</sup> With an appropriate medical work up that involves an exercise test coupled with continuous laryngoscopy to visualize the upper airway, EILO and other causes of shortness of breath can be identified and properly treated. This article will review EIB and EILO, a differential diagnosis for SOB with exercise, and an algorithm of how to evaluate these patients. We will share lessons that we have learned over the past ten years from our shortness of breath in the athlete clinic to help family physicians obtain a better understanding of this challenging presentation.

## Exercise-Induced Bronchospasm

The most common presenting diagnosis in our shortness of breath clinic is exercise-induced bronchospasm (EIB) (unpublished data). Most family physicians are quite familiar with EIB, which perhaps leads to its frequency of diagnosis. The term exercise-induced asthma is misleading and will not be used in this article. Exercise is not an independent risk factor for asthma, but rather a trigger of bronchospasm in patients with underlying asthma.<sup>7</sup> EIB is a transient increase in airway reactivity and subsequent airway narrowing following at least 5 minutes of strenuous exercise. SOB that occurs within the first five minutes of exercise is not EIB; consequently, the provider needs to consider other causes. Patients with EIB have initial bronchodilation with exercise followed by airway bronchospasm shortly after the cessation of exercise, reaching a

peak 5 to 10- minutes post-exercise.<sup>8</sup> EIB can also present with cough, chest tightness, and expiratory wheeze. Symptoms typically last 30 – 60 minutes prior to resolution. The severity of the airway response varies with temperature and water content of the exercise environment with cold, dry air resulting in greater airway narrowing. Airway narrowing is proportional to exercise intensity with more bronchospasm occurring from higher workload activities such as running as opposed to lower workload activities like walking.<sup>8</sup> EIB does not typically cause prolonged or intense airway obstruction that would necessitate a hospital or emergency room visit.

## Exercise-Induced Laryngeal Obstruction

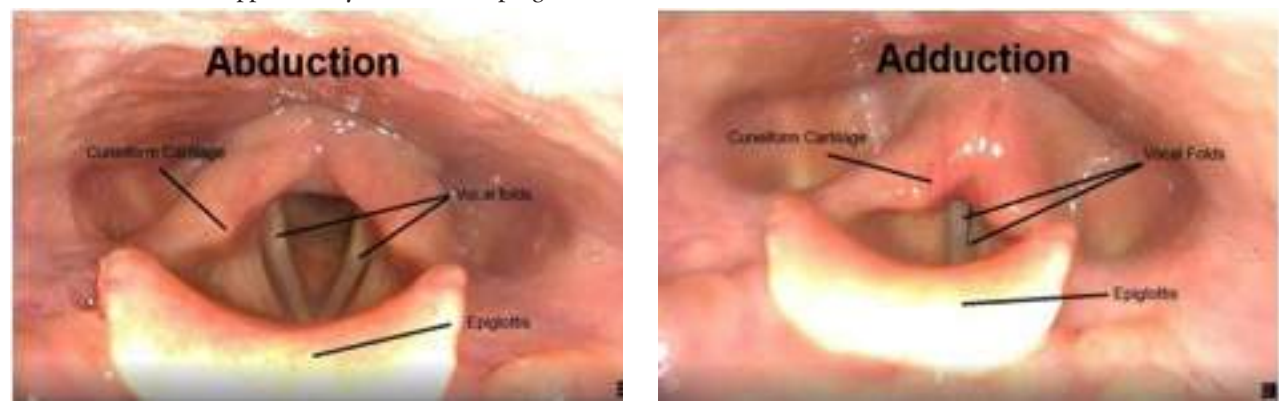
The most common exiting final diagnosis at our SOB clinic is EILO (unpublished data). EILO is a paradoxical adduction of the vocal cords or supraglottic structures within the larynx during exercise provocation.<sup>4</sup> Under neurologic control for the respiratory reflex, the dynamic larynx abducts during exercise in patients without EILO, increasing the opening diameter to allow increased airflow.<sup>9</sup> Athletes with EILO often point to their neck as the source of airway limitation, as opposed to the chest in EIB. They describe a sensation as choking or breathing through a straw. When symptomatic, they may be loud breathers who have harsh stridor on inspiration as opposed to the high pitch expiratory wheeze that can be heard in EIB. Unlike EIB which usually has a subtle presentation, the presentation of EILO can be quite dramatic. In part because EILO is still relatively unknown by providers, appropriate diagnosis can be delayed for years as patients move from physician to physician in search of an accurate diagnosis and subsequent successful treatment. Physical exam at rest is usually normal<sup>10</sup> as obstruction tends to occur during maximum exercise.<sup>11</sup> The combination of delayed diagnosis and dramatic presentation with subsequent emergency care has been shown to result in an increased health care utilization when compared with patients who have EIB.<sup>12</sup>

**Photo 1:** Continuous Laryngoscopy with Exercise (photographs are author's own)





**Photo 2. A.** Normal Upper Airway B. Grade 2 Supraglottic Obstruction and Grade 3 Glottic Obstruction



Continuous laryngoscopy with exercise, which allows direct visualization of the larynx during exercise, is the gold standard for diagnosis (photo 1). Unfortunately, at this time, there are not less invasive, simpler tests to obtain an accurate diagnosis, which limits the ability of most family physicians to make the diagnosis of EILO. Only 6% of family physicians perform laryngoscopy and the authors are unaware of other family physicians who have been able to couple laryngoscopy with controlled provocative exercise in the office.<sup>13</sup> Prior to visualization during exercise, the phenomenon was inappropriately called vocal cord dysfunction.<sup>14</sup> In reality, the obstruction more commonly occurs in the arytenoid or aryepiglottic mucosa which is the tissue above the level of the vocal cords (supraglottic obstruction) but it can also occur at the levels of the vocal cords (glottic obstruction)<sup>15</sup> (photo 2). The Norwegian grading system, grades both glottic and supraglottic obstruction from 0 – 3 and provides a convention that may be useful in treatment algorithms and as a research tool as more work still needs to be done to help determine many facets about EILO including etiology.<sup>16</sup>

EILO occurs typically in young active people, particularly female athletes. In 112 patients diagnosed with EILO at the Cleveland clinic, 81.3% were female with a mean age of symptom onset of 13.8 years and mean age of diagnosis 15.4 years old.<sup>17</sup> However, people of all ages can have EILO. Of all 12–13-year-old children in Uppsala, Sweden 5.7% was found to have EILO and 11% of those who had exertional breathlessness had EILO.<sup>2</sup> In a follow-up study, Ersson found that 8% of 15-17-year-olds at a sports high school in Uppsala had EILO.<sup>18</sup> Of the athletes, who were referred to the asthma service at Bispebjerg University Hospital in Copenhagen for the investigation of exercise-induced respiratory symptoms between 2010 and 2011, 35% were found to have EILO.<sup>3</sup> Rundell found EILO in 5% of elite winter athletes at the United States Olympic Training Center in Lake Placid, NY.<sup>5</sup>

There are several different treatments for EILO that all seem to be at least somewhat effective but there have been no controlled studies evaluating efficacy.<sup>6</sup> Firstline treatment is speech therapy where the patient learns how to relax their upper airway during exercise.<sup>19,20</sup> One speech therapy method involves modifying the airway resistance from high to low pressure and thereby essentially forcing the larynx open with a sudden change in pressure gradient.<sup>21</sup> For those individuals who do not respond to speech therapy, biofeedback can simultaneously be performed in which the athlete receives direct visual feedback of their larynx during speech therapy by performing the speech therapy session with a rhinolaryngoscope in the larynx and

the images on a monitor (called therapeutic laryngoscopy with exercise).<sup>22</sup> Supraglottoplasty involves laser resection of the supraglottic tissue and can be performed for those patients who do not improve with speech therapy.<sup>23</sup> Anxiety may be a component to EILO, but it is unclear if it is the cause of EILO or result from it. Treatment for anxiety or performance-based psychology intervention may provide relief.<sup>24</sup> We have found that working with athletes on their running form, in particular attempting to eliminate head forward shoulders raised position, can provide relief. Inspiratory muscle training has also been shown to be effective.<sup>25</sup> Inhaled anticholinergics may reduce symptoms but has not been critically evaluated.<sup>26</sup>

### Differential Diagnosis for Shortness of Breath

The differential diagnosis for SOB in the athlete is broad (Table 1). Anything that decreases oxygen delivery to the working muscles can limit one's ability to exercise at a high workload where rapid energy delivery is required. What further complicates the process of obtaining an accurate diagnosis is that it is possible to have more than one problem simultaneously contributing to the SOB. The two main entities to consider, particularly with young athletes, are EIB and EILO. These can occur in isolation but also occur together.<sup>3,5,27</sup> Anemia, in which oxygen-carrying capacity is diminished, can be the sole problem or it can be a contributing factor. When interpreting the results of hemoglobin and hematocrit testing, it is important to be mindful of dilutional anemia of athletes.<sup>28,29</sup> Endurance athletes, similar to pregnant women, have an increased red blood cell mass and increased blood volume. However, since blood volume increases by more, the indices suggest anemia, but it is physiologic. This pseudo anemia is never severe so any hemoglobin <10 merits additional work up. Older athletes often present to our clinic with an increased SOB with exercise and a decreased ability to accomplish previously manageable levels of exercise. At evaluation, they are found to be very fit for their age but their ability to do work diminishes with age. This change is physiologic and not from underlying bad pathology. Treatment involves expectation adjustment. Similarly, some young athletes are simply not as fit as they think they are, and they experience SOB when they are required to exercise at their maximum workload to keep up with their teammates. Dysfunctional breathing is a term that describes changes in normal breathing pattern with resultant SOB that is out of proportion to any underlying pulmonary or cardiac abnormalities.<sup>30</sup> Finally, panic attacks can mimic EILO presentation, thus taking a good history as to when breathlessness occurs in relation to exercise is essential.

continued on page 34

**Table 1: Differential Diagnosis****Common:**

Exercise-Induced Laryngeal Obstruction  
 Exercise-Induced Bronchospasm/ Insufficiently Treated Baseline  
 Asthma  
 Physiologic  
 Poor Fitness  
 Anemia  
 Dysfunctional Breathing  
 Panic Attack

**Not be missed:**

Cardiac: Supraventricular Tachycardia, Coronary Artery Disease, Congestive Heart Failure  
 Pulmonary: COPD, Pulmonary Artery Hypertension, Pulmonary Embolism  
 Exercise-Induced Anaphylaxis

There are certain entities that present with SOB with exercise that are essential to promptly diagnose due to concern for bad health outcomes if they remain undetected. Cardiac problems include supraventricular tachycardia, coronary artery disease, and congestive heart failure. Pulmonary problems that should not be missed are COPD, pulmonary artery hypertension and pulmonary embolism. Pulmonary embolism can occur in young individuals despite a normal chest x-ray. Exercise-induced anaphylaxis manifests as an abrupt onset of anaphylaxis symptoms with exercise quite often with accompanying gastrointestinal symptoms and can occur with laryngeal angioedema as component.<sup>31</sup> While we have seen all of these problems in our clinic for initial assessment, we recommend that family physicians who have a high degree of suspicion for significant cardiac or pulmonary pathology initially refer to cardiology or pulmonology initially. It is only after potential life-threatening problems have been eliminated is it reasonable to perform exercise testing.

### Evaluation of Patients Who Have Shortness of Breath with Exercise

Evaluation of individuals with SOB begins with a history and physical exam. Unfortunately, the current evidence does not support that history alone can be used to diagnose exercise-induced bronchospasm.<sup>32,33,34</sup> Further research needs to determine if asking different questions that are consistent with EILO may be beneficial. We advise clinicians to query when breathing difficulties occur in relation to exercise. There is value added with getting specific with the history as to what the athlete is doing when they have breathing difficulties in an effort to ascertain exertional level and timing in relation to exercise. Knowing whether the breathing limitation is an inspiratory, expiratory or both and how long the patient takes to recover can be helpful.

At the initial office visit, we obtain a complete blood count to evaluate for anemia and infection, a chest x-ray, and pre-and post-beta agonist spirometry to evaluate lung function and assess for baseline asthma (diagram 1). An improvement in FEV1/FVC >12% is supportive of asthma in the correct clinical setting. If the athlete tests positive for underlying asthma, we treat and have the patient return in several weeks to assess efficacy of treatment prior to further diagnostic work up. Early in the course of our SOB clinic, we obtained ECGs on all patients, but we have not found that it yields helpful data. Exercise testing is essential to determine the problem. The workload needs to be commensurate with the individual's fitness level in order to provoke symptoms. We determine what type of exercise protocol to use based on the clinical picture and

the patient's fitness. If we suspect EIB, we will perform an exercise provocation test following American Thoracic Society guidelines by exercising the patient in a cold, dry room.<sup>35</sup> After 2-4 minutes of warm up (to prevent refractory period), we aim for 4-6 minutes of sufficient pulmonary stress at 17.5-21 times FEV1 or 80-90% HRmax predicted as a surrogate. Positive EIB provocation test is determined by a 10-15% drop in FEV1 (ideally without a drop in FVC) on post exercise spirometry. If clinical suspicion for EIB is high but the individual does not test positively during exercise provocation testing, we consider other forms of EIB testing including methacholine testing, eucapnic hyperventilation test, or inhaled mannitol. Alternatively, if the individual is detrained prior to testing, they can be retested during a period of more vigorous sport training. If our patients have a clinical picture consistent with EILO, we perform continuous laryngoscopy with exercise. This procedure involves placing a rhinolaryngoscope through the nares and into the upper larynx where the glottis and aryepiglottic folds can be visualized during exercise. The rhinolaryngoscope is stabilized to a headgear worn by the patient while they run on a treadmill or ride a stationary bicycle.

During both EIA provocation and CLE, we perform metabolic gas exchange with a metabolic cart to gather the most accurate data on fitness by measuring VO2max or the maximum of oxygen utilization as well as the pulmonary response to exercise. Limited fitness is one of the leading causes of SOB with exercise and can improve by following a structured training program tailored to the individual's heart rate.

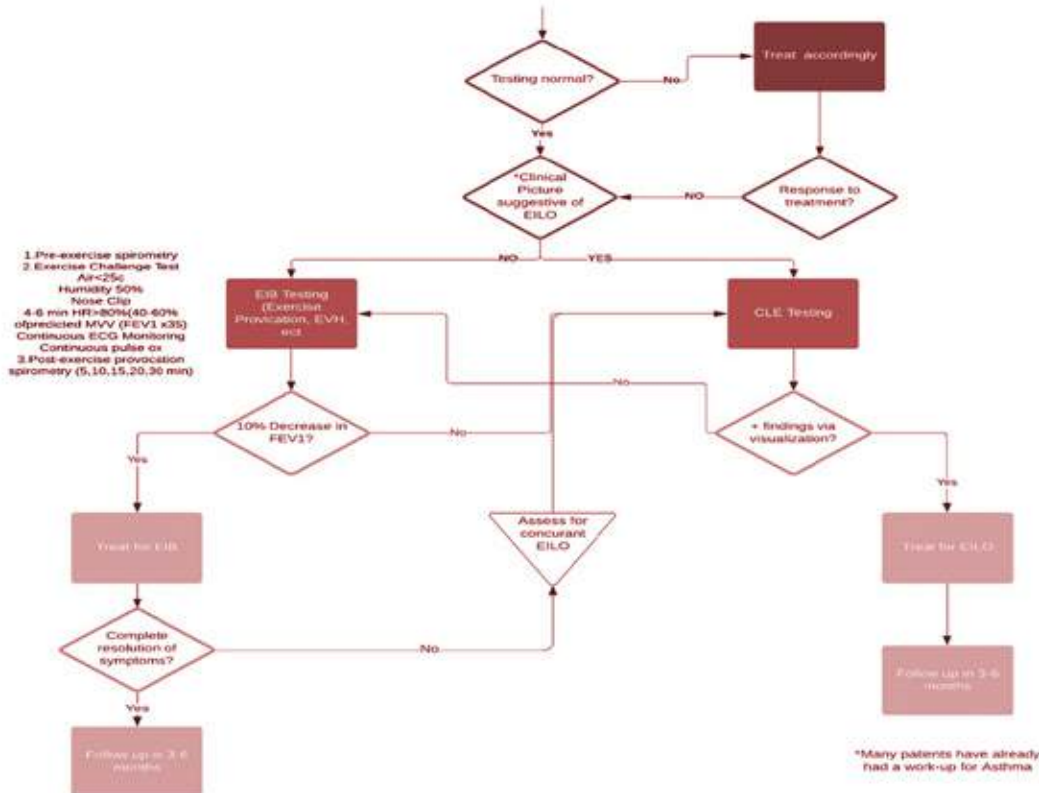
Some patients may in fact have both EIB and EILO, so testing for both entities with two lab test days using different test protocols can provide added value. We had previously attempted to do all exercise testing on the same day but learned that it is necessary to do the testing on different days to obtain accurate data. While we have a baseline algorithm established, it is not inclusive to identify all problems and therefore should not take the place of clinical judgement. Many of our patients have been referred to us after pulmonary and cardiac evaluation, but for those who have not, and their clinical picture is concerning for cardiac abnormalities, we order an echocardiogram or referral to either general cardiology or an electrophysiologist. For those patients with a concern but low pretest probability for a PE, a d-dimer blood test can be helpful. If patient is acutely short of breath with a high pretest probability for pulmonary embolism, consider a helical CT.

### What the Family Physician Needs to Know About SOB with Exercise

SOB with exercise is a common frustrating problem for patients and clinicians alike. Evaluation begins with a good history and physical exam. Unfortunately, history alone does not appear to provide sufficient data to differentiate between the two most common causes: EILO and EIB. Additional lab and imaging may be helpful but the key to determining the cause is exercise provocation testing. The family physician should consider ordering initial testing including a chest x-ray and complete blood count. If there is concern for significant cardiac or pulmonary problems, we advise referral to cardiology or pulmonology. EILO is a common problem particularly in young, female athletes, where the larynx paradoxically adducts during exercise. With an incidence of 5% in adolescents, it is a problem that most family doctors have probably seen in their office but might have been unaware of its existence. Concern for EILO should prompt referral to a center that can perform continuous laryngoscopy with exercise and initiate appropriate treatment when indicated.

### Algorithm for SOB Clinic

Westmead Unit | February 28, 2021  
**INITIAL EVALUATION**  
 History/Physical  
 CXR  
 CBC  
 Spirometry- pre and post  
 SABA



### Endnotes

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**Thanks to all the NYSAFP members who worked to make the 2021 virtual Lobby Day a success!**

# Food, Exercise, Enlightenment from the 1800s

By Thomas C. Rosenthal, MD

Much as the internet informs us today, printed media informed the medical and social enlightenment of the nineteenth century. Outsold only by the Bible, *Mrs. Beeton's Book of Household Management* was the “go to” family reference. Sir Arthur Conan Doyle, described Mrs. Beeton as, “the finest housekeeper in the world;” and her husband as, “the happiest and most comfortable man.”

Mrs. Beeton described a woman's task as reclaiming her husband from vice while training her children in virtue. There was, “no more fruitful source of family discontent than a housewife's badly-cooked dinners and untidy ways.”

Men were wearing Bowler hats when Isabella and Samuel Beeton published their first edition in 1861. Isabella died of puerperal fever in 1865, but ever-expanding editions of *Household Management* were issued for another fifty-plus years. Eventually, sixty chapters of recipes were followed by instructions on raising chickens, budgeting, and medical care; each plagiarizing the best sources of the day.

*Household Management* reckoned moderate activity for a healthy man was equivalent to walking eight miles a day. Men should consume 4 ounces of meat, 3 ounces of fat, 15 ounces of sugar or starch, and one ounce of salt. Women and young boys required nine-tenths that amount, and ten-year-old children half that. Meat and cereals both satisfied appetites and provided good nutrition. Meals must be served with clockwork regularity and seasonal availability of food was a known challenge.

According to Beeton, mankind's moral and physical welfare hinged on a breakfast of cheese, cold chicken, ham or pressed beef with hard crusted barley or corn bread; washed down by coffee, tea, milk or hard cider. Bacon and eggs more than twice a week risked boring one's husband. Dinner was the largest and most varied meal and served at noon sharp. In the winter, dinner was centered on smoked bacon or ham with a side of sauerkraut to prevent scurvy.

Summer meals were enlivened with fresh lamb, chicken, or pork and garden greens. Beef was for special holidays. Evening meals were leftovers eaten before they spoiled. Sugar was cheap and added to everything, while garlic, onions, leeks, mustard and pepper improved both flavor and bile production. Hard cider, beer or brandy reliably stimulated after dinner banter. Once a day cod-liver oil prevented muscle aches and bowing of youthful knees. Amicably predictable bowel movements, essential at all ages, were enhanced by complete mastication and avoiding mental anxiety or heavy labor for a half-hour after meals.

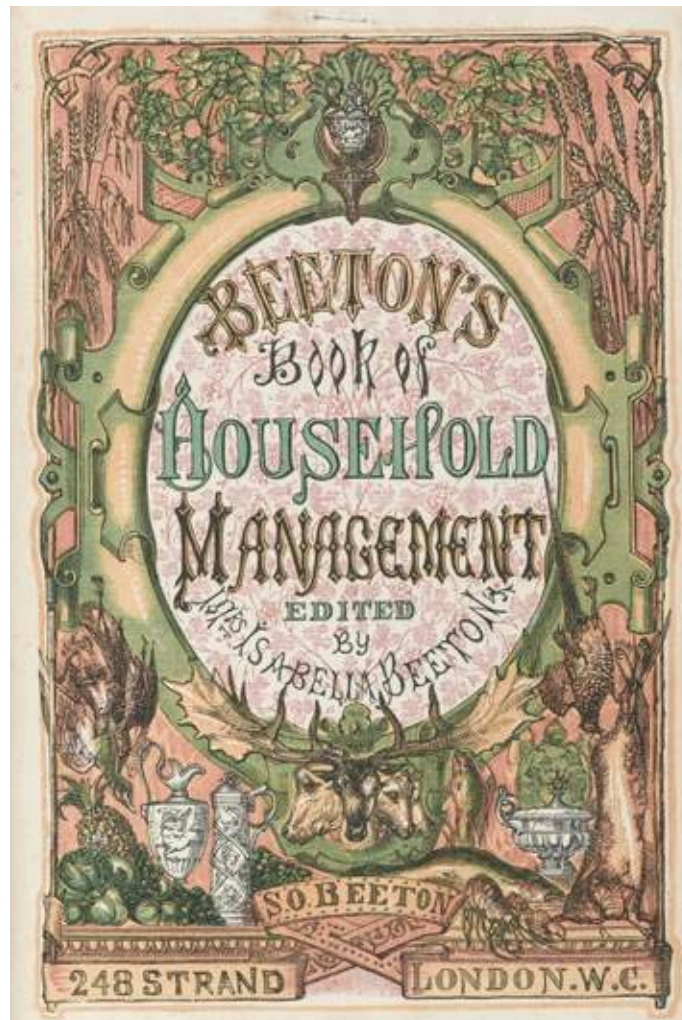
Year-round food availability improved after the American Canning Company began selling canned foods in the 1820s, but they were expensive. Wealthy families would host parties at which cans were ceremoniously opened by hammer and chisel, the can opener not being invented until 1850.

The Beetons recommended men consume 4 pints of fluids a day,

but warned that water a horse would drink was not necessarily safe. Hand dug wells were often muddy and the ubiquitous need for leather meant tanneries fouled a good many rivers and creeks. Somewhat cleaner was the rain water caught in basement cisterns; but beer, hard cider and corn whiskey (aka. bourbon) were safer.

The book included several chapters about supervising servants which contained many useful instructions for performing household tasks. Dirty clothes were to be presoaked in water (soap added when available) then boiled for an hour in a copper kettle with a little added baking soda. It was also critical that half of the winter wood pile and food stores remained on February 2, German Badger day.

Health being essential to earthly happiness, it was a woman's job to limit disturbances likely to distress the collective family's internal organs. The body's organs generate injurious wastes that are eliminated through the skin by perspiration. By driving the blood circulation



Credit: Wellcome Library, London. Wellcome Images images@wellcome.ac.uk <http://wellcomeimages.org>. Beeton Published: 1861  
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inwards, cold exposure caused congestion of internal organs. When chilled, a person should immediately cover with blankets, soak their feet in hot mustard and water, and drink cups of hot gruel until they perspire.

Sweat and dirt also block skin pores. Bathing was recommended once a week in winter, twice a week in summer, but not after eating. The wife was also to assure that the midday sun would not over-heat the family's brains and lead to giddiness or fainting. The solution was a large brimmed hat.

Breathing caused carbonic acid accumulation and respiratory disorders, made worse by oil lamps. Beeton suggested opening an upper window sash in any room where two or more people congregated. She mentions that impossibly small germs might cause disease, but dismisses it as inconceivable.

Excessive thinking, uneven passions and conjugal acts may occasion the onset of blindness, insanity, restless wretchedness, or apoplexy. Though noting that Frederick the Great and Napoleon required only 5 hours of sleep, Beeton prescribed 6 to 8 hours of sleep. It was excessive blood in the brain that caused intrusive thoughts. These were sometimes relieved by sponging the forehead with dilute vinegar, but eating a biscuit with a glass of milk redirected blood to the digestive organs and worked better.

Walking the standard eight miles a day should maintain large muscles responsive to bodily commands. Three or 4 miles daily should suffice for women, though the modern nineteenth century girl could safely exceed this amount. Obese women should eat lightly and exercise to perspiration which ejects fat through the pores. More effectively, because nature abhors an empty womb, the obese woman should find a husband. Beeton thought most properly raised women could maintain their usual habits during menstruation. However, the monthly catamenia were not to be trifled with; physical or mental exertions, iced drinks, bathing in the sea, and soaking the feet in cold water could be injurious.

Mrs. Beeton accurately describes the small pupils of opium poisoning, that partial thickness burns are more painful than full thickness burns, and that the central depression of smallpox pustules distinguishes them from chickenpox. Remedies like applying vinegar to insect stings would be recognized today. Others, such as applying a cold compress to the back of the neck to stop a nose bleed, confound us. Mrs. Beeton provides the twenty-first century doctor with many entertaining ideas, and a whole lot of great recipes.

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*The next issue of Family Doctor invites articles related to COVID-19. Dr. Rosenthal will discuss the practice relevant lessons learned from the diphtheria, cholera and typhoid epidemics of the nineteenth century. Mrs. Beeton's book can be downloaded at: <https://archive.org/details/mrsbeetonsbouse00beetuoft>.*

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# Rotator Cuff Tendinopathy: Understanding the Biomechanical Failures of the Shoulder and the Targeted Rehabilitation for Recovery

By Erika Sadeghi, MD and Jason Matuszak, MD, FAAFP, FAMSSM

Rotator cuff (RC) tendinopathy is one of the most common musculoskeletal complaints in the primary care setting, and commonly leads to orthopedic referrals, even though the majority of rotator cuff pathologies can be treated with conservative management.<sup>4</sup> The RC is comprised of four muscles that stabilize the humeral head in the glenoid, similar to a golf ball sitting on a tee. The RC hugs the glenohumeral joint in place for stabilization and to allow torque during shoulder abduction, adduction, forward flexion, internal rotation, and external rotation. RC tendinopathy is a nonspecific term describing an overuse condition associated with tendon disorganization and thickening. As a result of these changes, the tendons fatigue and ultimately fail. The prevalence of RC pathology increases with age starting at 40 years and may be as high as 50% by the age of 70 years.<sup>2</sup> Tendonitis, a more generic term deeply ingrained in clinicians and patients, was initially used to describe the acute inflammatory process of rotator cuff injuries. However, histological research has found that there are minimal number of inflammatory cells present in rotator cuff tendons<sup>1</sup> and that the term “tendonitis” is a somewhat of a misnomer. Rather, the terms “tendinosis” and “tendinopathy” better describe the chronic degenerative nature of atraumatic RC tears.

The biomechanical failures leading to rotator cuff tendinopathy are subdivided into intrinsic and extrinsic sources, and pathology often results from both. Intrinsic mechanisms are associated with the tendon

itself. Patients typically understand the terms muscular weakness, aging tendons, overuse, and degenerative changes. But what do these terms actually mean to the clinician? These intrinsic forces cause tendon overload leading to microvascular compromise of the tendon on a microbiological level. Micro-tears, decreased elasticity, calcification, and fibrovascular proliferation develop with aging tendons and ultimately lead to RC failure. The RC attempts to heal with neovascularization, but this leads to disorganized matrices that crowd out necessary collagen and this further weakens the tendon.<sup>1</sup>

Extrinsic mechanisms are compressive forces surrounding the rotator cuff. Shoulder impingement is the main extrinsic cause of RC tendinopathy and the most common cause of shoulder pain (Diagram 1). Anatomical forces narrow the subacromial interval which leads to mechanical compression of the RC. Acromial shape, acromial angle, coracogligament thickening, and AC joint spurs are examples of anatomical variants that can cause compression or “impingement” on the RC.<sup>4</sup> This phenomenon is often visualized with dynamic testing under ultrasound as the supraspinatus bunches underneath the acromion with shoulder abduction. The translation into layman’s terms is to imagine the shoulder bones acting as a roof to the RC and hitting your head on the ceiling with every jump. Other extrinsic factors, such as a tight posterior capsule, cause anterior superior humeral head translation leading to the narrowing of the subacromial space. Scapular dyskinesia from weakened

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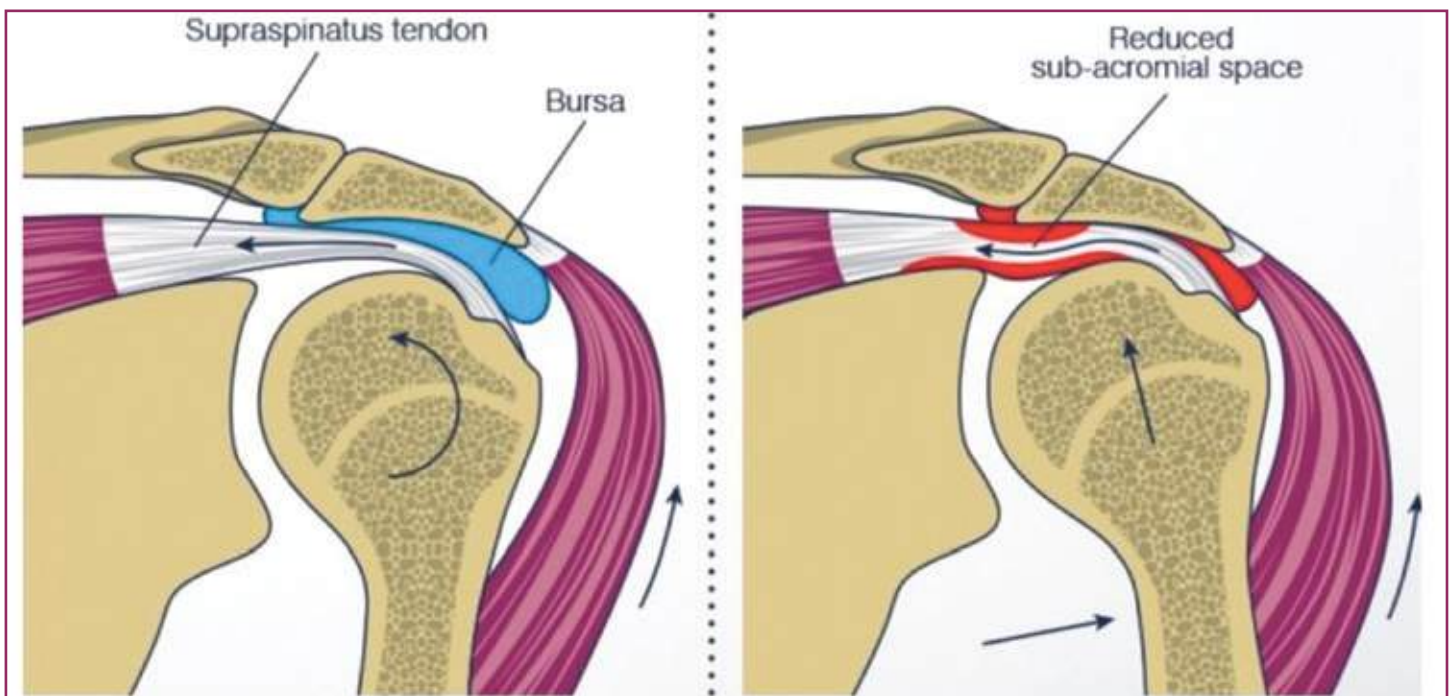
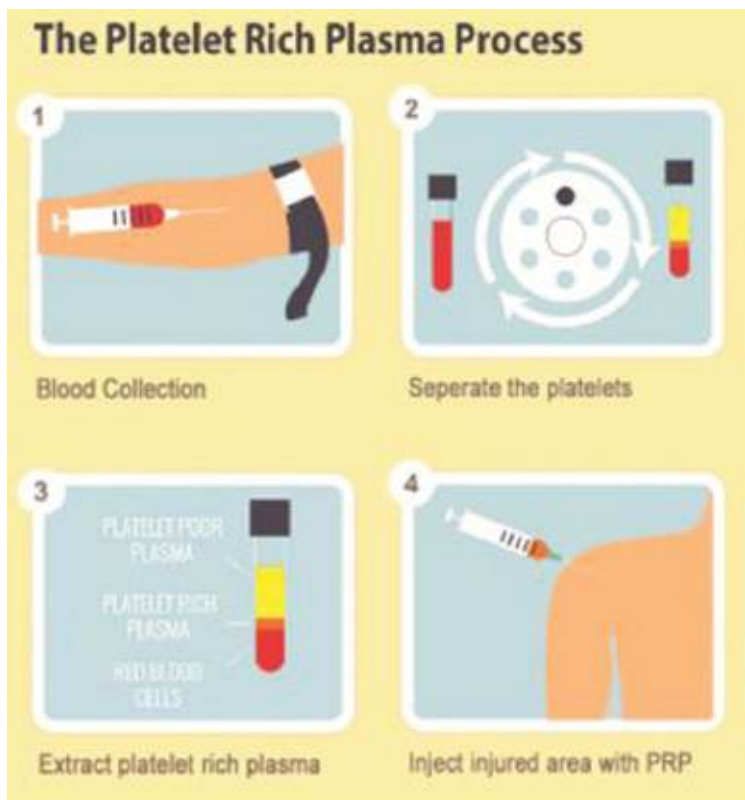


Diagram 1: Shoulder Impingement <https://www.spd.org.sg/shoulder-impingement-syndrome-how-to-prevent-it/>



**Diagram 2: Platelet-rich Plasma (PRP)**

<https://www.napervillerehabclinic.com/platelet-rich-plasma-therapy/>

serratus anterior and trapezius muscles is theorized to cause impingement by preventing the humerus from moving freely past the acromion with overhead extension. Lastly, glenohumeral instability, a diagnosis common in younger athletes, can lead to superior subluxation of the humerus creating increased contact between the acromion and subacromial tissues. Understanding these intrinsic and extrinsic biomechanical failures can better guide treatment. The treatment of rotator cuff tendinopathy is on a continuum of conservative to more aggressive management.

Conservative management starts with activity modification, medication, ice, and physical therapy.<sup>4</sup> Over the counter topicals and oral analgesics, in addition to ice, manage pain without healing potential. Topicals such as blue emu, arnica, and capsaicin cream are safe options for patients trying to avoid oral medications, such as ibuprofen or acetaminophen. Rehabilitation is geared at correcting biomechanical failures by focusing on scapular stabilization, widening the rotator cuff interval to decrease the extrinsic compressive sources, eccentric strengthening, and pain free range of motion. Oftentimes, simple patient education during the office visit regarding proper ergonomics, such as the visual of a string attached to the top of one's head pulling to the ceiling, is necessary to change daily habits. In order to appreciate objective results, formal physical therapy visits are recommended one to two times weekly for six to eight weeks. There is no evidence to support ultrasound therapy, electrical stimulation, or dry needling for treatment, which is often offered at physical therapy. The key to successful formal physical therapy is daily home physical therapy exercises. Compliance with formal and daily home exercises drastically affects prognosis.

When rehabilitation is unsuccessful, more aggressive approaches are reasonable, including therapeutic injections (steroid and anesthetic) and platelet-rich plasma therapy. The goal of a corticosteroid injection can be diagnostic and potentially therapeutic.<sup>4</sup> Results vary depending on the dose of

corticosteroid and accuracy of the injection. Injections are classified as palpation guided subacromial injections and ultrasound guided subacromial injections. One study demonstrated the accuracy of the subacromial subdeltoid bursa was 100 percent with ultrasound versus 72 percent without ultrasound.<sup>5</sup> However, the literature is unclear whether accuracy improves patient reported clinical outcomes. Platelet-rich plasma (PRP) is autologous blood injections to promote tendon healing (Diagram 2). PRP promotes tendon healing by bathing the injured tendon with potent amounts of growth factors. These factors activate angiogenesis, epithelialization, cell differentiation, proliferation, and the formation of extracellular matrix and fibrovascular callus.<sup>1,2</sup> Although this is seen on a microbiological level, high power clinical studies demonstrating clear positive clinical outcomes are lacking.<sup>2</sup> Nevertheless, PRP is very safe and more insurance companies are covering the procedure if conservative management has been exhausted.

Due to the high prevalence of RC tendinopathy in the patient population, research has clarified the etiology and an understanding of the disease process, ultimately leading to better treatment. Despite strong evidence supporting physical therapy, success rates vary depending on compliance. Patient's understanding of the disease process plays a role in their own investment in physical therapy which is why patient education is key for objective results. If conservative management fails, progressing to more sophisticated therapies on the scientific horizon, such as PRP, seems promising although research is ongoing.

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# Implementing an Anti-Inflammatory Nutrition Plan as a Treatment for Joint Disease

By Stephanie Ortiz Page, DO and Jessica Rosenberg, DO

Musculoskeletal diseases are a major cause of disability, morbidity, and cost burden for our health and social care systems globally. The prevalence of musculoskeletal diseases including osteoarthritis and other joint diseases are gradually increasing, affecting approximately 350 million people worldwide and nearly 43 million people in the United States.<sup>1</sup> Arthritic diseases of synovial joints are some of the most common musculoskeletal diseases with the most common form of arthritis being osteoarthritis (OA). The prevalence of OA is set to increase in parallel with the increase in the number of people aged greater than 60 years and the continued rise of obesity rates across the world.

Metabolic and endocrine diseases can also contribute to the pathogenesis of OA. Cohort studies have demonstrated that after age, obesity and metabolic disease are major risk factors for the development of joint disease.<sup>2</sup> The management of joint disease represents a challenge for the medical community. It is a complex and multifactorial disease that requires the treatment of pain and inflammation with the goal of also trying to preserve the structure of the joint. Currently, there is no cure for many joint diseases, and specifically osteoarthritis. Thus, we must continue to investigate new therapeutic strategies to help prevent and mitigate the debilitating effects of joint diseases.

Imagine however, a treatment for OA with no negative side effects, no health insurance necessary to cover the cost, no monthly renewals or visits to specialists. How could it be? Is this even possible? We believe it is. And so, we present a case for the anti-inflammatory diet.

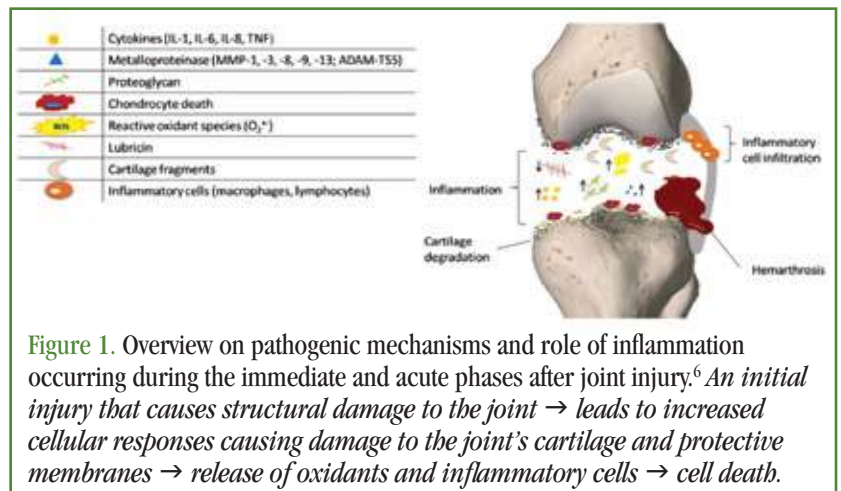
The age old saying “you are what you eat” has never rung so true as we begin to learn more about the role of food on inflammation in our bodies and specifically in our joints. The food that we consume is what fuels and forms our muscles, connective tissue, joints, and tendons. Food can both help and harm us, it can be pro-inflammatory or it can help heal us. Inflammation is the first stage of any healing process. It is the body’s protective response to negative stressors whether it’s infection, joint trauma, instability or intense physical activity. It is a crucial and important part of recovery and healing.<sup>3</sup> A prolonged pro-inflammatory state however, has been shown to be a cause of joint disease, orthopedic injury and poor recovery from an injury.

## Pathophysiology

Inflammation is an integral part of the body’s response to any outside stressor whether it’s infection, injury, or intense physical activity. While inflammation is essential to the human immune system, it is also at the root of most types of joint and musculoskeletal pain.<sup>4</sup> The short-term response to any injury is redness, swelling, and pain. However, this

prolonged inflammation can lead to poor recovery outcomes. The inflammatory markers that are mediated in part by inflammatory substrates (free fatty acids, reactive oxygen species (ROS), cytokines, and adipokines) are primarily produced by adipose tissue, which can be released into the bloodstream.<sup>3</sup> The over consumption of ultra-processed foods, refined carbohydrates, and trans fats are a leading cause of obesity, specifically in the United States, leading to high levels of inflammation.<sup>5</sup> It is clear then, that nutrition should be optimized to support the prevention of unhealthy weight gain, joint injury and help support joint healing.

Significant inflammation especially at the level of a joint leads to subsequent increase of ROS. This oxidative damage causes decreased antioxidants (which are our body’s defense system). Perpetuation of inflammation through a continued activation of innate inflammatory pathways, such as complement and danger signal-mediated pathways, may promote progression to chronic arthropathies.<sup>4</sup>



## Stages of Recovery After an Orthopedic Injury

There are two main stages of recovery in injuries specifically requiring prolonged immobilization:

- 1. Healing & Recovery:** This stage involves the initial inflammatory response that is necessary for the body to adequately respond to the injured joint. There is increased blood flow to the damaged or traumatized joint, which allows for proliferation and remodeling of the injury. Some injuries may also require an immobilization period, especially injuries that require surgical repair or a non-weight bearing status. Injuries that require prolonged immobilization result in loss of muscle mass and reduced muscle strength and function. This loss of muscle is secondary to decreased muscle fiber stimulation and a reduction in muscle protein synthesis.<sup>4</sup> Nutritional support can lessen the length of recovery time, reduce the negative aspects of reduced activity and immobilization, and promote a successful return to activity.
- 2. The Rehabilitation Stage:** Throughout this stage, it is crucial to be in a state of low inflammation to dampen ROS. During this stage, nutritional support is crucial to allow for a reduced recovery time and promote a successful return to activity.<sup>7</sup>

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Nutrition has a powerful and nourishing role in helping the body recover from an injury. As mentioned previously, antioxidants reduce inflammation, prevent muscle damage and may aid in injury recovery. Some antioxidants are naturally found within the body but can also be consumed through food. Several studies have looked at the effect of eating a diet rich in anti-inflammatory foods on inflammatory joint conditions. Several natural substances have been investigated for their anti-inflammatory capabilities, including omega-3 fatty acids (FA), curcumin, resveratrol, the polyphenolic green tea catechins and various flavonoids. One study showed that curcumin domestica extracts are as effective as ibuprofen for the treatment of knee osteoarthritis.<sup>8,9</sup> The TOMORROW study examined dietary intake of monounsaturated fatty acids (MUFAs) and saturated acids and the correlation with sedimentation rate values (ESR). Increasing intake of MUFA significantly improved symptoms of RA.<sup>10</sup> In another study subjects consuming fish  $\geq 2$  times/week had a significantly lower clinical disease activity score compared with subjects who ate fish never to  $<1$  time/month.<sup>11,12</sup>

### Pro Inflammatory Foods

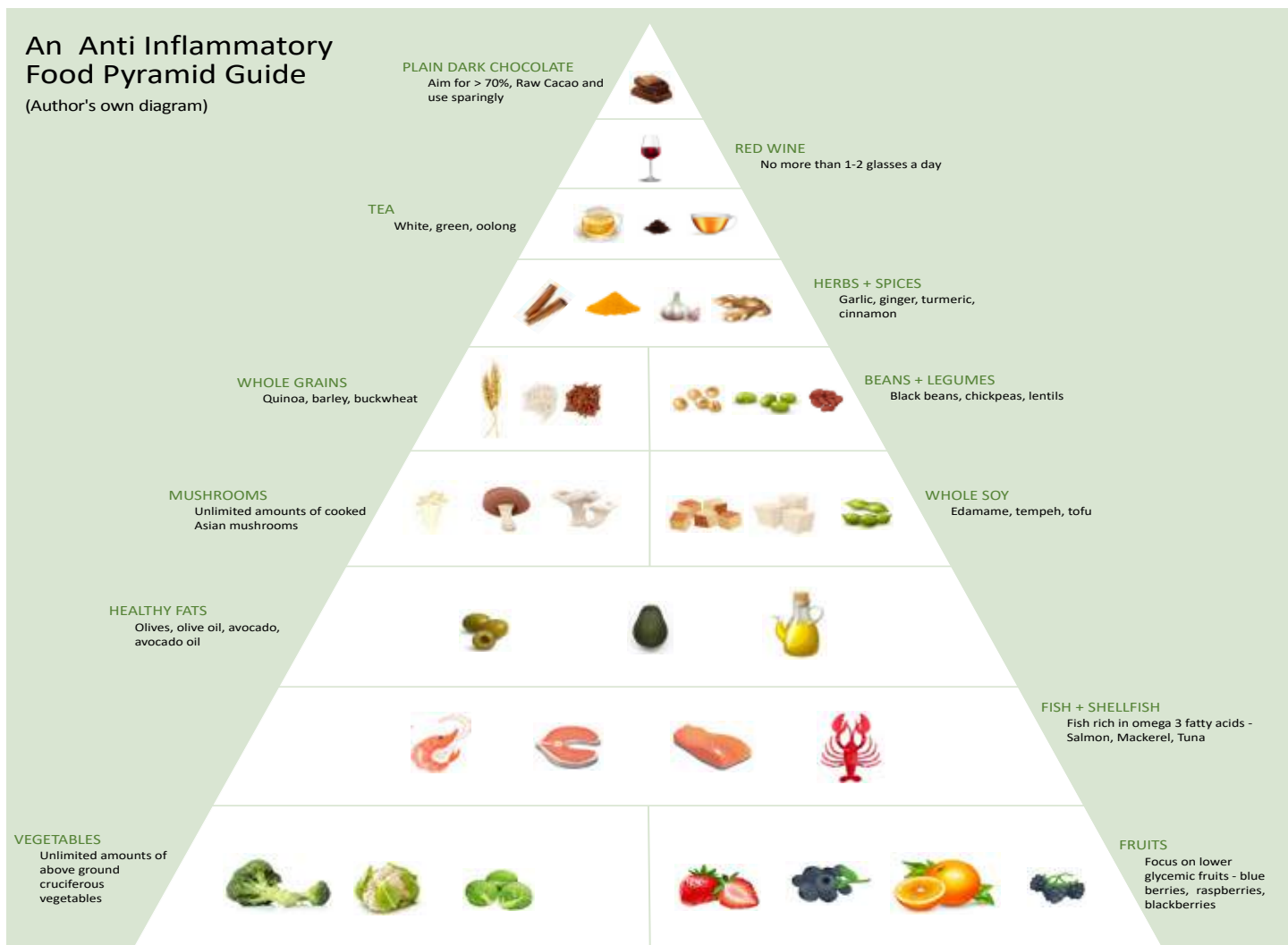
A diet high in processed refined carbohydrates and refined sugars has shown to be a main driver of inflammation in the body.<sup>4</sup> Processed sugars can prompt the release of cytokines, which act as inflammatory

messengers in the body. The sugars that manufacturers add to sweetened beverages, including soda, sweet tea, flavored coffees, and some juice drinks in addition to white bread, white rice, and potato chips are the most likely to worsen inflammatory conditions. Research studies have proven that saturated fats trigger inflammation in fat cells called adipose tissue, which increases the inflammation associated with arthritis.<sup>13</sup> Sources of saturated fats include meat (especially red meat), pizza, desserts, cheeses and other full-fat dairy products like butter.

### The Anti-Inflammatory Diet

Recommending anti-inflammatory food such as turmeric, omega 3's like fatty fish and other foods rich in MUFAS, resveratrol, the polyphenolic green tea catechins and various flavonoids may be of benefit in people with joint disease by reducing inflammation, decreasing C - reactive protein and decreasing pain. These foods are all integral parts of an anti-inflammatory nutrition plant.<sup>11</sup>

When consuming foods that are anti-inflammatory, people are encouraged to eat a wide variety of the antioxidant rich foods (See Figure 1) while also avoiding foods that can contribute to inflammation such as the previously mentioned processed foods and those containing an excessive amount of saturated or trans-fat. One of the best things about this type of diet is that there are plenty of food options so people can choose the foods they like best.



## Foods to focus on when implementing an anti-inflammatory nutrition plan:

- **Vegetables** – Put emphasis on plant foods with a low glycemic load (typically all below ground cruciferous vegetables).
- **Whole Soy Foods** – Soy foods contain isoflavones that have antioxidant activity and are protective against cancer. Choose whole-soy foods over fractionated foods like isolated soy-protein powders and imitation meats made with soy isolate - tofu, tempeh, edamame, soy nuts and soymilk.
- **Cooked Asian Mushrooms** – Shiitake, enokitake, maitake, oyster mushrooms (and wild mushrooms if available). These mushrooms contain compounds that enhance immune function.
- **Protein** – High-quality natural cheese and yogurt, organic, omega-3 enriched eggs, skinless poultry, grass-finished lean meats.
- **Seasoning** – Season foods with turmeric, curry powder, ginger, garlic, chili peppers, cinnamon, and other herbs and spices, which have anti-inflammatory properties.
- **Drink Tea instead of Coffee** – especially good quality white, green, or oolong tea, 2 to 4 cups per day.
- **Fruits** – Focus on fruits rich in antioxidants such as berries (blueberries, strawberries, blackberries) or peaches, nectarines, oranges, pink grapefruit, red grapes, plums, pomegranates, cherries, apples, and pears – all lower in glycemic load than most tropical fruits.
- **Whole and Cracked Grains** – Whole grains digest slowly, reducing frequency of spikes in blood sugar that promote inflammation. Whole grains mean grains that are intact or in a few large pieces such as brown rice, basmati rice, wild rice, buckwheat groats, barley, quinoa, steel-cut oats. Be sure to balance your grains with a higher proportion of non-starchy vegetables, healthy fats and protein choices.
- **Beans and Legumes** – Beans are rich in folic acid, magnesium, potassium and soluble fiber. They are a low-glycemic-load food. Eat them well cooked either whole or pureed into spreads like hummus.
- **Eat Plenty of Healthy Fats** – Focus on consuming more of the monounsaturated (olives, olive oils, avocado, avocado oil, macadamia, almonds, pecans, peanuts, and brazil nuts) and polyunsaturated omega 3 (fatty fish, grass fed animals, dairy from grass fed animals, eggs, algae, chia seeds, flax seeds, hemp seeds, walnuts).
- **Fish and Shellfish** – Wild Alaskan salmon (especially sockeye), herring, sardines, and black cod (sablefish). These fish are rich in omega-3 fats, which are strongly anti-inflammatory. If you choose not to eat fish, then take a molecularly distilled fish-oil supplements.

“Let food be thy medicine and medicine be thy food” stated by Hippocrates, one of the founding fathers of medicine, truly explains how nourishing our bodies with the right foods will help prevent and

treat chronic disease. Encouraging our patients to focus on whole and real foods that are anti-inflammatory is key to targeting the current obesity epidemic and one of the leading causes of musculoskeletal disabilities worldwide.

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# A Family Practitioner's Approach to the Transgender Athlete

By Divya Seth and Frank Dowling, MD

## Introduction

When transgender athletes seek to participate openly in sex segregated sports, a “controversial” question may be asked regarding the fairness of whether transgender athletes should participate based on their sex assigned at birth or their gender identity. Such concerns about fairness are raised when transgender women or girls choose to compete in women’s sports, while there are fewer concerns about transgender men or boys competing in men’s sports. LGBTQ students face high rates of discrimination, harassment, and victimization, which contributes to lower rates of participation in school and community sports activities; and transgender students experience the highest rates of these adversities as well as the lowest sports participation rates.<sup>9,12</sup> Since participation in school sports is associated with better physical health, mental health, academic achievement, social adjustments, and future health and success in adult life,<sup>9,14</sup> it is imperative to remove obstacles and to encourage and support transgender students to participate in sports.<sup>9</sup> AAFP policy recognizes that family physicians can play a critical role in encouraging sports participation and should “encourage and promote equity and inclusion in team sports and physical fitness activities, including for patients with disabilities and gender-diverse patients.”<sup>3</sup>

For these reasons, it’s important for family physicians in New York State to have some understanding of the medical spectrum of gender identity and rules that impact participation in sports for transgender students, so that physicians can assist their transgender patients who wish to engage in school- and community-based sports. Help could include the education of individuals, families, and school administrations, counseling and support to encourage participation, and advocacy with administration to remove obstacles to participation.

## Positions of Selected Sports Governing Bodies

Transgender athletes have been permitted to compete openly in sports for many years. In the United States, many state high school sports athletic associations have allowed transgender athletes to compete based on their gender identity for several years, the National Collegiate Athletics Association (NCAA) has allowed them to compete since 2011, the International Olympic Committee (IOC) has allowed them to compete since 2004, and the International Association of Athletics Federations (IAAF), now known as World Athletics, introduced their first eligibility regulations applying to transgender athletes in 2011.<sup>6,9,10,16,29</sup>

*Currently, the IOC has the following key criteria for participation:*<sup>6</sup>

- Those who transition from male to female may compete in male category without restriction
- Those who transition from female to male may compete in the female category under certain conditions:
  - The athlete must have declared her identity as female

- This declared designation must not change for at least 4 years
- Athlete’s total serum testosterone level must be < 10 nmol/L for at least a year, or longer in certain case by case situations
- Athlete’s total serum testosterone level must remain < 10 for the duration of time that they compete
- If there is any noncompliance, the athlete cannot compete at all for a period of 12 months

*The NCAA has participation allowances based on medical treatments, as follows:*<sup>10</sup>

- A trans male (FTM) student who has received a medical exception for treatment with testosterone for diagnosed gender identity disorder or gender dysphoria and/or transsexualism, may compete on a men’s team, but is no longer eligible to compete on a women’s team
- A trans female (MTF) student-athlete being treated with testosterone suppression medication for gender identity disorder or gender dysphoria and/or transsexualism, for the purposes of NCAA competition may continue to compete on a men’s team but may not compete on a women’s team until completing one calendar year of testosterone suppression treatment
- Any transgender student-athlete who is not taking hormone treatment related to gender transition may participate in accordance with his or her assigned birth gender
- A trans male (FTM) student-athlete who is not taking testosterone related to gender transition may participate on a men’s or women’s team
- A trans female (MTF) transgender student-athlete who is not taking hormone treatments related to gender transition may not compete on a women’s team

*The NY State Public High School Athletics Association (NYSPhAA) has an all-inclusive policy for transgender students to participate according to their stated gender identity, as determined by the local home school district, procedure as follows:*<sup>16</sup>

- The student and parent/guardian notify the superintendent’s office that the student wants the opportunity to participate in interscholastic athletics with the gender they identify
- The student’s home school district will determine eligibility when the identified gender does not correspond to the sex assigned at birth
- The superintendent or designee will confirm the gender identity through documentation from the parent, guardian, guidance counselor, or from a doctor, psychologist or other medical professional
- Once a member school has rendered a determination of eligibility to try out or participate based on a student’s gender identity, the eligibility is granted for the duration of the student’s participation in sports



- The athletic director must notify the NYSPHSAA if any accommodations are needed
- Any appeals will be referred to the (state) commissioner of education to resolve

*The World Athletics (formerly known as IAAF), the principle body for establishing rules for all international competitions and for any competition where a world record may be recognized, updated its policy for transgender athletes which emphasizes testosterone levels for all female (transgender and cisgender) athletes as a principle exclusion factor as follows:<sup>29</sup>*

- A transgender male athlete must give a written signed declaration of gender identity at least 6 weeks prior to entering a competition stating that their gender identity is male
- A transgender female athlete must give a written signed declaration of gender identity stating that their gender identity is female
- She must demonstrate to the satisfaction of the World Athletics Expert Panel (on the balance of probabilities) that the concentration of testosterone in her serum has been < 5 nmol/L continuously for a period of at least 12 months
- She must keep her serum testosterone concentration below 5 nmol/L as long as she wants to maintain eligibility as a female athlete
- While no medical or surgical treatments are required as a condition for competing aligned with their gender identity, the Expert Panel will consider during their review:
  - any reassignment surgeries the athlete has undertaken, including the date(s)
  - of any such procedures and whether they took place before or after puberty
  - any other relevant treatment the athlete has received (including any pre- or post-reassignment treatment), including the dosage and frequency of such treatment
  - the levels of testosterone in the athlete's serum during the relevant 12-month period, as well as the current level of testosterone in the athlete's serum
  - the results of any pre- or post-reassignment monitoring

Note that with the NYSPHAA guidelines there are no participation rules based on hormone levels, medical or surgical treatments, or duration of time living publicly with the identified gender. This results in fewer obstacles for transgender or non-binary people to participate in sports compared to other sports bodies.

## Spectrum and Diversity of Gender Identity

When approaching the topic of transgender athletes, it is important first to acknowledge the diversity of the medical spectrum of gender identity that falls under the umbrella term “transgender.” As all bodies do, the bodies of transgender people vary widely. These variances may be based on sex assigned at birth, gender identity, and/or transition state. Transgender people may identify as women, men, or non-binary (identifying outside of the gender binary). Based on personal gender identity and feelings of body dysmorphia (or lack thereof), transgender people decide which specific medical transitions to

pursue or not. The process of discovering the nuances of one's own identity may take years, and often begins with the use of non-medical tools such as binders (worn to reduce the size and appearance of breast tissue), packers (worn to simulate the appearance of penile tissue), gaffs (worn to reduce the appearance of penile tissue), and many others. For some, non-medical gender-affirming devices may be the extent to which a transgender person alters their appearance to reflect their gender identity.<sup>4</sup>

For others, medical transitioning tools are available. Transgender women may choose to undergo estrogen supplementation, testosterone suppression, orchiectomy, breast augmentation, facial feminization surgery, laser hair removal, or other medical procedures. Transgender men may elect for testosterone supplementation, bilateral mastectomy or chest restructuring, metoidioplasty, phalloplasty, hysterectomy, facial masculinization surgery, or other medical procedures. Non-binary transgender people may elect for any of the above-mentioned procedures, alternative facial contouring or andrognization procedures, or none of the above.<sup>4</sup> It is important to note that access to all medical procedures is entirely dependent on the patient's access to healthcare, which is heavily mediated by socioeconomic status, geographical location, and social support systems.

Thus, a transgender athlete may find themselves at any point in their journey towards gender affirmation while attempting to find inclusion and success in the athletic community, whether they are actively undergoing medical transition, have completed their transition, are attempting to access resources, or have decided that they don't need medical transition medications or procedures. For some, social transition is enough. Throughout this journey, transgender patients may also be navigating the social aspect of their transition, that is, to openly adopt a gender-affirming name, pronouns, and style of dress, and be presented to others in social settings as their gender identity. Supporting the endeavors of a patient who is socially transitioned (or transitioning) has been associated with better mental health outcomes in transgender patients.<sup>5,17</sup>

## Is There a Transgender Brain?

When considering a person's sex assignment at birth, physicians and others consider chromosomes, sex and reproductive anatomy, particularly external genitalia, and then state that they have determined one's “anatomical” or “biological” sex. These sex characteristics are then assumed to be indicative of a person's gender identity. However, when considering such biology in assigning male or female sex, the brain anatomy and function, not externally visible but important nevertheless, is not routinely considered. In fact, it's often entirely overlooked.

There are many studies that have explored anatomy and function of the brains of cisgender and transgender people. During in utero development, the consensus is that primitive embryonic tissue can develop as male or female, with the default sex being female. While the developing reproductive/sex organs and brain are each impacted by testosterone levels, the critical timeframe for reproductive/sex organs is in the 2<sup>nd</sup> and 3<sup>rd</sup> months in utero, and the critical timeframe for the developing brain is in the third trimester and after birth. The differing

timeframes makes it easily plausible that there can be varying influences of testosterone in the same person and the “sex” of reproductive/sex organs and the brain may not be in alignment.<sup>22,23,24,28</sup>

Several studies demonstrate that some aspects of both structure and neurofunction of brains of transgender people are more closely aligned with the brains of cisgender males or females that match their gender identity, instead of the sex assigned at birth, and other studies demonstrate that some aspects of the transgender brain are intermediate between cisgender males and females.<sup>22,23,28</sup> In addition, recent research suggests that areas of the brain involved in gender identity itself may vary between transgender and cisgender people.<sup>22,23,28</sup> Therefore, when others define someone’s “biological sex” or assign gender identity based on visible reproductive or sex anatomy and overlook the brain, they are ignoring the most important aspect of biology or anatomy in defining one’s own gender identity. See the listed references for more detailed information.

## Sports Policies and the Well-being of Transgender People

In 2020, twenty bills in states across the country were introduced, attempting to ban transgender student athletes from participating in school sports.<sup>1</sup> By the end of January 2021, legislators across six states had introduced more bills attempting the same.<sup>19</sup> Most recently, Mississippi, North Dakota, South Dakota, and Tennessee have been successful in their efforts, effectively banning transgender students from participating in school sports in a manner that is concordant with their gender identity.<sup>21,26</sup> Given what seems to be a coordinated introduction of policies attacking the inclusion of transgender students in athletics on a state by state basis, it is likely that more states will follow. The spirit of these bills can be found in the climates of schools across the country, as demonstrated by nearly one-third of LGBTQ students reporting that they were prevented from using locker rooms that aligned with their gender identity at school and one-quarter avoiding sports-associated facilities at school entirely because they felt unsafe or uncomfortable.<sup>12</sup>

On the national and international level, policies created by the athletic organizations cited earlier (the IOE, NCAA, and World Athletics) attempt to define the gender identity of transgender athletes by mandated testosterone levels. While not an outright ban on the participation of transgender people in sports, these policies mirror the spirit of exclusivity seen in the US state bans and in the climate of American schools. By defining gender identity by testosterone levels, such policies do not take transgender patients’ social transitions into account.

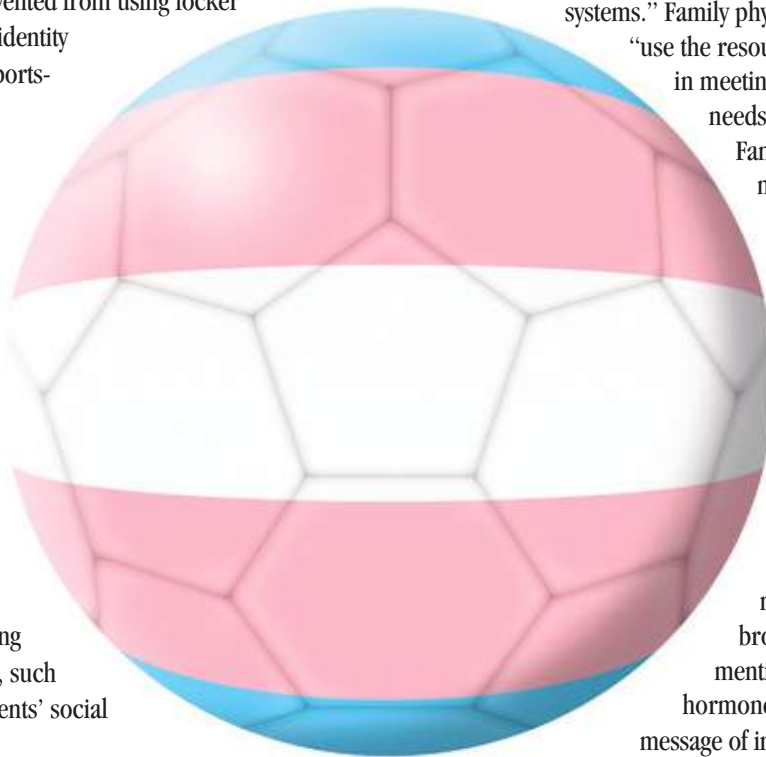
The effects of such policies may have far-reaching deleterious effects on the participation of transgender people in sports, the well-being of transgender athletes, and the subsequent gap in data on transgender athletic performance.<sup>11</sup> School-age transgender children have shown lower participation in physical education activities through their schools than their cisgender counterparts, and even shown unhealthy eating patterns that resulted from their perceived safety in their school environment.<sup>18</sup> Poor diet and lack of adequate exercise are problematic health risk behaviors found to be most common in transgender women in particular, making their participation in sports even more advisable.<sup>25</sup> The effects of gender identity on physical health carry on later into life, as demonstrated by the significantly worse physical health outcomes of transgender elders, resulting in lower physical activity levels and higher rates of obesity than non-transgender elders.<sup>7</sup> The results of one Spanish study on athleticism among transgender people clearly depict the negative impact that gender disclosure has on participation in group and organized sports—a barrier to participation that cisgender athletes do not face, that is further reinforced by transgender-specific mandates and bans.<sup>15</sup>

## How can Family Physicians Best Support Transgender Athletes?

In recently passed policy, the AAFP stated that “family physicians are uniquely suited to provide gender-affirming care because of their whole-person focus, ability to create care plans that meet the needs of diverse individuals, and longitudinal relationship with the patient across the entire lifespan.” In addition, the AAFP recognized that “wider sociopolitical efforts are needed to mitigate barriers and advance equity for transgender and nonbinary people.”<sup>22</sup> In a recent call to action in support of transgender patients, it was stated that family physicians should also understand and appreciate that “care of transgender patients is not limited to their sexual and reproductive health, but also includes assessment of mental health and support systems.” Family physicians were challenged to

“use the resources available to take the lead in meeting both medical and social needs of transgender patients.”<sup>27</sup>

Family physicians should seek to make their offices a welcoming safe space for LGBTQ patients, so they may be more willing to seek or accept recommendations regarding their involvement in sports and other social activities. Such LGBTQ-welcoming actions may include but are not limited to: visible statements about all being welcome or non-discrimination statements; brochures/posters/flyers that mention services such as PrEP or hormone therapy, which sends a message of inclusion and invites discussion;



imagery/artwork that includes LGBTQ people; gender neutral bathrooms; sexual orientation- and gender identity-inclusive intake forms; education of all professionals and staff on inclusive attitudes and messaging; awareness of and comfort with gender-affirming care; and, development of referral sources that provide more specialized transgender-affirming care when needed.<sup>4,8</sup> Family physicians should also become familiar with inclusive and gender-affirming language that can be incorporated into their dialogue with patients; for example, referring to sex assigned at birth instead of birth sex or biological sex.<sup>13</sup>

The American Academy of Pediatrics (AAP) policy statement “Ensuring Comprehensive Care and Support for Transgender and Gender-Diverse Children and Adolescents,” addressed several aspects of inclusive and affirming care in the physicians’ office, and also urged that “pediatricians have a role in advocating for, educating, and developing liaison relationships in school districts, and community organizations to promote acceptance and inclusion of all children without fear of harassment, exclusion, or bullying because of gender expression,” and “pediatricians have a role in advocating for policies and laws that protect youth who identify as transgender from discrimination and violence.”<sup>20</sup> Perhaps the same is true for family physicians who care for transgender and non-binary children and teens.

In caring for individual transgender and non-binary patients and their families, NY-based family physicians should be familiar with relevant policies regarding transgender students’ participation in sports based on gender identity, and embrace the opportunity to educate, support and assist transgender children, teens, and their families by encouraging participation in sports consistent with a child or adolescent’s gender identity. When sports governing bodies require and appropriately request documentation regarding a patient’s identified gender, the family physician should provide such supporting documentation, so their patients may participate and experience the most benefit, and least harm, from participation in school sports. Individual family physicians should consider their potential role in local advocacy for the development of more inclusive policies for transgender and non-binary students, and the potential role of NYSAFP and AAFP in advocacy at the state and national levels.

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### For Additional Guidance and Information to Support Transgender and Non-binary Patients

The National LGBTQ Health Education Center Resources	<a href="https://www.lgbtqiahealtheducation.org/resources/">https://www.lgbtqiahealtheducation.org/resources/</a>
Fair Play: The Importance of Sports Participation for Transgender Youth from the Center for American Progress	<a href="https://cdn.americanprogress.org/content/uploads/2021/02/09122423/Fair-Play-correction2.pdf?_ga=2.137172592.171422425.1614977378-978803000.1612822523">https://cdn.americanprogress.org/content/uploads/2021/02/09122423/Fair-Play-correction2.pdf?_ga=2.137172592.171422425.1614977378-978803000.1612822523</a>
NYS AFP Journal Issue Devoted to LGBTQ Health ( <i>Family Doctor</i> , Winter 2019)	<a href="http://www.nysafp.org/NYSAFP/media/PDFs/Family%20Doctor/Family-Doctor-Winter2019.pdf">http://www.nysafp.org/NYSAFP/media/PDFs/Family%20Doctor/Family-Doctor-Winter2019.pdf</a>
AAFP Article: Caring for Transgender and Gender-Diverse Persons: What Clinicians Should Know	<a href="https://www.aafp.org/afp/2018/1201/p645.html">https://www.aafp.org/afp/2018/1201/p645.html</a>
GLSEN 2019 School Climate Survey	<a href="https://www.glsen.org/research/2019-national-school-climate-survey">https://www.glsen.org/research/2019-national-school-climate-survey</a>
LGBTQIA+ Glossary of Terms for Healthcare Teams. National LGBTQIA+ Health Education Center.	<a href="https://www.lgbtqiahealtheducation.org/publication/lgbtqia-glossary-of-terms-for-health-care-teams/">https://www.lgbtqiahealtheducation.org/publication/lgbtqia-glossary-of-terms-for-health-care-teams/</a>



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# Enhancing Treatment of Musculoskeletal Disorders by Effective Communication Among Collaborating Providers

By Nina E. Millet, MD and Christine A. Blonski, DO

Globally, the prevalence of musculoskeletal disorders in the population is estimated to be 30%.<sup>1,2</sup> Given this information, it should come as no surprise that musculoskeletal complaints account for over 15% of primary care visits.<sup>1,2</sup> Many atraumatic musculoskeletal pain issues are caused by overuse, age related degeneration or biomechanical dysfunction. Chronic shoulder, lower back, and knee pain are among the most frequent complaints evaluated by primary care providers.<sup>2,3,4,5</sup> There are numerous pathophysiological etiologies that contribute to musculoskeletal pain. Shoulder pain for example, can be secondary to arthritis, adhesive capsulitis, or rotator cuff impingement syndrome, just as anterior knee pain can be secondary to arthritis, patellofemoral syndrome, or bursitis. Although these conditions share similar features, the diagnosis can be determined if the practitioner has a solid comprehension of the functional anatomy. More importantly, the findings of their evaluations will guide management.

The treatment of musculoskeletal disorders is often a collaborative effort involving specialists and physical therapists. Effective communication between the referring provider and other team members can improve patient outcomes by timely identification of the diagnosis and effective management. Conversely, poor communication can hinder this process and prolong patient recovery. As the burden of musculoskeletal disorders on the healthcare system is projected to increase, primary care providers must play a more active role in the early management of musculoskeletal pain.<sup>1,4,5</sup> This article will focus on highlighting the most important elements of the history and physical exam to share with other providers to ensure optimal care.

Obtaining a detailed history is perhaps the most important skill in assessing a patient. Through the patient's history alone, practitioners can identify risk factors and other relevant features to help narrow their differential diagnosis. Some of the most important features of the history are the onset of the complaint including the usual characteristics of pain, the work up that has been completed, prior treatments or therapeutic interventions, and lastly, the overall clinical progression.

Often chronic musculoskeletal complaints began insidiously and patients cannot identify a specific injury or traumatic event that initiated their pain. In these scenarios it is important to identify the patient's risk factors whether they be age, occupation, or concurrent medical conditions. For example, predictive factors of adhesive capsulitis include female gender, age greater than 40, and medical conditions like diabetes or hypothyroidism.<sup>6,7</sup> Individuals with shoulder osteoarthritis may have a labor intensive job or a history significant for repeated shoulder dislocations predisposing them to degenerative joint changes. Lastly, individuals suffering from rotator cuff impingement likely have occupations or hobbies that require repetitive overhead motions, such as painters or mechanics.<sup>6,8</sup> Regardless of the musculoskeletal issue, there are typically identifiable extrinsic and intrinsic risk factors.

The next important section of the history is a review of the patient's past work up. Laboratory tests can reveal underlying systemic processes or autoimmune conditions such as rheumatoid arthritis. Imaging modalities such as plain radiographs or advanced imaging such as ultrasound, MRI or CT scan can help to confirm a diagnosis or serve as a visual representation of the disease to guide care and help with patient education regarding treatment options and prognosis. For instance, an MRI of the shoulder can confirm a suspected labral tear. Comparing recent and old X-ray images can demonstrate progression and staging of joint degeneration in osteoarthritis. For instance, loss of joint space in knee osteoarthritis (Figure 1). Sharing of the results of prior tests can spare the patient from undergoing duplicate or unnecessary diagnostic testing. Acquiring the patient's medical record can present its own challenges as providers may use different electronic medical records or operating systems. Thus, patients should be encouraged to request their own CD copy of any imaging tests completed.

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**Figure 1:** X-ray of the knee AP view. Demonstrates loss of joint space in the medial compartment of the knee. This image was obtained from the *Journal of Clinical Orthopaedics and Trauma*. Copyright 2020 by Elsevier, Inc.<sup>11</sup>

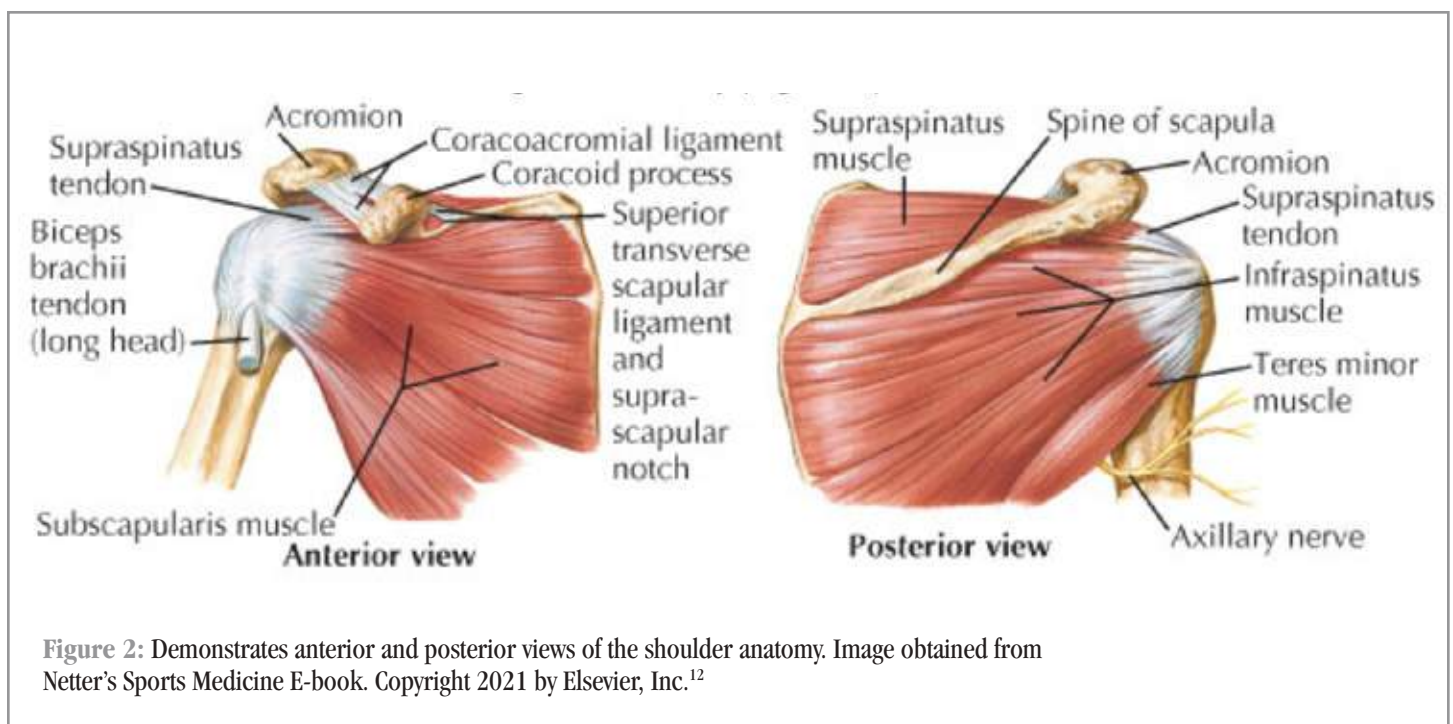
Knowledge of prior management and treatment is an essential part of the history. This can include review of past and current medications, prior physical therapy trials, chiropractic adjustments, injections, or other procedures. For any of these treatment modalities it is imperative to know the duration and efficacy. If the treatments were unsuccessful it is equally as important to try to discern why they failed. For example, when a patient states physical therapy “did not work,” providers need to determine why. Often, the patient may not have had realistic expectations or goals for timeline to improvement with the duration of therapy. Other patients may not have been compliant with the program or may not have allotted an appropriate amount of time to see results. Sometimes patients are committed to therapy but find the session makes their pain worse. Lastly, there may be external barriers preventing them from attending their sessions. These details must be identified to make appropriate changes and set the patient up for success. Similarly, for patients who have had joint injections, it is useful to know the type of injection (location and medication dosage), the technique or approach used (landmark or radiographically guided), the number of past injections, the amount of relief the patient experienced, and timeframe they received benefit. These details help dictate whether the patient should undergo a repeat steroid injection or if they are a good candidate for biologic injections. In cases of severe joint osteoarthritis that is not amenable to joint injections, a referral to orthopedic surgery can be considered for joint replacement.

General practitioners must be able to perform an appropriate musculoskeletal examination and then convey pertinent findings with other providers. Generally, physical exams begin with inspections to identify gross deformities, swelling, or other signs of a pathological process. Next, palpation is used to identify painful areas and evaluate for structural abnormalities or instability. Palpation should be specific and based on a detailed knowledge of anatomy (Figure 2).

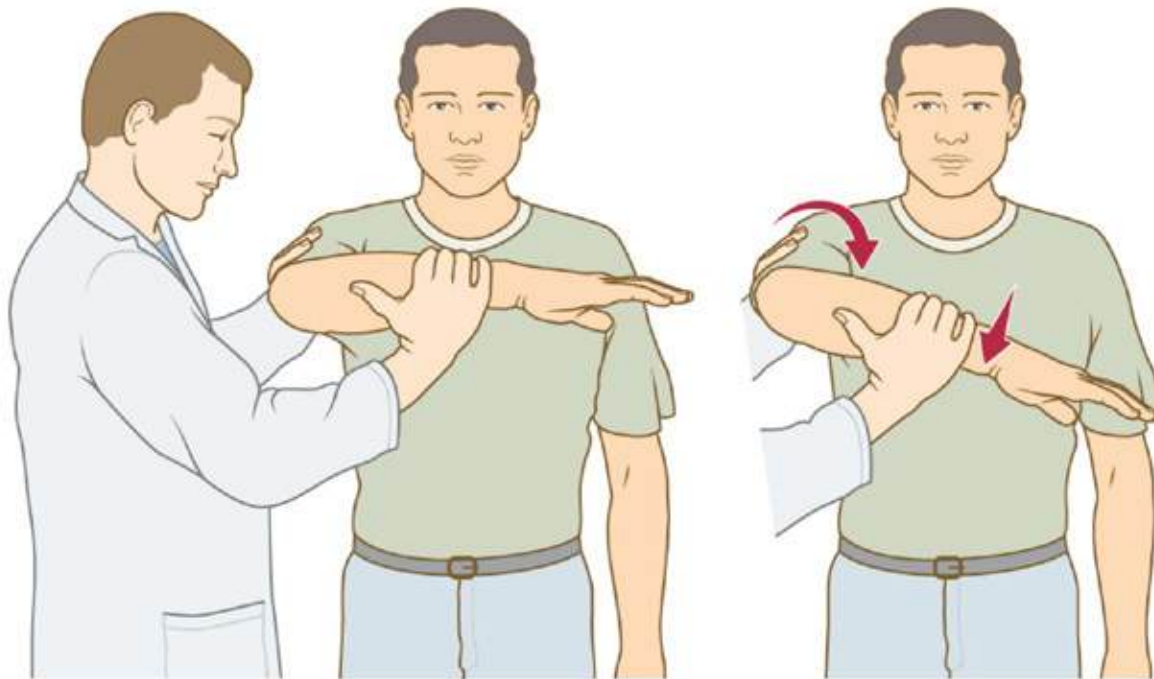
For example, patients with acromioclavicular arthritis often have point tenderness directly over the acromioclavicular joint, whereas those with biceps tendonitis may be tender over the coracoid process.<sup>9</sup> Range of motion, functional movement, and strength should then be assessed by comparing problematic joint or muscle to the healthy or contralateral side. Loss of passive rotation is pathognomonic for adhesive capsulitis, while a positive arm drop is indicative of a rotator cuff tear. After completing the basic components of the physical exam, providers can perform special test maneuvers to rule in or out their differential diagnosis. For example, the examiner can perform the Hawkins/Kennedy impingement test to evaluate rotator cuff impingement as seen in Figure 3. Similarly, a positive J sign is indicative of patella maltracking and potential instability.

Ultimately, these findings will be used by the provider to formulate a treatment plan, and can be shared with other providers and guide appropriate recommendations for treatment. When referring a patient, providing a more specific diagnosis to the physical therapist aids and can streamline the care that provider can give to each patient. For example, referring a patient for treatment of rotator cuff impingement compared to “shoulder pain” provides more specific information regarding the provider’s concern about pathology and will allow physical therapists to dedicate more time to directed therapeutic exercise for the patient.

Primary care providers are often the first in line in evaluating and managing musculoskeletal disorders. Their role will continue to expand to meet the demands of the growing number of musculoskeletal complaints.<sup>3,5</sup> Fortunately, other providers such as physical therapists, sports medicine doctors, orthopedic surgeons, and other specialists can work with primary care providers to treat patients and optimize their functional capacity.<sup>10</sup> Effective communication among all providers is paramount in achieving this goal in a timely fashion.







**Figure 3:** The Hawkins-Kennedy test performed on a right shoulder. The patient's shoulder and elbow are flexed at 90 degrees. The examiner stabilizes the posterior shoulder with one hand and applies a downward force over the patient's wrist with their other hand to evaluate for the elicitation of pain. This image was obtained from Macleod's Clinical Examination. Copyright 2018 by Elsevier, Inc.<sup>13</sup>

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# Musculoskeletal Point-of-Care Ultrasound

By Frank Nguyen, DO; Patrick Cleary, DO, CAQSM; Anter Gonzales, MD, FAAP, CAQSM; Derek Ho, DO, CAQSM, FAAPMR; Mohammed Emam, MD, CAQSM, RMSK; Charles (Bob) Litchfield, MD, MS and Christine S. Persaud MD, MBA, CAQSM, FAAFP

## INTRODUCTION

Musculoskeletal (MSK) complaints account for approximately 10–20% of all visits to family physicians with 70% of new MSK complaints being treated by primary care.<sup>1,2</sup> For this reason, it is important for family doctors to be well versed in MSK management. Point-of-care ultrasound (POCUS) can be an invaluable tool to improve and enhance patient care. Family medicine residencies began incorporating POCUS into training in 2014, with an increasing number of residency programs adding a curriculum since.<sup>3</sup> Relevant uses of ultrasound in family medicine practice include screening for an abdominal aortic aneurysm, evaluation of a deep vein thrombosis, limited trauma diagnostic evaluation, image guidance for procedures, and MSK evaluation. In this article, we will focus on MSK POCUS applications, advantages, and disadvantages.


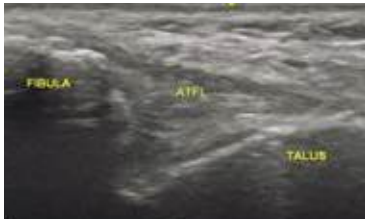

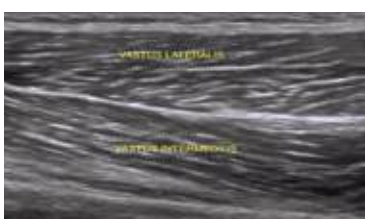


### *What is the appearance of different tissues on ultrasound?*

Ultrasound transducers produce sound waves. Ultrasound gel allows these sound waves to transmit to the anatomical structures below the transducer and how much they reflect back will depend on the structure's density. This is called echogenicity; a dense structure such as bone will appear hyperechoic (or bright) while a less dense structure such as fluid will appear hypoechoic (or dark). Table 1 demonstrates common MSK structures and their appearance on ultrasound.

## ADVANTAGES

There are many advantages of utilizing POCUS for both the diagnosis and treatment of MSK disorders. POCUS allows for a dynamic, real-time evaluation with direct feedback from patients and can be used as an extension of the physical examination without radiation exposure. Instant results can allow for timely and appropriate medical management. For example, in a patient with a suspected Achilles tear, POCUS can differentiate tendinopathy from partial rupture or a complete tear. Being able to use POCUS for a definitive diagnosis can save both time and money, as it may replace the need for magnetic resonance imaging (MRI) in certain conditions. Differentiating between these diagnoses will dictate the next step in management. In a patient with unilateral symptoms, it also allows for contralateral limb comparison to minimize incorrectly diagnosing anatomic and physiologic variants as pathologic. Furthermore, in contrast to other imaging modalities, there is minimal metal artifact for patients who have implants or foreign bodies.

**Table 1. Appearance of anatomic structures on ultrasound\***

Structure	Appearance	U/S Image
Bone	Very hyperechoic without further penetration of sound waves	
Ligaments	Hyperechoic with striations	
Tendons	Hyperechoic with fibrillar structure	
Muscle	Relatively hypoechoic with interspersed hyperechoic lines due to perimysium	
Hyaline cartilage	Hypoechoic	
Nerves	Mixed hyperechoic/hypoechoic with a "honey-comb," fascicular pattern	

MSK POCUS can be utilized for a wide array of both diagnostic and interventional applications (Table 2).

**Table 2A: Diagnostic Uses**

Diagnostic
Bones - cortical irregularities, fractures
Tendons - tendinopathies, partial/full tears, strains, neovascularization
Muscles - strains, tears, contusions
Nerves - entrapment, focal injury, generalized disease
Ligaments - sprains, tears
Joints - effusions, synovitis
Cartilage - quality, defects
Foreign Bodies

**Table 2B: Interventional Uses**

Interventional
Injections
Tenotomies
Tendon release
Barbotage
Aspiration
Lavage
Biopsies
Fenestration

In recent years, POCUS machines have become increasingly portable, lighter, and more affordable, increasing their accessibility for practices. POCUS machine prices vary vastly based on resolution, size, capabilities, and extra features and can range from \$2000 to \$50,000+. There are even options to purchase refurbished units or rent US machines in order to limit the upfront costs. Portable ultrasound machines come in laptop or handheld styles with some allowing the use of a cellular phone or tablet to function as the display. This increased portability can make it easier to move a single ultrasound unit between rooms, clinics, or even to sports sideline coverage. Some devices have probe technology to emulate multiple transducers to allow for a single transducer across many clinical needs.

In the MSK field of ultrasound, improvement of technologies and features has allowed for improved ease and capability of visualization. Features such as three-dimensional and panoramic views can provide more extensive visualization of structures, especially of larger structures that exceed the size of the transducer. POCUS allows for improved safety and accuracy of interventions.<sup>4</sup> The doppler feature can be utilized to avoid vasculature as well as confirm the injectate flow. Other ultrasound features such as needle steer can improve the visibility of the needle during guided injections. Biplane visualization allows both in and out of plane simultaneous imaging to assist with interventional procedures. Accessories such as needle guides and echogenic needles can help users new to ultrasound perform interventional procedures by assisting with needle placement and improving needle visualization.

For the family doctor, POCUS can offer a higher level of care, especially in rural areas where there is a lack of specialists and accessibility to advanced imaging tools such as MRI causing disparity in access to care.<sup>5</sup>

## CLINICAL CONDITIONS

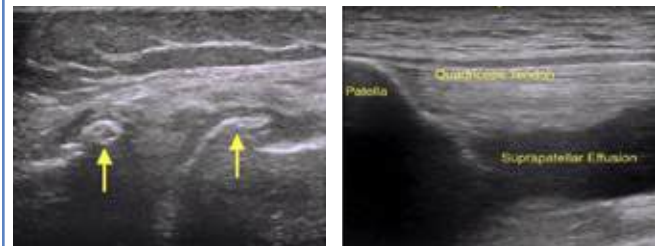
In the following section, we will discuss common clinical scenarios where POCUS would aid in diagnosis and treatment.

### A. Osteoarthritis

Osteoarthritis is the most common joint disease, affecting more than 240 million individuals worldwide and is a common presentation in the primary care setting.<sup>6</sup> Osteoarthritis can affect any joint but most commonly affects the knees, hips, and hands. Knee osteoarthritis is the

most common joint disorder in the elderly. Symptomatic knee OA occurs in 10% of men and 13% of women aged 60 years or older and this number is expected to rise with the growing elderly and obese population.<sup>7</sup> POCUS can be utilized to identify osteoarthritis with findings such as cortical irregularities including osteophytes, joint effusion, and decreased cartilage thickness or uniformity.

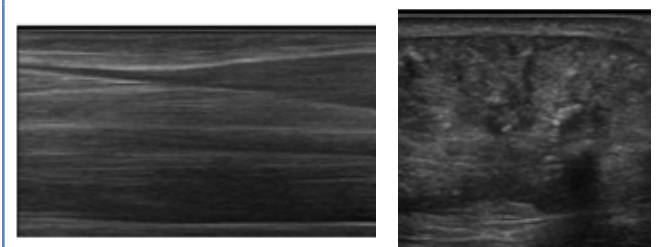
**Fig 1.** Yellow arrows indicating osteophytes present at medial knee joint line\* **Fig 2.** Suprapatellar effusion indicated by hypoechoic fluid collection\*



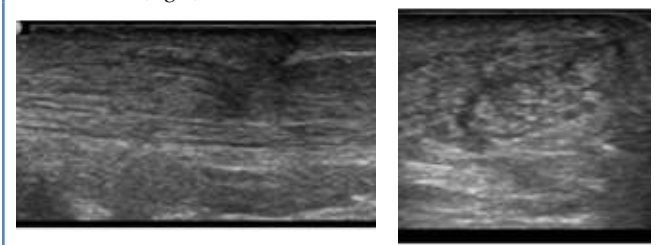
### B. Tendinopathy

POCUS can be utilized to diagnose and evaluate the extent of a tendon tear or tendinopathy. In tendinopathy, POCUS will demonstrate thickening, loss of the normal fibrillar structure, and reduced echogenicity. A tendon tear will demonstrate discontinuity of the tendon fibers often with a fluid collection acutely and possible retraction if a full thickness tear is present. Neovascularization may also be present on doppler.

**Fig 3.** Achilles tendinopathy demonstrating thickening without tear in long (left) and short (right) axis\*



**Fig 4.** Partial Achilles tendon tear in long (left) and short (right) axis\*



**Fig 5.** Intrasubstance supraspinatus tear near the rotator cuff interval indicated with a hypoechoic lesion and discontinuity of tendon fibrillar fibers\*



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**Fig 6.** Yellow star marking tear of ATFL\*



### C. Ligaments

POCUS can be utilized to evaluate the integrity of ligaments both statically and dynamically. In the case of patients presenting with inversion ankle sprains, ultrasound evaluation of the anterior talofibular ligament (ATFL) can be performed with the ligament taut in ankle inversion, as well as dynamic evaluation of the ligament by performing an anterior drawer test during visualization. Ligamentous injury can present with disruption of the fibers as well as laxity.

### D. Rheumatologic Diseases

POCUS can be utilized in rheumatologic disorders such as gout to evaluate for joint effusions, synovitis, bone erosions, and tendon and enthesis involvement.<sup>8</sup> Gout is the most common inflammatory arthritis affecting 1-2% of the population and results in deposition of monosodium urate crystals in and around joints.<sup>9</sup> POCUS can help differentiate gout with a cartilaginous double contour sign in contrast to crystalline deposition within the cartilage with pseudogout.

## DISADVANTAGES

While there are many positives to using POCUS, it is also important to understand the disadvantages. An initial limitation is the acquisition of the technical skills in order to perform an ultrasound and some users may have a steeper learning curve than others. Although POCUS can be helpful to visualize structures not readily palpable in obese patients, it also poses challenges due to limited penetration. Its utility can also be limited in patients who are unable to maintain certain positions to obtain ideal ultrasound images. Although less prone to metal artifacts, POCUS is susceptible to artifacts such as anisotropy, acoustic shadowing, and reverberation. The sonographer should be well versed to identify these artifacts to avoid pitfalls in diagnosis. Furthermore, POCUS has limited intra-articular visualization as ultrasound waves are unable to penetrate bone. The quality of the study will also be operator- and device-dependent, based on available transducers and resolution. Although there is probe technology to allow for the use of a single transducer across many clinical needs, this can limit resolution. Multiple probes such as a low frequency curvilinear for deeper structures, matrix array transducer for intermediate structures, and high frequency linear for superficial structures may be required to maximize resolution which should be considered in the cost of POCUS.

Although POCUS machines are increasingly available at a lower price point, some may have associated fees such as subscriptions to be able to store ultrasound images, maintenance fees, and costs associated with ultrasound accessories including sterile gel, probe

covers, echogenic needles, and cleaning supplies. There is also increased time expenditure associated with POCUS. Performing ultrasound may lengthen patient encounters and can limit the number of patients that are able to be seen per day. Depending on the department, institution, and patients' insurance, there may also be requirements to meet prior to utilizing POCUS and/or obtaining reimbursement which can be time intensive. These may include additional training, credentialing, and certification in musculoskeletal ultrasound (RMSK). Furthermore, POCUS may only be reimbursed if indications are met such as patients having failed clinically guided injections, the inability to palpate anatomic landmarks in obese patients, and avoiding injury to vital structures e.g., femoral artery.

## BILLING

The American Medical Association (AMA) creates and maintains Current Procedural Terminology (CPT)† codes that are the most widely accepted and used for billing purposes. To obtain reimbursement for the use of ultrasound, images must be permanently recorded to be available to the insurer upon request. If a patient presents for a typical office visit and a diagnostic or interventional ultrasound is performed during that visit, a -25 modifier is added to the office visit code. However, if a patient is referred for a diagnostic or interventional ultrasound procedure, only the CPT code is typically billed. When performing extremity diagnostic ultrasound, CPT 76881 and 76882 are utilized for complete and limited diagnostic ultrasound respectively. Of note, a diagnostic and interventional ultrasound CPT code cannot both be billed in the same visit.

**Table 3: Commonly utilized ultrasound CPT codes**

CPT Code	Description
76881	Ultrasound, extremity, nonvascular, real-time with image documentation; complete
76882	Ultrasound, extremity, nonvascular, real-time with image documentation; limited
76942	Ultrasonic guidance for needle placement (e.g., biopsy, aspiration, injection, localization device), imaging supervision and interpretation
20604	Arthrocentesis, aspiration and/or injection; small joint or bursa (e.g., fingers, toes) with ultrasound guidance, with permanent recording and reporting
20606	Arthrocentesis, aspiration and/or injection; intermediate joint or bursa (e.g., temporomandibular, acromioclavicular, wrist, elbow or ankle, olecranon bursa) with ultrasound guidance, with permanent recording and reporting
20611	Arthrocentesis, aspiration and/or injection; major joint or bursa (e.g., shoulder, hip, knee joint, subacromial bursa) with ultrasound guidance, with permanent recording and reporting

Note that CPT code 76492 is used in addition to the CPT code for the associated procedure, is limited to being used once per patient encounter, and should not be combined with any of the last three 206\*\*\* codes that have ultrasound guidance bundled. A complete list of CPT codes as well as further details such as relative value units and modifiers is available through the AMA.

## CONCLUSION

The use of POCUS in primary care is increasing because it reduces cost, radiation exposure and imaging delays, and increases patient satisfaction.<sup>10</sup> In addition to the plethora of resources that can be utilized in order to learn and utilize POCUS that has been put forth by the American Academy of Family Physicians,<sup>11</sup> YouTube can also be a great tool taking into consideration the source of the videos such as educational US videos on the American Medical Society for Sports Medicine's YouTube channel.

The use of MSK POCUS can improve accuracy and safety of interventional procedures as well as bridge access to care through its diagnostic capabilities. It is important to select the correct POCUS machine for your clinical needs taking into account cost, portability, and resolution. Its utility will outweigh the cost, especially after overcoming the learning curve and can be a versatile tool and valuable addition to family medicine practices.

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# COVID-19 and the Athletic Heart

By Robert Wilson, DO and Michael Kernan, MD

Family medicine physicians will be on the frontline when it comes to medical clearance and cardiac evaluation of patients post COVID-19 infection. In this article we will review the literature on COVID-19 myocarditis with a special focus on athletes and highlight guidelines that family medicine physicians can refer to for cardiac clearance for return to physical activity for any patient. There is a special focus on athletes since this subgroup is at a 10%-20% increased risk of sudden cardiac death from myocarditis.<sup>1</sup> With many athletes across the nation relying on their family physicians for clearance to return to play, it is important that we stay up to date on the most current guidelines and literature.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) caused by the coronavirus disease 2019 (COVID-19) is known to be associated with a variety of cardiovascular complications, such as, arrhythmias, myocarditis, pericardial effusion, pericarditis, acute coronary syndrome, venous thromboembolism, cardiogenic shock, and heart failure.<sup>2</sup> Acute cardiac injury as a complication of COVID-19 has been reported anywhere from 12%-17%, to 22%-31% in patients admitted to the ICU.<sup>3,4,5</sup> Cardiac injury, as measured by the extent of elevated cardiac troponin I (cTnI) values, is known to be associated with severity and mortality of COVID-19 infection, with cTnI values >99th% reported anywhere from 8%-12% of cases,<sup>6,7,8</sup> with some reports of elevated cTnI in as many as 50% of patients who died from COVID-19. Other measurements of cardiac involvement such as novel abnormal findings on echocardiography and electrocardiography have also been shown to be associated with severity of COVID-19 infection.<sup>3,4</sup>

Many common pathophysiologic factors that play a role in other acute respiratory infections are also presumed to be involved with SARS-CoV-2, such as increased production of proinflammatory cytokines that trigger atherosclerotic plaque rupture, thrombosis formation via enhanced procoagulation, and high output cardiac stress.<sup>9</sup> Interestingly, the angiotensin-converting enzyme 2 (ACE2) protein is the primary receptor for COVID-19 cell entry that has expression in many tissues including cardiomyocytes, capillary pericytes, and endothelial cells.<sup>10,11</sup> This opens up the possibility for direct cardiovascular invasion, with studies that report an increase in ACE2 expression in cardiomyocytes in those with chronic heart disease.

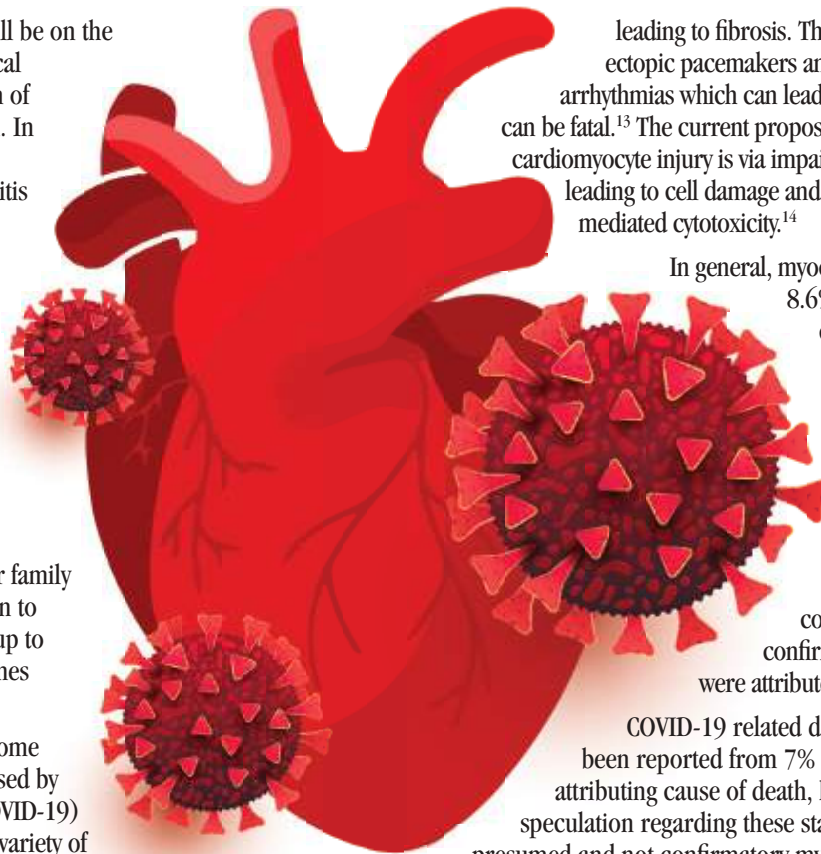
Myocarditis defined as a non-ischemic cardiac injury due to inflammation causing cardiomyocyte injury, is becoming a quickly recognized important COVID-19 sequelae.<sup>12</sup> The concern with myocarditis is the damage to the myocyte membrane from inflammation,

leading to fibrosis. This predisposes the heart to ectopic pacemakers and subsequent cardiac arrhythmias which can lead to sudden cardiac death and can be fatal.<sup>13</sup> The current proposed mechanism of cardiomyocyte injury is via impaired stress granule formation leading to cell damage and activation of CD8+ T-cell mediated cytotoxicity.<sup>14</sup>

In general, myocarditis is reported in 8.6%-12% of patients with sudden cardiac death.<sup>11,15</sup> In a 2016 study analyzing a US national registry of sudden death in athletes over a 32-year time span, of the 2406 reported sudden deaths, 80% were high school/middle school or college athletes, 74% occurred during practice or competitive play, and of the 842 confirmed cardiovascular cases, 7% were attributed to myocarditis.<sup>16</sup>

COVID-19 related deaths due to myocarditis have been reported from 7% to as high as 33% as an attributing cause of death, however, there is some speculation regarding these statistics, as these are presumed and not confirmatory myocarditis cases.<sup>17</sup> The true prevalence and mortality rate of COVID-19 myocarditis still remains unknown. However, a few concerning results reported out of Ohio State University and University Hospital Frankfurt reported a moderate percent of athletes with COVID-19 associated myocarditis. The initial prospective observational study from April to June 2020 by Puntmann et al. reported that out of 100 patients that had recovered from COVID-19, 60% had cardiac magnetic resonance (CMR) imaging results consistent with ongoing myocardial inflammation.<sup>18</sup> Of these 100 patients, 67% recovered at home, 78% overall had abnormal CMR findings, and many compared to healthy controls had lower left ventricular ejection fraction, higher left ventricle volumes, and higher left ventricle mass. Interestingly, endomyocardial biopsy reported active lymphocytic inflammation in one case. This is consistent with histology findings by Basso et al. when evaluating 21 COVID-19 autopsies in which 14% had lymphocytic myocarditis finding with increased interstitial macrophage infiltration.<sup>19</sup> This initial study by Puntmann et al. had caught the attention of the medical community since the cardiac involvement did not seem to be correlated with severity of infection and showed that cardiac involvement can persist well past the acute infectious stage.

With the Puntmann et al. statistics reported, in combination with the fact that 10%-20% of athletes are at increased risk of sudden cardiac death from myocarditis, the Ohio State University wanted to further investigate the relationship between athletes and the possible increased risk of myocarditis.<sup>16,20</sup> Rajpal et al. analyzed the CMR imaging findings of 26 competitive athletes that had recovered from COVID-19. Of the 26 athletes 15% had findings consistent with myocardial inflammation, with 30% having suggestive findings of prior myocardial involvement.<sup>20</sup> Similar to





the Puntmann et al. study, a good portion of study subjects, 26.9%, had only mild symptoms and no participants required hospitalization. This brings into question who is considered high risk and who should be evaluated prior to a return to physical play. It is important to note that athletic cardiac adaptation itself was reported to not be a probable cause of CMR image findings, favoring true myocarditis pathology.

In contrast to the above studies, there are CMR studies being published that report much lower rates of CMR myocarditis findings, such as Clark et al. out of Vanderbilt who published a larger CMR study for further evaluation of COVID-19 myocarditis among athletes.<sup>21</sup> The COVID-19 Myocardial Pathology Evaluation in Athletes with Cardiac Magnetic REsonance (COMPETE-CMR) study focused on 59 COVID-19 positive athletes, with only 3% having findings consistent with myocarditis. It is important to note, that although a much smaller proportion of CMR images were consistent with myocarditis compared to the prior studies mentioned, the myocarditis group had unremarkable cardiovascular prior workups, including an electrocardiogram, echocardiogram, and troponin I levels, so otherwise could have been missed.

Additionally, Malek et al. who evaluated 26 athletes via CMR, of whom 77% had only mild or asymptomatic COVID-19 infection, reported that 19% of the athletes had CMR findings consistent with cardiac involvement, but none of which was myocarditis related.<sup>22</sup> There was discussion of a possibility that gender could possibly be playing a large role in the stark contrast of published results, because the COMPETE-CMR study and the Malek et al. study were primarily female, while the Ohio and Frankfurt studies were mostly male. It is also known that females tend to have a less severe disease course.<sup>23</sup> However, a recent study by Starekova et al. out of the University of Wisconsin analyzed 145 student athletes via CMR, 49% with mild symptoms, 74% were male, and only 2 cases (1.4%) had CMR findings consistent with myocarditis.<sup>24</sup>

In a final review of recent studies, research from Johns Hopkins University and Louisiana State University Health Sciences Center by Halushka et al. published a literature review of 277 post mortem histopathology reports, reporting that COVID-19 myocarditis occurred only between 1.4%-7.2%, as compared to 14% by Basso et al. as previously mentioned.<sup>25</sup>

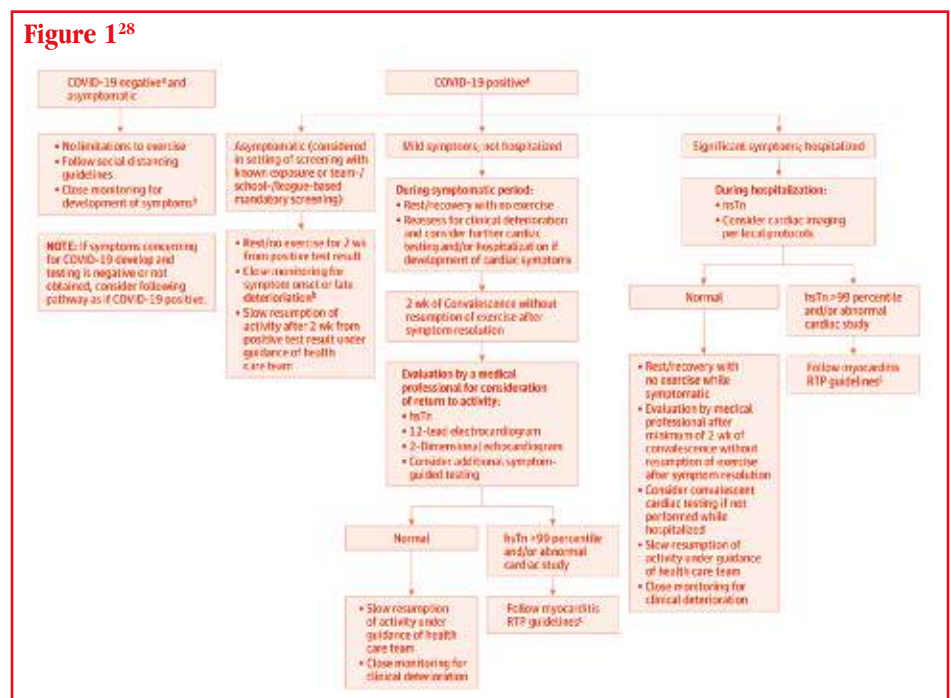
Even with contradicting study results published over the past few months, the athletic heart and increased risk of myocarditis quickly became a reality in professional sports. Many

college football commissioners and team doctors had serious concerns, with the Big Ten Conference crediting myocarditis as playing a significant factor in postponing their 2020 football season.<sup>26</sup> Many notable athletes have missed part of or their entire playing seasons, after being afflicted by post COVID-19 myocarditis, including MLB pitcher Eduardo Rodriguez of the Boston Red Sox, NFL player Tommy Sweeney of the Buffalo Bills, MLB outfielder Heston Kjerstad of the Orioles, and Vanderbilt women's basketball player Demi Washington.

Ultimately, the true prevalence of COVID-19 myocarditis remains largely unknown. Although many studies report lower rates of myocarditis as compared to initial studies, many of the same studies report modest cardiac involvement of other types such as, cardiac fibrosis, left ventricular hypertrophy, and pericarditis, suggesting the need for further evaluation of overall cardiovascular involvement in athletes. To help with this investigation the American Medical Society for Sports Medicine has been selected to receive a large research grant to establish a national registry in collaboration with the NCAA, to study cardiac outcomes in athletes post COVID-19 infection.<sup>27</sup> Part of the investigation is to evaluate the importance of pre-participation cardiac testing, the prevalence of myocarditis, and other cardiovascular outcomes as mentioned above. Some 70+ schools are participating in the prospective multi-site study, which is titled "Outcomes Registry for Cardiac Conditions in Athletes" (ORCCA). This is a 2- year research project, with the first round of statistical results not expected until later this year.

Until more promising data and consistent findings are published regarding athletes and COVID-19 cardiovascular disease, current return to physical activity guidelines and testing should be followed. Current guidelines published in the May 2020 issue of the Journal of the American Medical Association (JAMA) of Cardiology risk stratify athletes based on symptoms (Figure 1).<sup>28,29</sup> If the patient is COVID-19 positive and asymptomatic, the patient should avoid physical exercise for a 2- week period from the positive test. If a patient has mild or moderate symptoms, the patient should avoid physical exercise for a 2- week period from end of symptoms, not from the positive test. Cardiac evaluation for any symptomatic patient can be performed via cardiac biomarkers, ECG, and echocardiogram. In any symptomatic patient, current guidelines recommend following myocarditis guidelines only if troponin levels are >99 percentile or if the patient has had abnormal cardiac work-up with the above listed modalities. Phelan et al. in the JAMA article refers to the American College of Cardiology (ACOC) for myocarditis guidelines. The ACOC recommends that athletes restrict exercise for 3-6 months when being evaluated for myocarditis.<sup>29</sup> In patients following the myocarditis guidelines, return to play after the 3-6 month resting period is based on normalization of left ventricular function on resting echocardiogram, no relevant arrhythmias captured during a 24-hour holter monitor or on an exercise stress EKG, and normalized cardiac biomarkers.

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## Endnotes

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