

Pediatric Sports Medicine: Practical Pearls



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Disclosure

Neither I, **Holly J. Benjamin**, nor any family member(s) have any relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation.

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Objectives

- To look at some serious, less common sports medicine cases from a case based approach
- Discuss red flags with common complaints
- Indications for referral, work-up or withholding clearance



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Clinical Case 1: Friday night lights

17 yr old high school FB player was seen by his PMD

- 3 days URI symptoms, fatigue, poor appetite
- 1 day of a tactile fever
- physical exam was unremarkable.

Seen the next day for persistent sx
 Both days he was cleared to practice



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Friday night lights (continued)

- He plays the first quarter without difficulty
- second half collapses on the field.
- He is transported to the local ER
- Arrives hypotensive, arrests and dies.



Diagnosis?



Friday night lights (out)

- **Weeks later, the autopsy confirms splenic rupture**
- **And, EBV mononucleosis**

Infectious mononucleosis [EBV] †,**

Incubation period 30-50 days

- Malaise, fatigue, anorexia => sore throat, fever, LA

Return to play 3-4 weeks minimum

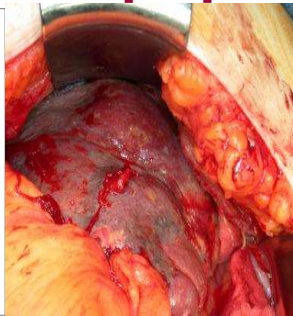
- Splenic fragility
 - Lymphocytic infiltration
 - Capsular and trabecular changes
- Splenomegaly
 - Rule of odds [1x3x5 in, 7 oz, ribs 9-11]
 - Exam versus imaging (US vs CT)

†Macknight, John. Infectious Mononucleosis: Ensuring a Safe Return to Sport. *The Physician and Sports Medicine*. 30(1), Jan, 2002

**Putukian, Margot MD; O'Connor, Francis G MD, MPH; Stricker, Paul MD; McGrew, Christopher MD; Hosey, Robert G MD; Gordon, Steven M MD; Kinderknecht, James MD; Kriss, Vesna MD; Landry, Gregory MD. *Clinical Journal of Sport Medicine: Mononucleosis and Athletic Participation: An Evidence-Based Subject Review*; 18(4); July 2008: pp 309-315

Infectious mononucleosis [EBV] †,**

- Clearance for RTP 3-4 weeks minimum after onset of sx
 - Splenic fragility
 - Splenomegaly
- After 3 wks RTP based on resolution of sx



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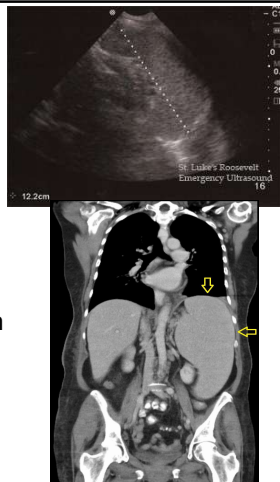
Testing and imaging

• Hoagland Criteria

1. 50% lymphs and atypical lymph's pathognomonic
 2. + serologic test – heterophile antibodies
 - False neg up to 25% week 1
 - 90% positive by 3 weeks of sx
 3. Must be symptomatic
- Elevated liver enzymes (present up to 90% of patients/jaundice 10%)
 - Concurrent Strep Pharyngitis occurs up to 30%
 - Penicillin's often cause diffuse rash in (IM)

Imaging

- US is gold standard
- Difficult to interpret in some cases (larger athletes) without baseline
- Serial exams to track resolution may be needed
- CT helpful but limited use in pediatrics due to radiation
- MRI similar to CT



Pearls

- Fatigue and sore throat are the most common presenting symptoms
- Early return to play most concerning in contact and strenuous sports
- However, light to moderate exercise does NOT prolong the recovery from chronic mono symptoms
- Individual treatment—primarily supportive care
- High index of suspicion
- Mono outbreaks and COVID

Clinical case 2: exertional chest pain in a tennis player

- 17 yr old male tennis player w/ 5d of allergy sx, congestion, fatigue, sinus HA.
- Reports to nurse's office with 2 days of palpitations at tennis and one episode of lightheadedness
- Anxiety about ACT reported
- Taking Zyrtec and Flonase
- FMH: negative for cardiac disease
- No known COVID exposures
- Exam in nurse's office unremarkable except erythematous oropharynx & swollen turb's
- What do you do?



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Differential diagnosis & management

Differential Diagnosis:

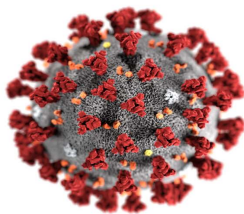
- Strep throat
- Viral syndrome
- Mono
- COVID
- Anxiety
- Allergic rhinitis
- Medication side effects
- Other

Management:

- To play or not to play?
- Refer for testing?
- What tests?
- Consider Strep test, COVID swab, possible monospot with CBC/LFT's

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Final diagnosis



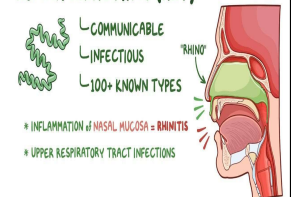
Out for 10 days; no exercise; contact tracing teammates, etc.

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The return of sports and spectators

- Whether vaccinated or not, mass gatherings, removal of masks and not social distancing increase the risk of viral (& bacterial) transmission—**all viruses, not just COVID**
- All of our old "friends" are still around: seeing Rhino/Enterovirus (common cold); parainfluenza spikes, RSV, some COVID, Coxsackie (hand-foot-mouth) & Strep throat
- Universal precautions keep our athletes healthy and mitigate risk
 - Hand washing
 - Not sharing personal items
 - Masks
 - Social distancing

HUMAN RHINOVIRUS (HRV) = "COMMON COLD"



Transmission:

- respiratory
- direct contact
- contaminated surfaces

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Infection control practices

- Taking care of yourself is also taking care of your teammates
- Any athlete who feels unwell ***should avoid*** the team
- Hand washing (soap/water or sanitizer-60% alcohol)
- Physical distancing and masking whenever possible (nurse office and training room)
- Limit shared equipment
- Frequent cleaning of high touch surfaces
- If you are vaccinated, you will NOT need to quarantine for a close COVID exposure unless you develop symptoms
- Indoor, poorly ventilated spaces are higher risk for transmission



COVID transmission in athletes

- **Data from outdoor contact sports confirm low transmission risk from on-field activities**
 - Off field activities with low areas of ventilation remain highest risk.
- **Assess risk –**
 - Current community levels
 - social distancing & exposure time
 - Level of exertion
 - Age of participants
- **Effective mitigation strategies**
 - Cohorts
 - Staggered times
 - Masks and social distancing



Exercise considerations during quarantine post-exposure

- **If an athlete is quarantined via contact tracing and is UN-vaccinated:**
 - Light to moderate exercise is permitted if does not cause cardiopulmonary symptoms
 - No group exercise
 - Monitor with daily check-ins (virtual)
 - If symptoms develop, test for SARS-CoV-2 (ideal timeframe remains 3-7 days post-exposure)
 - If asymptomatic at 10 days they are released from quarantine
- **A vaccinated athlete may continue to participate with daily check-ins**



Quarantine and isolation



VACCINATED

- **Quarantine after exposure is not necessary**
 - Consider testing at 72 hours
 - Consider masking until testing returns negative
- **Covid + => isolation is necessary**
 - 10 days since symptom onset & 24 hours without fever
 - Improvement in COVID-19 symptoms

UNVACCINATED

- **Quarantine after exposure**
 - 10 days (or 7 days with negative test)
 - Minimize public exposure
- **Covid + => isolation is necessary**
 - 10 days since symptom onset and 24 hours without fever
 - Improvement in COVID-19 symptoms

Return to play

- Detailed screening for cardiovascular complications is vital
- Use shared decision making to counsel on return to play as well as the need for cardiac evaluation
- A gradual return to play is important to assess deconditioning, mitigate injury risk and assess for subtle COVID complications
- Remember there are other causes of post-covid-like symptoms (fatigue and sleep, stress, iron deficiency, injury, etc)



Post COVID Clearance Form for University of Chicago Athletics:

- Do you have any medical conditions? Please list: _____
- Do you take any medications? Yes/No: _____ If yes then please list: _____
- When did you test positive for COVID19? Please provide the date of your test.
 - Date of test: _____
 - Type of test (please write in): Nasal swab or saliva test: _____
- Were you tested due to contact tracing? (Yes/No): _____
- Were you asymptomatic at diagnosis? (Yes/No): _____
- Have you had any of the following symptoms in the past 14 days? Please "X" the yes answers

<input type="checkbox"/> Fever or chills	<input type="checkbox"/> Headache	<input type="checkbox"/> Fatigue
<input type="checkbox"/> Cough	<input type="checkbox"/> chest pain	<input type="checkbox"/> heart racing or skipping beats
<input type="checkbox"/> Shortness of breath or difficulty breathing	<input type="checkbox"/> Muscle or body aches	<input type="checkbox"/> New loss of taste or smell
<input type="checkbox"/> Sore throat	<input type="checkbox"/> Congestion or runny nose	<input type="checkbox"/> Nausea or vomiting
<input type="checkbox"/> Diarrhea	<input type="checkbox"/> unexplained rashes or skin changes	
- Please list the date your symptoms began? _____
- Please list the date your symptoms resolved? _____
- Did you seek medical care as a result of your COVID infection? (Yes/No): _____
- Were you hospitalized? (Yes/No): _____
- Have you had a positive test for COVID-19 antibodies? (Yes/No): _____ Test Date: _____
- Were you vaccinated? What type? _____ What dates? (Month/Year) Dose 1: _____ Dose 2: _____

UChicago NCAA collegiate return to play

Step 1: Up to 30 minutes of light steady-state cardiovascular activity &/or interval training or the equivalent of 20% usual training effort

Step 2: Up to 30 minutes of modified strength and conditioning work &/or 30 minutes of intense cardiovascular interval training or the equivalent of 40% usual training effort

Step 3: Up to unrestricted 45-minute strength & conditioning session &/or 45 min intense cardiovascular training or the equivalent of 60% usual training effort

Step 4: Modified Practice up to 80% usual training effort

Step 5: Full Practice or the equivalent of 100% usual training effort

Return to play: AAP recommendations

- Severe COVID-19 (ICU stay) or MIS-C
 - Minimum of 3 to 6 months' restriction
 - Clearance by cardiology
- Mild to Moderate
 - Always monitor for chest pain, shortness of breath, new-onset palpitations, or syncope

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

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

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

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

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

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

Emergency action plans and AED's with COVID-19

- Sudden cardiac arrest is a rare event
- All schools should have EAP's and AED's already
- Will COVID-19 increase the occurrence of sudden cardiac arrest?
 - myocarditis can cause sudden cardiac arrest and has been linked with 10%-20% of all sudden deaths in young athletes
 - COVID-19 myocarditis has been linked to several sudden cardiac deaths in patients who only had mild viral infection symptoms
 - The sequelae of myocarditis can be present weeks to months post-infection
- **Advice? Practice your EAP and AED use—don't be afraid to use it. It will only allow a shock if needed**



Conclusions

- The best path forward is prevention
 - An emphasis on public health
 - suppression of viral spread
 - increased access to testing
 - Vaccination
 - Common sense
- **AED's save lives**
- COVID -19 is not going away but rather we are learning to live with it
- *Just like concussion, if you are concerned that an athlete has exertional cardiac symptoms, hold them out and referring to PCP, sports medicine or cardiology directly*



Clinical case 3: headache lacrosse

A 15 year old female lacrosse player presents to school nurse asking for Tylenol or Motrin for headache

ROS: + for recurrent headaches & difficulty reading s/p MVA 3 weeks ago—no amnesia, no LOC

PMH: unremarkable

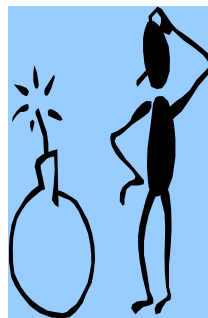
PE: normal

Sports: starts lacrosse tomorrow; has been conditioning and running daily

She hands you a sports physical form signed yesterday clearing her for lacrosse



The management decision



- File the form, tell the athlete patient to return if having problems in lacrosse
- Send to ER or back to PCP for head CT; tell her she is cleared if normal
- Consult neurologist or neurosurgeon
- Hold clearance until asymptomatic by history
- Hold clearance until asymptomatic at rest AND with exertion

Return to play

ASymTOMATIC!!

- At rest
- With exertion

The flowchart shows five steps for returning to play after a concussion. Step 1: No activity (at rest) for 24 hours. Step 2: Light aerobic exercise (walking, swimming, stationary cycling) with heart rate <90% of max. Step 3: Sport-specific exercise (shooting drills, throwing drills, soccer, etc.) with heart rate <100% of max. Step 4: Non-contact training drills (increased exertion, coordination, attention) with heart rate <100% of max. Step 5: Full contact practice. Each step includes a decision point: 'Symptom Free for Next 24 Hours?'. If 'Yes', move to the next step. If 'No', return to the previous step until symptom-free.

Reference: Consensus Statement on Concussion in Sport: The 4th International Conference on Concussion in Sport held in Zurich (2008), the 4th Sports Med 2008, at 176-184 and 181-184 June 2008-05-09

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Symptom threshold

- Newest data by John Leddy
- Buffalo Concussion Treadmill Test
- Demonstrated that the introduction of light exercise early on, up to the **symptom threshold** that triggers worsening symptoms
 - Did NOT prolong recovery
 - In fact, sped up recovery
 - *RTP protocols are changing slowly*

Haider, Leddy, Willer, et al. Frontiers in Neurology. April, 2019.

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Test: myth busters—true or false

- CTE is caused by repetitive head trauma
 - **FALSE:** relationship of trauma to chronic encephalopathy is poorly understood & unproven; however, concern exists
- Only athletes are at risk for CTE
 - **FALSE:** CTE can occur in the absence of a history of head trauma
- Football causes brain damage
 - **FALSE:** to date there are no studies that report on the long-term effects on the brain resulting from college football participation
- Concussion Education is required by the IHSA for all athletes, coaches, and sports medical personnel on an annual basis.
 - **TRUE:** Furthermore, at UChicago and Lab each SA signs a Concussion Statement prior to participation and each coach signs also

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Test: myth busters—true or false

- You can sleep through the night following a concussion
 - **TRUE:** sleep is important for recovery—quantity & quality
- Concussion is diagnosed by either CT or MRI
 - **FALSE:** Routine imaging is normal in concussion
- Concussion can be diagnosed by neuropsych testing like IMPACT
 - **FALSE:** while NP testing adds clinical information about the athlete, concussion remains a clinical diagnosis
- Physical therapy and neurocognitive therapy have been proven to result in a faster recovery than just time alone.
 - **FALSE:** the natural history is that 80-90% resolve w/in 3 weeks & 98-99% eventually make a full recovery

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Case 4: hockey player

A 17 yr old male hockey player comes in
He reports frequent headaches & fatigue
which he relates to not sleeping well
He has back pain for 3 months on and off
with hockey
Grades are slipping; he is not spending
time with friends
He is not getting along with his parents
but feels safe at home
Immunizations are UTD except for HPV
and meningococcus
Normal physical exam today



Primary care provider approach

- Combines well child care visit into this
- Updates the immunizations
- Refers for counseling for possible depression, prescribes a HA log & use of acetaminophen or ibuprofen prn.
- Counsels on improved sleep and nutrition and against use of tobacco, drugs, EtoH, seat belt safety.
- Checks a spine xray - normal-no further action
- COVID negative

Specialist office experience

- Review hockey participation in more detail for possible concussion, he admits to several body checks & head hits in a game that triggered sx-both HA and back pain.
- player held out for possible concussion/PCS-refers for vestibular therapy, contacts school for modifications. Also physical therapy for LBP.
- Further questioning reveals use of DHEA supplements during weight-lifting-counseled pt
- does not update immunizations, does not refer for counseling for possible depression nor does anticipatory guidance on substance abuse other than supplements

Conclusions

- Both approaches add value
- Neither is perfect
- Input from family, school nurses and coaches or ATC's is VERY valuable to uncover the psych issues
- If post concussion syndrome is suspected then encourage the family to pursue the therapies that are available
 - Vestibular
 - Ocular
 - Neuropsych counseling/CBT

Mental health concerns

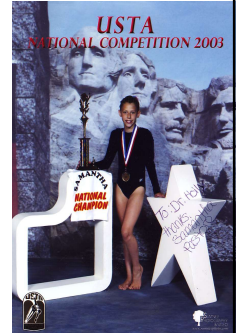
- The pandemic was (and is somewhat still) a period of extreme isolation
- Survey studies suggest more than 50-70% of adolescent and collegiate students experienced mental health issues related to the pandemic
- Mental health issues persist
- Strategies to help students, athletes and ourselves
 - Talk it out
 - Stay engaged with your sport and physical activity
 - Remember your "Why"
 - Focus on physical and mental fitness – adapt and resilience
 - Establish a daily routine
 - Stay connected
 - Recognize the degree of impact
 - Neutralize extreme emotions; focus on facts
 - Consider others safety
 - Practice and model self-care – sleep, nutrition, etc.
 - Acknowledge mental health needs and seek care



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Benjamin's summary

- Take thorough histories
- Look for red flags
- Rare things are rare
- Follow-up & communicate
- Diagnostic testing adds value
- Support vaccinations
- **When it doubt, sit the athlete out!**
- **In 2021, anything can be COVID**



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