Sports Medicine Update: All of Our Patients are "Athletes"

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Nothing to disclose.

Why think of our patients as athletes?

- One of our roles as physicians is to help our patients stay active. Knowing when it is safe for them to keep going and when to stop (or modify!) is important.

- Jobs or hobbies my be more athletic in nature than we think. Assembly line workers, item pickers, mouse clickers, gardeners…

- Theme for today: keep them moving!

Objectives

- Review role of ferritin/iron in active individuals.
- Discuss current concussion principles.
- Identify common stress injuries and general treatment principles.
- Review common causes of “growing pains.”
- Discuss exercise recommendations for our patients.

Fatigue and Ferritin in a College Runner

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19 y/o female

- 10/21
  - Hgb 13.9 (12-16)
  - Ferritin 54.6 (11-309)
  - TIBC 372 (250-450)
  - Iron 18 (50-211)
  - Iron sat <10% (15-50%)

  - had been on iron in the past—off now—ferritin had been “low”
  - Feeling fatigued in workouts

Fatigue

Can be multi-factorial:

- Overtraining—is AM heart rate going up?
- Low thyroid—check TSH.
- Low iron—need to check iron, iron binding capacity (TIBC) and ferritin.

- Energy Balance

Definitions

- Hemoglobin: the oxygen carrying component of blood. This is in the CBC and is often used incorrectly to assess iron levels.

- Serum iron: the active iron in the blood stream.

- Ferritin: the storage form of iron.

Anemia

- Two primary causes:
  - blood loss
  - nutritional deficiencies.
- GI bleeding may cause blood loss in some athletes, particularly distance runners.
- Genitourinary system may be source of chronic blood loss in athletes.
- Sweat represents a negligible loss of iron.

Anemia

- Many male and female endurance athletes fail to meet recommended energy intake, and many female athletes also consume less than the RDA of iron.

- Those who follow vegetarian or modified vegetarian diets have lower ferritin levels and lower iron bioavailability, although iron intake is similar (source of iron may be important).

Anemia

- Iron deficiency is the most common nutritional deficiency in the US--up to 11% of females and 4% of men.

- Iron deficiency with anemia is less common, occurring in only about 1-2% of all adults.

Ferritin

- Ferritin is the protein bound iron stored in your body (liver, spleen and bone marrow in particular).

- Ferritin is important in endurance athletes; knowing the number may be as important as any training plan they are following; and ferritin should be checked at least yearly.

How do they all work together?

- Iron is important as a key part of hemoglobin (the oxygen carrying component in blood).
- Endurance athletes need to get oxygen to working muscles while training and racing.
- When hemoglobin levels are low there will be an issue with oxygen transport.
- When iron levels are low, hemoglobin levels may be low as well, but sometimes not (iron deficiency nonanemia-IDNA).
- Hemoglobin levels do NOT directly assess iron levels. If you are told your iron levels are normal but only the hemoglobin was tested you are not getting the complete story.

“Normal” Levels

- Most physician who work with endurance athletes feel that hemoglobin, iron and ferritin levels are all important, and athletes with normal hemoglobin and iron levels, but low ferritin levels benefit from iron supplementation.
- One other confounding factor is that ferritin levels are considered “normal” down to levels of 10 or 12 even though this is too low for the endurance athlete (more on levels later). Different levels are “normal” for different people –what is normal for many may not be normal for those who push their bodies on a regular basis.

Symptoms

- Recent studies have shown that those with normal hemoglobin levels but low ferritin levels feel better, perform better, and have better treadmill test results after taking iron and getting the ferritin level up.
- Symptoms of this will include fatigue, having trouble keeping up during workouts, plateau in performances, injuries, odd muscle pain, and even GI discomfort/issues.
- If an athlete develops any of these symptoms, getting blood work done (CBC, chemistry panel, serum iron, ferritin and thyroid tests) would be a good idea.

Symptoms/Testing

- There are other problems that can lead to the above symptoms, but the labs are an easy way to get the work-up underway.
- One problem with waiting until there are symptoms, however, is that by the time the blood is tested the ferritin level may be very low and it takes a little time to get the levels up.
- We recommend that endurance athletes get it checked at least once a year, and more frequently if a problem is identified.

1. Assess Levels.

- **Assess serum ferritin levels** (as well as CBC and serum iron) in the “pre-season” if at all possible.
  - Early summer for XC.
  - Consider recheck September/early October.
  - Track athlete as well—consider Feb/early March.

2. If Ferritin Low?

- **If the ferritin is low (less than 30)** even if hemoglobin and serum iron are normal, I would recommend supplementing with two over the counter iron pills per day (there is typically 65 mg of active iron in each tablet), with Vit C (which helps absorption) and folate (a deficiency in this can also inhibit absorption).
  - Do NOT take at the same time as calcium.
  - Meat sources absorbed better than plant sources.

3. Recheck.

- **Recheck levels in 6 weeks.**
  - Target > 50.
  - Once reaches mid 30's will often feel better.
  - >40 often do well, 50 gives a buffer.
  - Recheck labs every 6 weeks until 45 or greater, then 1-3 times a year.

4. Why Not Just Start Iron?

- **DO NOT just start iron** as 1 in 250 may have something called hemochromatosis that can cause a toxic build-up of iron in the liver.

- Monitoring levels will help stay away from this issue as well as guide ongoing treatment.

5. Maintenance.

- **When the desired level is achieved,** I usually have the athletes cut down to one tablet a day. While endurance training is going on there is a good chance the levels will drop again if the supplementation is stopped completely.

6. Who Should Perform the Tests? (OR: Am I the Right Person for the Job?)

- **Talk to your doctor about this.** If they agree with testing and understand that for an endurance athlete “normal” is 35 or more (not just barely inside the normal range of 10 or 12 for the normal population) make sure you get the actual number from your doc, not just “everything looks fine.”

7. Infusions.

- **If for some reason an athlete has an exceedingly low ferritin level** (single digits) or has problems with absorption, we have utilized iron infusions.
  - There are often a few other tests that need to be run to ascertain if at all possible the reason for the issues, but infusions when used at the right time in the right athlete can be very helpful.
  - Considering this would warrant a thorough evaluation and discussion with a sports medicine physician who deals with endurance athletes.

Anemia Caveats (E. Randy Eichner MD 2021)

- "Fatigue has many faces"
  - Fatigue means different things to different people.
  - Multiple factors can be present—depression, recent illness.
- "Anemia can be pseudoanemia"
  - Exercise is a plasma builder (a good thing), so endurance athletes can have low baseline Hgb--dilutional affect.
  - Single bout of exercise can expand plasma volume by 10% within 24 hours.
  - Hgb can go up when training ceases.

Anemia Caveats (E. Randy Eichner MD 2021)

- "Anemia can be relative anemia"
  - Mild anemia is relative—can vary by gender, age, altitude…
  - What is anemia for one may not be anemia for another.
  - Define NOT relative to cutoff value, but relative to baseline.
  - If ferritin less than 20, likely anemic for that person.
- IDNA is likely mild anemia

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  - Iron sat <10% (15-50%)
  - Vit D 54.6
- 3/22
  - Hgb 14.8
  - Ferritin 41.3
  - TIBC 358
  - Iron 56
  - Iron sat 16%
  - Vit D 41.3

19 y/o female

- 10/21
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  - Vit D 54.6
- 3/22 5/22
  - Hgb 14.8 14.8
  - Ferritin 41.3 52.0
  - TIBC 358 315
  - Iron 56 87
  - Iron sat 16% 28%
  - Vit D 41.3 54.7

Periods

- Is it normal to miss periods? NO.
  - (Does it happen a lot in runners/other female athletes? Yes.)
- Why do we care?
  - Often a sign of underfueling (often accidental).
  - Not enough calories coming into body. Body shuts down reproductive system. Normal cycle necessary for bone density. Missing periods can lead to performance declines and stress fractures.
  - Often small deficit (200-400 cal/day)—reversal will restart periods.
  - Hormones (birth control pills) will NOT reverse the problem.
  - Goal is 10 or more periods a year.
  - Should have first period by age 15 (even if "family history" of starting later).

Concussion Update

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Overview/Objectives

- Concussion Update:
  - Consensus Statement—Berlin 2016 (5th Meeting)
  - Return to Learn/Play
  - Thoughts/Pearls

- Next Update: Amsterdam 10/27-29, 2022
  - (*** next to likely key update areas)
  - All forms will be updated (SCAT 5 now SCAT 6?)
  - Are there different “types” of concussions?

- Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016
  - http://dx.doi.org/10.1136/bjsports-2017-097699
  - BJSM Volume 51, Issue 11

11 R's

1. Recognise
2. Remove
3. Re-evaluate
4. Rest
5. Rehabilitation
6. Refer
7. Recovery
8. Return to Sport
9. Reconsider
10. Residual Effects and Sequelae
11. Risk Reduction

Recognise

Definition of Sports Related Concussion (SRC):

- Direct blow or impulsive force.
- Rapid onset of short-lived impairment, but some evolve over minutes to hours.
- Largely reflects functional instead of structural injury.
- Range of clinical symptoms that may or may not include LOC.

Remove

- Physician or other licensed medical professional.
- First aid then SCAT5***.
- Do not leave alone.
- No same day RTP.

Re-evaluate

- Office or ER.
- Hx, neuro exam (mental status, cognitive functioning, sleep/wake disturbance, ocular function, vestibular function***, gait and balance).
- Improving/deteriorating?
- Need for imaging.

Rest

- Rest for 24-48 hours.
- Gradually and progressively more active staying below cognitive and physical symptom-exacerbation thresholds.
- Avoid vigorous exertion(?***).
  - New Sports Concussion Clinic will be opening at UMH-West late 2022/early 2023.

Rehabilitation

- Literature has not evaluated early interventions, as most recover in 10-14 days***.
- Ongoing or persistent symptoms: psychological, cervical and vestibular rehab.
- Controlled sub-symptom-threshold, sub-maximal exercise may be helpful.***
- Control cognitive stress, meds as needed, school accommodations.

Refer

- Persistent symptoms: >10-14 days in adults and 4 weeks in children.
- Target specific medical, physical, and psychosocial factors.

Recovery

- Strongest and most consistent predictor of slower recovery from SRC is the severity of a person's initial symptoms in the first day, or initial few days, after injury (*** still true?).
- Hx of migraines or depression may prolong symptoms.
- ADD—more planning.

Return to Sport

- Stage 1 now “Symptom Limited Activity.”
- 2. Light aerobic exercise.
- 3. Sport specific exercise.
- 4. Non-contact training drills.
- 5. Full contact practice.
- 6. Return to sport.

    - Stage = Day

Reconsider

- Elite and non-elite managed the same.
- Treat children (5-12) and adolescent (13-18) similar to adults. Children may take up to 4 weeks to become symptom free.
- Child SCAT 5
- New graduated return-to-school strategy noted.
- Keep school notes somewhat open-ended.

Residual Effects

- More studies needed.
- *Chronic Traumatic Encephalopathy in Sports: A Historical and Narrative Review.*
    - Developmental Neuropsychology, 2018, Vol 43, No 4, 279-311.

Risk Reduction***

- SRC History.
- Prevention—mixed results. Most consistent evidence evaluating policy is related to body checking in youth hockey.
- Knowledge translation important.

On-Field Evaluation

- Level of consciousness and ABC's first.
- Know the emergency action plan.
- Establish the presence of any loss of consciousness (LOC). Occurs in less than 10% of concussive injuries, and often lasts only a few seconds.
- Confusion and amnesia much more common than LOC.

What To Watch For

- Severe or worsening headache with vomiting or declining mental status is more ominous and transport to hospital is warranted.
- Don’t forget other signs and symptoms: visual disturbances, fatigue and feeling “slow” are also common.
- Athletes with any mental status change should be managed conservatively.

Thoughts/Pearls

- Physiologic (neurobiologic) recovery v. clinical recovery.
- More injuries to lower extremities after a concussion.
- Return to learn BEFORE return to play.

Thoughts/Pearls

- Pediatrics: psychiatric history, female gender, HS age are all risk factors for greater than 1 month return to play.
- Gender differences***?
- Vestibular/balance testing—will be a lot more on this in Amsterdam meeting (likely).

Stress Injury Thoughts

What Is a Stress Injury?

- Repeated motions causing damage to bone, muscle, tendon, ligament or nerve.
- “Repetitive use” better term than “overuse” as that suggests the patient is doing something wrong.
- In bone the term stress fracture is often used, when there is often no fracture. Stress injury a better term as it is a continuum—use stress fracture when actual fracture from stress injury.

How to Diagnose?

- Plain film can show—particularly in long bones (metatarsals, tibia, fibula, femur).

- Advanced imaging:
  - Bone scan—falling out of favor—sensitive but does not help with severity/grading.
  - MRI best tool—shows soft tissue and bone very well.

Management Pearls

- Keep them moving!
- Lower leg or foot injuries-–use cam walker—can get out to exercise.
- Pool (swim or aqua jog)→bike→elliptical→ unweighted treadmill.
- Core/upper body work usually OK (depending on where stress injury is).

Apophysitis “Growing Pains” in the Young Athlete

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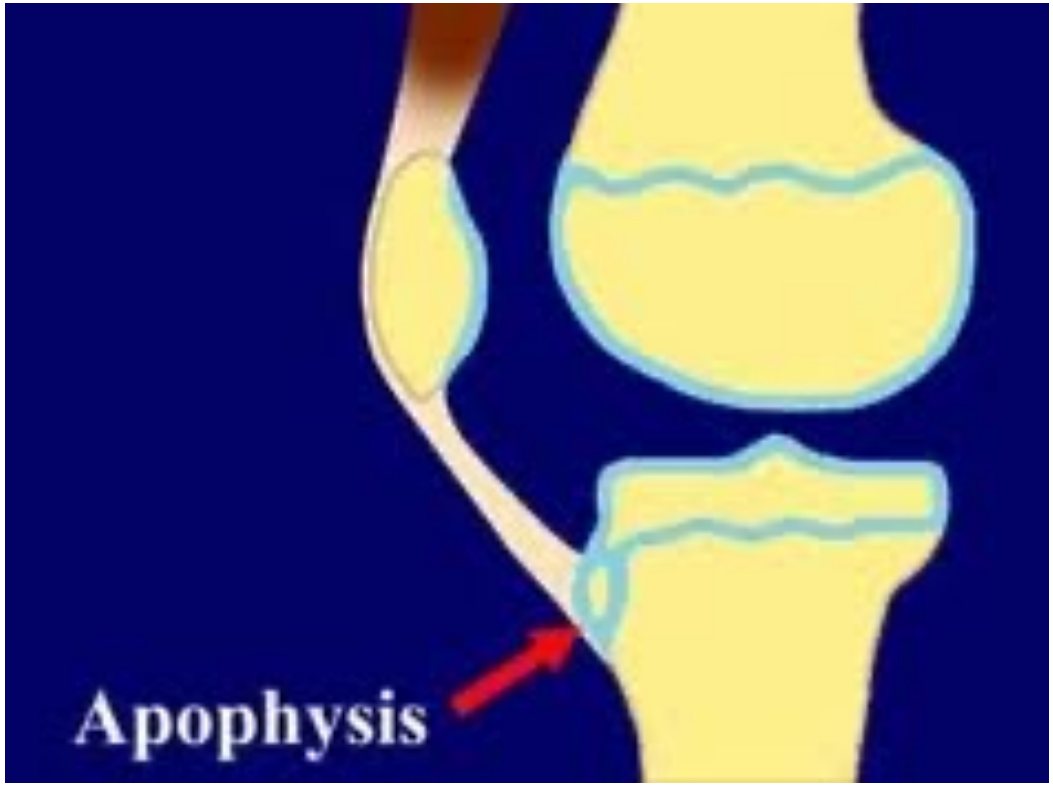
Objectives

- Define apophysis/apophysitis.
- Review pertinent anatomy.
- Identify conditions with similar symptoms that should not be missed.
- Discuss treatment and return to play considerations.

Definition

- Apophysis: cartilaginous prominence adjacent to the physis (growth plate).
- Site of tendon attachment prior to skeletal maturity.
- Use/overuse can result in a traction apophysitis: repetitive microtrauma caused by the force of pull of the attached tendons resulting in partial avulsions and inflammation—excessive force may result in an avulsion fracture.


Apophysis

What a “growing pain” is NOT

- OR “What we better make sure it is not:”
  - Infection
  - Osteochondritis Dissecans
  - Stress Fracture
  - Tumor

Causes?

- Multiple factors:
  - During a time of rapid growth bone growth exceeds the ability of the muscle-tendon unit to stretch sufficiently to maintain its previous level of flexibility, causing increased tension at the attachment site.
  - Training and competition increase force generation of the attached muscle and amplify traction forces.
  - Underlying biomechanical factors such as foot pronation or genu valgum may exacerbate abnormal forces at the apophysis.
  - Improper technique.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011

Presentation

- Apophysitis typically develops from repetitive submaximal loading at the apophysis, but a forceful eccentric (lengthening) muscle contraction may cause an acute avulsion fracture at the apophysis, with immediate disability.
- In general, apophysitis presents with gradual onset of pain without a specific history of injury—it also may present as persistent and/or worsening symptoms after a single traumatic event.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011.

Diagnosis

- The diagnosis of apophysitis can be made solely on the basis of classic history and physical exam findings.
- Radiographs are not necessary for diagnosis but may help rule out other conditions such as infection or tumor, especially with an atypical history, or when concerning historical factors such as night pain, fever, weight loss, or pain persisting after skeletal maturity are present.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011.

General Treatment Principles

- Rest from activities that cause pain and protect the apophysis from further injury.
- Although rare, inadequate protection of the apophysis during a time of increased stress can result in an avulsion fracture.
- Activity may be modified to allow continued participation, but certain athletes require complete rest depending on their level of pain and disability.
- A general rule is that sports participation is allowed as long as limping is not present during normal walking or during or after activity.
- A rehabilitation program in the form of a home exercise program, formal physical therapy, or rehab with an athletic trainer is used to correct underlying flexibility and strength deficits.

Apophysitis of the lower extremities. Contemp Peds. June 1, 2011.

Little League (Thrower's) Shoulder

- Technically a physeal injury.
- Pain/ache in shoulder.
- Often non-specific.
- Radiographs useful for showing widening of the proximal humeral physis.
- Use comparison views.

Little League (Thrower's) Shoulder

- Tenderness at physis WITHOUT physeal widening—4 weeks of rest followed by strengthening, then gradual RTP.
- If physeal widening evident—3 months rest followed by strengthening and an interval throwing program.
- Mechanics!!!

Little League (Thrower's) Elbow

- Overstress of the medial elbow-stabilizing structures and repetitive compression injury to the lateral radiocapitellar articulation.
- Will often see decreased velocity and control.
- Tender/swollen medially at elbow.
- Increased pain with resisted wrist flexion and pronation.
- X-rays often negative—may show widening of medial epicondylar apophysis.

Little League (Thrower's) Elbow

- Differentiate from UCL tear—LLE 9-12, UCL tear often older.
- May have OCD lesion as well.
- In athletes over 12 consider MRI, partic if gapping with valgus stress.
- Rest 4-6 weeks, ice, NSAID.
- Look at the shoulder (particularly the scapular mechanics), core, and MECHANICS.
- Interval throwing program.

Osgood-Schlatter Disease

- Traction apophysitis occurring at the tibial tuberosity because of the pull of the quadriceps muscle group via the patella tendon.
- Often seen during rapid growth—8-13 in girls and 12-15 in boys.
- More common in active individuals.
- Often insidious, can be initiated by traumatic event.
- Pain often exacerbated by running/jumping/kneeling.
- Tenderness and swelling over the tibial tuberosity.
- Causative factors may be quad and hamstring tightness.

Osgood-Schlatter Disease

Osgood-Schlatter Disease

- Self-limiting.
- May take 12-24 months to resolve—will often wax and wane.
- May “play through” pain as long as not limping.
- Ice, PT (or HEP with stretching of quad/ham/SLR), NSAIDs, patellar tendon strap.
- If limping, affecting ADL’s—activity modification with rest (relative rest), with gradual reintroduction of activities.
- Immobilization/surgery rarely needed.

Sinding-Larsen-Johansson Disease

- Traction apophysitis which develops because of the pull of the patella tendon at the inferior pole of the patella.
- SLJD appears to affect males over females and is seen in active adolescents between the ages of 10 and 13 years.
- Pain inferior patella, partic with running and jumping activities.
- Bony tenderness over the inferior patellar pole with or without swelling.
- Radiographs may demonstrate irregular calcification at the inferior pole of the patella or may be normal.

Sinding-Larsen-Johansson Disease

- Self-limited with resolution of symptoms occurring with apophyseal closure at the inferior pole of the patella.
- Shorter in duration than OSD lasting 3 to 18 months.
- Most children with mild symptoms are able to continue playing sports and respond to ice, NSAIDs, and therapy consisting of quadriceps strengthening and flexibility of surrounding muscle groups.
- Consider sleeve or strap.

Sever('s) Disease

- Considered the most common overuse injury in pediatric and adolescent populations, accounting for approximately 8% of all overuse injuries in this group.
- Affects children between the ages of 8 and 12 years—girls presenting earlier.
- Males are affected 2 to 3 more times often than girls, and 60% of patients have bilateral symptoms.
- Pain posterior heel made worse by running and jumping.
- Tenderness at Achilles insertion—often more tenderness along the sides of the posterior calcaneus ("squeeze test").
- May see tight heel cord tightness and weak ankle dorsiflexors.
- X-ray may show an apophysis that appears thickened, sclerotic, and fragmented (this can also be considered normal).

Sever('s) Disease

- Relative rest, NSAID's, ice, heel cord stretching and ankle strengthening.
- Role for heel cups, pads or orthotics?
- Severe cases may require crutches or walking boot/cast (2-4 weeks)—I will often keep the athlete in the boot most of the day and out for their activities.

Iselin's Disease

- Traction apophysitis involving the tuberosity of the fifth metatarsal.
- Peroneus brevis and tertius tendons insert near the attachment of the plantar fascia.
- Females aged 8 to 12 years and in males aged 10 to 14 years.
- Made worse by running/jumping/cutting.
- Peroneus brevis repetitively pulls on the weaker apophyseal cartilage.
- Typically insidious onset—may start after inversion injury. Footwear may aggravate as well.

Iselin's Disease

- Physical exam may reveal tenderness at the base of the fifth metatarsal and associated soft tissue edema, mild erythema, and enlargement of the tuberosity in comparison with the uninvolved foot.
- Typically will have pain with resisted eversion of the foot as well as increased pain with extreme dorsiflexion and plantar-flexion with inversion.
- Best seen on the oblique view of the foot as a small, shell-shaped fleck of bone oriented obliquely to the long axis of the metatarsal shaft.

Iselin's Disease

Iselin's Disease

Iselin's Disease

- Limitation of activity based on the severity of symptoms, icing, and NSAIDs.
- Therapy including stretching of the ankle evertors/plantar flexors and strengthening of the invertors/dorsiflexors along with proprioceptive exercises.
- Consider immobilization/walking boot with or without crutches for 2-4 weeks.
- Benign and self limiting.
- Rarely non-union may occur with symptoms later in life—consider surgical excision.

Exercise/Activity Guideline Update

Prospective data on 116,221 adults followed 1988-2018.

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Exercise/activity—How Much?

- More than we thought, BUT some is better than none and more is better than some.
- 5-10 hours/week moderate activity (40-80 min daily) OR 2.5-5 hours per week vigorous activity (20-40 min daily) OR some combo.
- Moderate: walking briskly, doubles tennis (doubles pickleball?), raking.
- Vigorous: jogging, running, shoveling snow, carrying heavy items, fitness class.
- Recent (different) study: 8,600 steps to maintain weight, and 11,000 if overweight and want to ward off obesity.

What does this mean?

- All of the following are essentially equivalent at about 4 miles/day (and fall within preceding guidelines):
  - 64 min walk at 16:00 pace
  - 38 min run at 9:30 pace
  - 8500 steps

Strategies

- OK to break into smaller pieces—four 10 min moderate activities.
- Walk/jog—walk 2 min/jog 30 seconds.
- Park and walk farther to store (when not using Amazon!).
- Stairs/stairs/stairs!
- COVID seems to have had some of us exercise more (more time) or less (Y closed, so many services bring things to us now—Uber Eats).

Questions?

Thank you!

- Contact:
  - 616-252-7778 (SM line)
  - 616-443-5494 (cell)
  - Curbside in EPIC (or text/call)

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Primary Care Sports Medicine: Your “non-op, keep people moving, spend a little more time with patients” ortho (and medical issue) team!

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