Hands on Sports Physical Practice
(Plus the Syncopal Athlete)

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Learning Objectives

• What do you do when you have a positive history?
• Exactly how do you do all of these fancy physical exam techniques?
• How do you work up a cardiac case?
Let’s put you to the test!

• You are doing a sports physical and notice that the 17 year old male had a pneumothorax last year
• What are the common causes of a PTX in this population?
  – Emphysematous bleb 21%
  – Tobacco use 4%
  – Obstructive lung disease (asthma 10%, Cystic fibrosis)
  – Infectious lung disease (PCP, TB, HIV, Measles)
  – Interstitial lung disease (sarcoidosis, pulmonary fibrosis)
  – Connective tissue disease (Marfan, EDS, scleroderma)
History of a PTX

- What should you do?
  - It’s not what but why
- Should you clear the athlete?
  - Function, function, function
- Will this happen again?
  - 50% recurrence rate (especially in tall, smokers, females)
OK, let’s try another case

• You are seeing a junior who plays on the volleyball team. She is complaining of right hip/groin pain. You notice that it hurts to do a FADDIR test and you are thinking about a torn labrum. You ask her about past injuries and find out that she has sprained her ankles a lot and has chronic/recurrent back problems.
• There seems to be more to this story.
• What do you want to do next?
Volleyball Player

• She has had glasses since preschool
• Her back pain has been managed with a couple courses of PT and routine exercises
• She has chest pain spells with high intensity exercise but always thought it was asthma
• On cardiac exam she has a mid-systolic click followed by a blowing 2/6 murmur heard best at the apex of the heart.
VB player with a murmur

• The rest of your exam:
  – Narrow face with ears sticking out
  – High arched palate – she did have braces in middle school
  – Long arms and fingers
  – Scoliosis present with forward flexion
  – Pain in her lower back with forward flexion and extension
  – And that positive FADDIR test on the Right hip
So how do you make the diagnosis of Marfan Syndrome?

• So, if you are suspicious of Marfan’s
  – It’s a lot more than just long arms!
  – Think
    • Heart; Eyes; Spine
  – They will have to get
    • Physical looking for MSK changes
    • Echocardiogram
    • Slit lamp eye exam
    • Pelvic/hip x rays
    • Lumbar spine CT or MRI if having back pain
    • DNA testing for FBN1
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Marfan Syndrome

• The Skeletal System
• The majority of people with skeletal features do NOT have Marfan Syndrome
• Arms, legs, fingers, feet
  – Arachnodactyly
    • Wrist sign
    • Thumb sign
  – Decreased elbow extension (< 170⁰) due to elongated olecranon
• Arm span > height
  – Ratio of Arm span / height > 1.05
  – Pubis to ground > Pubis to head (>1.05)
• Hips – protrusion Acetabuli
  – 65% of Marfan patients will have deep hip sockets and anterior hip pain
• Chest wall
  – Pectus Excavatum or Pectus Carinatum
Facial Features
  – High arched palate, dolichocephaly, retrognathia
Grab A Partner

- Arms, legs, fingers, feet
  - Arachnodactyly
    - Wrist sign
    - Thumb sign
  - Decreased elbow extension (< 170°) due to elongated olecranon

- Arm span > height
  - Ratio of Arm span / height > 1.05
  - Pubis to ground > Pubis to head (>1.05)

- Scoliosis / kyphosis
Grab A Partner

• Flat feet
• Chest Wall
  – Pectus Excavatum or Pectus Carinatum
• Facial Features
  – High arched palate, dolichocephaly, retrognathia
Question:

why do some items get different points? (1, 2, or 3)

<table>
<thead>
<tr>
<th>Box 2 Scoring of systemic features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist AND thumb sign — 3 (wrist OR thumb sign — 1)</td>
</tr>
<tr>
<td>Pectus carinatum deformity — 2 (pectus excavatum or chest asymmetry — 1)</td>
</tr>
<tr>
<td>Hindfoot deformity — 2 (plain pes planus — 1)</td>
</tr>
<tr>
<td>Pneumothorax — 2</td>
</tr>
<tr>
<td>Dural ectasia — 2</td>
</tr>
<tr>
<td>Protrusio acetabuli — 2</td>
</tr>
<tr>
<td>Reduced US/LS AND increased arm/height AND no severe scoliosis — 1</td>
</tr>
<tr>
<td>Scoliosis or thoracolumbar kyphosis — 1</td>
</tr>
<tr>
<td>Reduced elbow extension — 1</td>
</tr>
<tr>
<td>Facial features (3/5) — 1 (dolichocephaly, enophthalmos, downslanting palpebral fissures, malar hypoplasia, retrognathia)</td>
</tr>
<tr>
<td>Skin striae — 1</td>
</tr>
<tr>
<td>Myopia &gt; 3 diopters - 1</td>
</tr>
<tr>
<td>Mitral valve prolapse (all types) — 1</td>
</tr>
</tbody>
</table>

Maximum total: 20 points; score ≥7 indicates systemic involvement; US/LS, upper segment/lower segment ratio.
So how do you make the diagnosis of Marfan Syndrome?

• 5 steps:

1) Detailed past medical history and family history
   a) Exercise associated symptoms of syncope, dizziness, chest pain
   b) History of murmur (any murmur)
   c) Joint arthralgias, back pain, ligament injury, joint instability
   d) Pneumothorax
   e) Family History
      1) Marfan’s
      2) early or unexplained sudden death
      3) Aortic aneurysm or surgery for aneurysm
      4) Heart valve surgery

There is a lot of overlap between the features of Marfan’s and normal people.
So how do you make the diagnosis of Marfan Syndrome?

• 5 steps:
  2) Complete physical
     looking especially at the changes related to Fibrillin
  3) Dilated split lamp exam by ophthalmologist
  4) Echocardiogram – looking for cardiac changes
  5) FBN1 DNA testing – Marfan Syndrome profile

There is a lot of overlap between the features of Marfan’s and normal people.
So Let’s Figure This Out

• If there is a family history, you need:
  – 1 of the following other items:
    • Ectopia Lentis
    • ≥ 7 points on the scoring system
    • Aortic Root Dilatation ≥ 2 times normal for age and gender

• If there is no family history (more than 25% of time), you need:
  – Aortic Root Dilatation ≥ 2 times normal AND ectopia lentis
  – Aortic Root Dilatation ≥ 2 times normal AND FBN1 mutation by lab testing
  – Aortic Root Dilatation ≥ 2 times normal AND ≥ 7 points on the scoring system
  – Ectopia Lentis AND FBN1 mutation AND Aortic Root Dilatation < 2 times normal
How should a Marfan patient be managed?

• Eyes
  – Regular eye exams by ophthalmologist

• Skeletal
  – Close monitoring of scoliosis and intervene when progressive
  – Total hip replacement if protrusio acetabulae progressing
  – Surgical repair of pectus excavatum if affecting lung function

• Cardiac
  – Close monitoring of mitral valve and aorta
  – Treat with beta blockers and Losartan (ARB)
  – Aorta surgery
How should a Marfan athlete be managed?

• Exercise?
  – Dynamic vs. Static?
  – Competitive vs. Recreational?
  – Intensity = increased stroke volume and heart rate = increased BP
  – Increased BP = Aorta Risks
How should a Marfan patient be managed?

• Exercise?
  – Will hasten progression of Aortic dilation and increase risk of aortic dissection

AHA/ACC SCIENTIFIC STATEMENT

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 7: Aortic Diseases, Including Marfan Syndrome

A Scientific Statement From the American Heart Association and American College of Cardiology
Journal of the American College of Cardiology 2015;66:2398-2405
How should a Marfan patient be managed?

- AHA/ACC 2015
  - Athletes with Marfan syndrome MAY participate in low and moderate static/low dynamic competitive sports * if they do not have ≥ 1 of the following:
    • Aortic root dilatation
    • Moderate to severe mitral regurgitation
    • Left ventricular systolic dysfunction (EF < 40%)
    • Family history of aortic dissection at an aortic diameter < 50 mm
  - Should not participate in any competitive sports that involve intense physical exertion or the potential for bodily collision
    * golf, billiards, bowling, cricket, curling, riflery, archery, yoga
How should a Marfan patient be managed?

• Marfan Foundation
  – Not happy with this level of restriction
  – Favors non-competitive, dynamic exercises
    • Walking, jogging, leisurely bicycle
    • Avoid isometric activities
    • Avoid contact sports

<table>
<thead>
<tr>
<th>Permitted</th>
<th>Intermediate*</th>
<th>Strongly Discouraged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowling</td>
<td>Singles tennis</td>
<td>Body building</td>
</tr>
<tr>
<td>Golf</td>
<td>Baseball/Softball</td>
<td>Ice hockey</td>
</tr>
<tr>
<td>Brisk walking</td>
<td>Hiking</td>
<td>Rock climbing</td>
</tr>
<tr>
<td>Modest hiking</td>
<td>Swimming (lap)</td>
<td>Windsurfing</td>
</tr>
<tr>
<td>Doubles tennis</td>
<td>Horseback riding</td>
<td>Surfing</td>
</tr>
<tr>
<td>Treadmill</td>
<td>Biking</td>
<td>Scuba Diving</td>
</tr>
<tr>
<td>Stationery bike</td>
<td>Ice skating</td>
<td>Weightlifting</td>
</tr>
<tr>
<td>Archery</td>
<td>Racquetball</td>
<td>Football</td>
</tr>
<tr>
<td>Table tennis</td>
<td>Dancing</td>
<td></td>
</tr>
<tr>
<td>Light weightlifting with repetitions</td>
<td>Jogging</td>
<td></td>
</tr>
<tr>
<td>Yoga, Pilates</td>
<td>Badminton</td>
<td></td>
</tr>
</tbody>
</table>
OK, let’s do another case!

- You are doing a sports physical on a high school senior. She is a state ranked high jumper and has several colleges looking at her. Last year she dislocated her shoulder during one of her meets. It was a fluke accident. She got surgery and missed the rest of the spring. She feels like the shoulder is loose again and has felt it pop in/out a few times in the weight room.

What do you want to do?
OK, let’s do another case!

- Tall (6’2”) and skinny (BMI 18.2)
- Lanky/long arms
- Mild scoliosis
- Surgical scar on her right shoulder
  - You can feel that shoulder sublux when you stress it anteriorly and inferiorly
OK, let’s do another case!

• What are the common causes of repetitive dislocations in this patient population?
  – EDS
  – Marfan’s
  – Joint Hypermobility Syndrome (JHS)
  – Battered child
  – Hemophilia
  – Developmental coordination disorder
Ehlers-Danlos Syndrome

- Connective tissue/Collagen abnormalities
  - Multiple genetic abnormalities can lead to the clinical disease
- Prevalence: 1 in 5000 births
- Most cases are autosomal dominant
- Subtypes
  - Hypermobile 53%
  - Classic 26% (defect in type V collagen)
  - Vascular 7% (defect in type III collagen)
- The big questions:
  - Is your hypermobility trying to tell me something more?
  - Is there a vascular component to your hypermobility?
Ehlers-Danlos Syndrome

• (A) With the palm of the hand and forearm resting on a flat surface with the elbow flexed at 90°, if the metacarpal-phalangeal joint of the fifth finger can be hyperextended more than 90° with respect to the dorsum of the hand, it is considered positive, scoring 1 point.
• (B) With arms outstretched forward but hand pronated, if the thumb can be passively moved to touch the ipsilateral forearm it is considered positive scoring 1 point.
• (C) With the arms outstretched to the side and hand supine, if the elbow extends more than 10°, it is considered positive scoring 1 point.
• (D) While standing, with knees locked in genu recurvatum, if the knee extends more than 10°, it is considered positive scoring 1 point.
• (E) With knees locked straight and feet together, if the patient can bend forward to place the total palm of both hands flat on the floor just in front of the feet, it is considered positive scoring 1 point.

Do the math for right and left – total of 9 possible points

Children/Adolescents ≥ 6 is positive for hypermobility
Grab A Partner

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Grab A Partner

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- (E) With knees locked straight and feet together, if the patient can bend forward to place the total palm of both hands flat on the floor just in front of the feet, it is considered positive scoring 1 point.
Grab A Partner

- Pinky Sign – Right and Left (1 point for each positive)
- Thumb/Wrist Sign – Right and Left (1 point for each +)
- Elbows – Right and Left (1 point for each +)
- Knees – Right and Left (1 point for each +)
- Palms on Floor – (1 point if +)

**total of 9 possible points**

Children/Adolescents ≥ 6 is positive for hypermobility
Grab A Partner

- Lobeless ears?
- Hyperelastic skin
- Gorlin sign
Making the Diagnosis of EDS

• 2017 Criteria
  – Combination of physical exam findings and Genetic testing
  – Classical EDS
    • Skin hyperextensibility and joint hypermobility
    • Plus minor criteria: easy bruising, fragile skin, hernia, Fm Hx
  – Vascular EDS
    • Fm Hx, Vascular event, spontaneous sigmoid colon perforation
    • Plus minor criteria: easy bruising, translucent skin, facial appearance, spontaneous pneumothorax
Making the Diagnosis of EDS

• 2017 Criteria
  – Hypermobile EDS
    • ≥ 6 on Beighton Score
  – Skin and other features
  – Not from another cause
  – Most common cause (53%)
    – And no known genetic marker!
Two More Cases

• You are seeing a 17 yo female soccer player who wants a referral to the knee specialist in Charlottesville. She has dislocated her knee cap on a couple of occasions, got a surgical repair 1 year ago. She just dislocated it again last weekend during her first game back.

• You are seeing a 14 yo high school swimmer who is having chronic low back and shoulder pains. She swims for both the school and her club team. She is ‘double jointed’ and sometimes thinks her right shoulder will pop in and out when she swims. It then feels very sore. Her back is routinely sore. You are treating her for POTS with Florinef.
Bring it back home

• If you are suspicious of a connective tissue problem
  – Think beyond the MSK features
  – Make sure a complete evaluation has occurred
    • Looking at heart, eyes, lungs, hips, spine, family history, symptoms, DNA testing
  – Get other first degree relatives tested
• Restrict activities to match features of disease
OK, let’s do another case!

• You are seeing a high school senior for her preparticipation physical. She is a state ranked high jumper and has several colleges looking at her. She complains of passing out on occasion. This usually will happen 3-5 minutes after an intense physical exertion or after sitting for a long time.
  – What do you think is the cause of her syncopal episodes?
  – What evaluation do you want to do?
OK, let’s do another case!

• Recurrent Syncope
  – Structural Cardiac issue
  – Electrical Cardiac issue
  – Autonomic nervous System issue

$1 + 1 + 1 = 5?$
OK, let’s do another case!

• After laying down for 5 minutes
  – BP 110/80
  – HR 65

• 2 minutes after standing
  – BP 90/75
  – HR 88

• Do you want any labs?

• What is going on?
OK, let’s do another case!

- **POTS (Postural Tachycardia Syndrome)**
  - Syndrome means we don’t know why
    - Hypovolemia and renin-angiotensin-aldosterone
    - Hyperadrenergic mechanism
    - Peripheral autonomic denervation
    - Mast Cell disorder
    - Anxiety and hypervigilance
  - Testing in the clinic?
    - 15 minute standing test
      - Check BP/HR/symptoms every minute
      - BP drop/HR increase > 30/symptoms
    - Look for the +1 (anemia, RED-S, OTS, Sleep, Stress)
  - Please don’t over diagnose or over treat POTS
While I ever see a cardiac problem?
What Made Your Athlete Collapse?

• What is the differential?
  – Very broad (cardiac, neurologic, electrolyte, hematologic, heat, musculoskeletal)

• A better way to break it down:
  – Collapse during exercise
  – Collapse after exercise
  – Collapse at any time
Your next patient is a freshman football player

- Well, he actually wants to become a football player. He was a wrestler and basketball player in middle school. But he has started doing the off-season/early morning workouts with the football coaches. They call this “open” gym but what it really means is – “if you plan on playing” gym. Yesterday morning he was running and suddenly felt weird. He felt like his heart would not stop racing and he was having lightheadedness and chest tightness. He tried to do another suicide but couldn’t finish it. His vision faded out and he crumpled to the ground. He remembers awakening to the coach yelling at him to get up. It took him 5 minutes to finally feel like his symptoms went away. He felt fine the rest of the day. His mom tried to get him to see you yesterday but you didn’t have any appointments. He is upset because she wouldn’t let him go to practice this morning and made him come to you for the walk-in slots.

- What do you want to do?
Flipped T waves – HCM?
### Abnormal EKG findings in Athletes

<table>
<thead>
<tr>
<th>ECG abnormality</th>
<th>European Society of Cardiology (ESC) recommendations</th>
<th>Seattle Criteria</th>
<th>Refined Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left atrial enlargement</td>
<td>Negative portion of the P-wave in lead V1 $\geq 0.1$ mV in depth and $\geq 40$ ms in duration</td>
<td>Prolonged P-wave duration of $&gt;120$ ms in leads I or II with negative portion of the P-wave $\geq 0.1$ mV in depth and $\geq 40$ ms in duration in lead V1</td>
<td>As ESC</td>
</tr>
<tr>
<td>Right atrial enlargement</td>
<td>P-wave amplitude $\geq 2.5$ mm in leads II, III or aVF</td>
<td>As ESC</td>
<td>As ESC</td>
</tr>
<tr>
<td>Left QRS-axis deviation</td>
<td>$-30^\circ$ to $-90^\circ$</td>
<td>As ESC</td>
<td>As ESC</td>
</tr>
<tr>
<td>Right QRS-axis deviation</td>
<td>$&gt;115^\circ$</td>
<td>$&gt;120^\circ$</td>
<td>As ESC</td>
</tr>
<tr>
<td>RV hypertrophy</td>
<td>Sum of R-wave in V1 and S-wave in V5 or V6 $\geq 1.05$ mV</td>
<td>Sum of R-wave in V1 and S-wave in V5 $&gt;1.05$ mV and right axis deviation $&gt;120^\circ$</td>
<td>As ESC</td>
</tr>
<tr>
<td>Corrected QT interval</td>
<td>$&gt;440$ ms (men) and $&gt;460$ ms (women)</td>
<td>$&gt;470$ ms (men) and $480$ ms (women)</td>
<td>As Seattle</td>
</tr>
<tr>
<td>Complete left bundle branch block</td>
<td>QRS $\geq 120$ ms predominantly negative QRS complex in lead V1 (Q5 or R5), and upright monophasic R-wave in leads I and V6</td>
<td>As ESC</td>
<td>As ESC</td>
</tr>
<tr>
<td>Complete right bundle branch block</td>
<td>RSR pattern in anterior precordial leads with QRS duration $\geq 120$ ms</td>
<td>Not relevant</td>
<td>As ESC</td>
</tr>
<tr>
<td>Intraventricular conduction delay</td>
<td>Any QRS duration $&gt;120$ ms including RBBB and LBBB</td>
<td>Any QRS duration $\geq 140$ ms or complete LBBB</td>
<td>As ESC</td>
</tr>
<tr>
<td>Pathological Q-wave</td>
<td>$&gt;0.4$ mV deep in any lead except III, aVR</td>
<td>$&gt;0.3$ mV deep and/or $&gt;40$ ms duration in $\geq 2$ leads except III and aVR</td>
<td>$\geq 40$ ms in duration or $\geq 25%$ of the height of the ensuing R-wave</td>
</tr>
<tr>
<td>Significant T-wave inversion</td>
<td>$\geq 2$ mm in $\geq 2$ adjacent leads (deep) or 'minor' in $\geq 2$ leads</td>
<td>$&gt;1$ mm in depth in two or more leads V2–6, II and aVF or I and aVL (excludes III, aVR and V1)</td>
<td>As Seattle</td>
</tr>
<tr>
<td>ST-segment depression</td>
<td>$\geq 0.5$ mm deep in $\geq 2$ leads</td>
<td>As ESC</td>
<td>As ESC</td>
</tr>
<tr>
<td>Ventricular pre-excitation</td>
<td>PR interval $&lt;120$ ms with or without delta wave</td>
<td>PR interval $&lt;120$ ms with delta wave</td>
<td>As Seattle</td>
</tr>
</tbody>
</table>

LBBB, left bundle branch block; mm, millimetres; ms, milliseconds; RBBB, right bundle branch block.
Refined Criteria

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

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

**Borderline ECG Findings**
- Left axis deviation
- Left atrial enlargement
- Right axis deviation
- Right atrial enlargement
- Complete RBBB

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

**2 or more**
- Further evaluation required to investigate for pathologic cardiovascular disorders associated with SCD in athletes
Next up - a football player with bad asthma

• You are seeing a 15 year old who has really struggled with his asthma. Several providers in your clinic have seen him. He started with Albuterol MDI but would suck up one in 2 weeks. Then he was prescribed a steroid MDI but still kept calling back for Albuterol refills too early. The last provider put him on Singular, Advair and Pro-Air. But it’s not working. He will be exercising and feel like he can’t catch his breath, develop chest tightness, and have to pull out of training. He will occasionally get chest tightness and heart racing at other times but these are infrequent and very minor. He has not awoken at night, ever, due to symptoms. On exam today, you think his lungs are perfectly clear.

• What do you think is going on? What do you want to do?
WPW
Post EPS/Ablation
Your next patient is a softball player

• You are seeing a 16 yo girl who had an alarming episode this morning. She awoke with her heart racing and having chest pain. This was the most intense spell she has had so far and it lasted for almost a minute. These have happened for about a year. At first she thought they were heartburn so she started taking Prilosec OTC. But twice she actually passed out during an episode. That made her take notice of the pattern, they tend to occur when she is startled – loud noise, sudden scare, this morning’s alarm clock. Her father had similar episodes when he was a kid but grew out of them. So he has told her to toughen up. Mom brought her in.

• What do you think is going on? What do you want to do?
LQTS
Your next patient is a senior Basketball player

• She has been playing since she was 10 years old. She is the team leading rebounder and 2\textsuperscript{nd} in scoring. But this year has been unusual. She has been getting anxiety attacks. These occur during practices and occasionally during games, especially during high intensity. Most recently it happened during practice when she was doing sprints up and down the court. She develops sudden chest tightness, heart racing, light headedness, shortness of breath and has to stop what she is doing. These symptoms will continue for 30 seconds to 3 minutes and then go away. She is able to return to practice afterwards. She is stressed about where she is going to go to college and her parents just separated.

• What do you want to do to evaluate her?
Your next patient – a XC runner

- She is a 14 year old who is running with the varsity team. She comes in because she passed out during Saturday’s meet. She put in her best time (PR) and actually beat a senior on the team! But she didn’t celebrate the race initially. 30 seconds after she came though the finishing shoot, she began to feel tingling all over, her vision become sparkly and then she passed out. It took her just a few seconds to awaken but she felt foggy, nauseous, and had a killer headache. This all took about 15 minutes to pass. Her mom was happy that she set her PR and felt like she was just being a little dramatic. Her coach wants her to get her iron checked.

What do you think is going on? What are you going to do?
Collapse after exercise

- This is the most common time for an athlete to collapse – 59% of medical tent visits at a marathon occur within the first few minutes after completion of exercise.
- Standing at the foul line preparing for free throws.
- Standing in group during a time out.
- After the finish line.
Collapse after exercise

• Causes
  – Exercise Associated Collapse
    • Vasovagal syncope / Neurocardiogenic syncope / Neurovascular syncope
  – Exertional Heat Illness
  – Exercise Associated Hyponatremia
Exercise Associated Collapse

• Physiology of endurance exercise
  – Blood deployment
    • To high demand areas - muscles(legs)
    • Vasodilation to skin to dissipate heat
  – Blood return to heart
    • becomes dependent upon pumping action from legs (“second heart”)

• Immediately after stopping
  “Second heart” stops + vasodilation + parasympathetic drop in heart rate = Syncope
Exercise Associated Collapse

- Risk Factors
  - Environmental
    - Pre-race temperature and humidity will cause more vasodilation
  - Nutrition
    - Relative hypoglycemia can blunt the baroreflex sensitivity
  - Dehydration
    - During exercise or pre-existent at start of exercise
  - Medications
    - Stimulants and antidepressants will affect vascular tone and heart rate response to exercise
- Any one factor is usually not the cause of the collapse

"Why Today?"

[Image of dietary supplement]
Office based evaluation of the athlete after a collapse

• History, History, History
  – Of the collapse – during, before or after exercise
  – Conditions associated with event – weather, nutrition, general health
  – Prior episodes, Family history of syncope or sudden death
  – Associated symptoms before or after collapse
  – History from family or athletic trainer
Office based evaluation of the athlete after a collapse

• Examination
  – Body habitus
  – Blood Pressure in both arms
  – Blood pressure and pulse lying down and after two minutes of standing
  – Cardiac ausculatory exam – at rest and with valsalva
  – Lung exam including forced exhalation
  – Office based tools: EKG, Peak Flows
Office based evaluation of the athlete after a collapse

- Exercise Associated Collapse is a “diagnosis of exclusion”
- Look for Cardiac causes
  - EKG is NOT always enough
  - Echocardiogram may not be enough
  - Cardiac MRI? Stress test?, Holter monitor?, Event monitor?
    - Cardiology referral?
  - Did it happen during or after exercise?
  - Put the pieces together: 1+1=?
- Return to participation
  - When you know the What and the Why
Hands on Sports Physical Practice

Thank You!