**Asthma**

- Exercise-Induced Asthma (EIA) – cough/wheeze with activity
- 10-50% adolescents have EIA
- H & P only 45% accurate to diagnose
- USOC does spirometry at all practice locations for screening (exercise challenge test)
- National level athletes can no longer use inhalers without objective evidence of EIA (ERGOGENIC)
- NCAA does not require same level of evidence
- USOC uses FEV1 drop of ≥ 10% (much of literature says 15-20%)

**Vocal Cord Dysfunction**

- Functional respiratory tract disorder
  - Characterized by paradoxical adduction of the vocal cords during the inspiratory and occasionally the expiratory phase of the respiratory cycle

**Epidemiology**

- More common in girls (68%)
- Academic achievers (84%)
- Athletes (61%)
- Family dysfunction (70%)

  - Brugman & colleagues, Am J Resp Care Med 1994
Predisposing factors

- Rhinosinusitis/GERD may exacerbate VCD
- May have coexisting anxiety and/or depression
- Occasionally VCD may develop in pts with:
  - ALS, encephalitis, Arnold-Chiari malformation, cerebral aqueductal stenosis, and movement disorders

EIA vs Vocal Cord Dysfunction (VCD)

Table 3, Features of Vocal Cord Dysfunction (VCD) and Exercise-Induced Asthma (EIA) Compared

<table>
<thead>
<tr>
<th>Feature</th>
<th>VCD</th>
<th>EIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female preponderance</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Chest tightness</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Throat tightness</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Stridor</td>
<td>±</td>
<td>-</td>
</tr>
<tr>
<td>Usual onset of symptoms after beginning exercise (min)</td>
<td>&lt;3</td>
<td>&gt;5-10</td>
</tr>
<tr>
<td>Recovery period (min)</td>
<td>5–10</td>
<td>15–60</td>
</tr>
<tr>
<td>Refractory period</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Latent-phase response</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Response to beta-agonist</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

VCD

- Treatment:
  - Treatable often with simple speech therapy
  - "Breathing recovery" quick nasal inhalation and slow exhalation through pursed lips
  - "smell a rose, and blow out candles on a birthday cake"
  - open jaw and relax tongue
  - Slow exhalations "mmmmmmm" or panting
  - Abdominal breathing
  - Treat GERD – H2 Blockers/PPI
  - Treat Allergies – Anti-histamines
  - Biofeedback/Relaxation
  - Botox

CONCUSSION

- Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.
**CONCUSSION MANAGEMENT**

- All previous guidelines - Cantu, Neurology, Colorado, etc. may be a rough guide but all are based on LOC & amnesia for severity & that is very outdated. Severity of concussion really depends on length of all symptoms – not just those two.
- **ZURICH GUIDELINES** – current standard of care
- No such thing as a “ding” – grade 1 concussion & RTP same day should be discouraged
- Most common concussions resolve in 1 week
- Convulsive activity may accompany a concussion & does not warrant any specific management beyond standard care
- NO Same Day Return To Play

**TABLE 2. Concussion Modifiers**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Modifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td>Duration (&gt;10 days)</td>
</tr>
<tr>
<td></td>
<td>Severity</td>
</tr>
<tr>
<td>Signs</td>
<td>Prolonged LOC (&gt;1 risk), amnesia</td>
</tr>
<tr>
<td>Seizures</td>
<td>Concussive convulsions</td>
</tr>
<tr>
<td>Temporal</td>
<td>Frequency = repeated concussions over time</td>
</tr>
<tr>
<td></td>
<td>Timing = injury close together in time</td>
</tr>
<tr>
<td></td>
<td>“merry-go-round”</td>
</tr>
<tr>
<td>Threshold</td>
<td>Repeated concussions occurring with progressive loss of focus or slower recovery after each successive concussion</td>
</tr>
<tr>
<td>Age</td>
<td>Child and adolescents (&lt;18 years old)</td>
</tr>
<tr>
<td>Co- and Pre-morbidities</td>
<td>Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), sleep disorders</td>
</tr>
<tr>
<td>Medication</td>
<td>Psychotropic drugs, antidepressants</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Dangerous style of play</td>
</tr>
<tr>
<td>Sport</td>
<td>High-risk activity, contact and collision sport, high playing level</td>
</tr>
</tbody>
</table>

**CONCUSSION MANAGEMENT**

- CT/MRI – usually normal anatomically
- Warranted for suspicion of intracerebral structural lesion
- Prolonged disturbance of consciousness
- Focal neuro-deficit
- Worsening symptoms
- Functional MRI, Single Photon Emission CT (SPECT), Positron-Emission Tomography (PET) are still experimental
- Genetic Testing – ApoE4 allele – testing not recommended (risk factor for adverse outcome in all brain injury & for chronic traumatic encephalopathy in boxers)
ROLE OF NEUROPSYCHIATRIC (NP) TESTING

- Not the standard of care
- Very useful tool (but only a tool)
- Impact
- Headminder
- Cogsport
- Validated for high school – adults
- Memory, reaction time (not balance)
- Costly
- Time-consuming (baselines & repeat testing)
- Done baseline, after injury when asymptomatic
- Balance testing not a part of most tests & can be useful
- NFL, NHL, many colleges – WSU??, some high schools

CONCUSSION MANAGEMENT

- Post-Concussion Syndrome
  - Persistence of symptoms for weeks to months
  - Subclinical Exercise Challenge
- Second Impact Syndrome
  - Controversial – some feel this could just result from an initial concussion
  - Getting a 2nd concussion when metabolic changes (brain glucose metabolism higher than normal) from first is not resolved could lead to brain swelling & permanent brain damage or death

Concussion Management

- Physical AND Cognitive rest is required.
- Activities that require concentration and attention (scholastic work, videogames, text messaging, etc.) may exacerbate symptoms and possibly delay recovery.
- Drug therapy can be used to modify the underlying pathophysiology of the condition with the aim of shortening the duration of the concussion symptoms – antidepressants, stimulants, migraine meds
- Athlete should not Return To Play until all meds have been weaned off

CONCUSSION MANAGEMENT

- RTP based on clinical decision with info from:
  - Sports Concussion Assessment Tool (SCAT2) – covers symptoms & exam
  - NP Testing
  - Number of previous concussions
  - Severity of Mechanism of Injury (if minimal blow – may hold out longer)
  - NEVER WITH SYMPTOMS
  - Helmet/mouthpiece do not protect from concussion

HEAT ILLNESS

- Risk factors –
  - Poor fluids (not replacing weight between double days)
  - Poor acclimatization
  - Poor fitness/over-weight
  - Young age (make less sweat, greater body surface area to body-mass ratio so gain more heat from environment, do not drink as readily as adult)
  - Meds/supplements
  - Fever
  - Equipment worn
  - THE ATHLETE IN THE BEST SHAPE CAN EXERCISE THE HARDEST & HAVE THE MOST HEAT ILLNESS!
  - Severe muscle cramps from exercising in the heat?
  - Sickle cell disease or trait?

### TABLE 1: Gradual Return to Play Protocol

<table>
<thead>
<tr>
<th>Rehabilitation Stage</th>
<th>Functional Exercise at Each Stage of Rehabilitation</th>
<th>Objective of Each Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No activity</td>
<td>Complete physical and cognitive pre</td>
<td>Recovery of ability</td>
</tr>
<tr>
<td>1. Exertion exercise</td>
<td>Walking, running, jumping, cutting, jumping, &lt;50%</td>
<td>Recovery of 40%</td>
</tr>
<tr>
<td>2. Sport specific</td>
<td>Driving, skiing, running, jumping, &gt;50%</td>
<td>Above symptoms</td>
</tr>
<tr>
<td>3. Non-contact skills</td>
<td>Programming, game situations</td>
<td>Recovery of 90%</td>
</tr>
<tr>
<td>4. Full contact</td>
<td>Following medical Bowl, participate in normal</td>
<td>Recovery of normal</td>
</tr>
<tr>
<td></td>
<td>practice</td>
<td>function skills</td>
</tr>
<tr>
<td></td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>
SICKLE CELL DISEASE / TRAIT
- Screening – mandatory in NCAA
- Deaths of 10 college football players & 12 military recruits attributed to sickling
- Deaths - 100% preventable!
- 1/12 blacks have trait
- Rhabdomyolysis (muscle cell death) in sicklers is markedly higher & athletes take longer to recover (CK’s 50,000 vs 5,000 & recover 7 days vs 1-2)

SICKLE CELL vs HEAT ILLNESS
- Rhabdomyolysis from heatstroke with novel overexertion
- Rhabdomyolysis from sickle cell occurs within minutes of maximal exertion
- Collapse from heatstroke takes a while
- Collapse from sickling occurs in first few minutes of exertion
- Arrhythmia from acidosis/hyperkalemia can occur in minutes to hours or next day - may be in myoglobinuric renal failure

SICKLE CELL vs OTHER SUDDEN DEATH ETIOLOGIES
- Unlike sudden cardiac death – athlete still talking when they hit the ground from cramping/rhabdomyolysis (although lactic acidosis may make them hyperventilate)
- Unlike asthma – suffocating breathlessness does not predominate
- Unlike heat cramps – no cord-like muscles (ischemic pain)

EXERCISE PRECAUTIONS WITH SICKLE CELL TRAIT
- No day 1 fitness tests
- No sprints > 600 m for football
- No timed miles
- No stadium steps to exhaustion
- Regular fluids
- Stop activity at first cramp – rest, oxygen, fluids
- Any cramp is sickling until proven otherwise (ischemia not cramp)
- Hematuria is sickling!! (not UTI)

MRSA (methicillin-resistant staph aureus)
- 1st reported on sports teams – 1998 (numerous fencers infected from a contaminated sensor wire shared among the athletes)
- Many of the infections result from contact with an asymptomatic carrier
- Had been a nosocomial infection
- “Staphylococcus is like gunpowder – harmless under some conditions & lethal under others”

WHAT IS IT?
- Gram + cocci with a Type IV mec Staphylococcal Cassette Chromosome (SCC) gene with PVL is called the USA 300 Strain
- Life span
  - 7 months on dust
  - 56 days on a mop head
  - 203 days on a blanket
  - 9 weeks on cotton
**S. aureus carriage by body site**

General Population  S. aureus carriers


**MRSA (methicillin-resistant staph aureus)**
- 80% of all skin wounds now (Single largest cause of skin infections in U.S.)
- Blacks > whites (etiology ?)
- Schools/teams with reported cases
  - NFL Rams
  - Cold whirlpool
  - MSSA (gel applicator for taping ankles)
  - Cultured from University of Toledo FB field artificial turf

**MRSA**
- Ricky Lanetti (a Lycoming College in Williamsport, PA senior FB player had a buttock pimple on Tuesday & on Saturday he was dead from MRSA

**DEATH RATES**
- 7% of infections are invasive
  - Septic shock – 55.6%
  - Pneumonia – 32.4%
  - Endocarditis – 19.3%
  - Bacteremia – 10.2%
  - Cellulitis – 6.1%
  - JAMA 10/17/07

**Panton-Valentine Leukocidin (PVL) Toxin**
- Once the bug is dead – the toxin is still there destroying tissue
- May look worse before it gets better
RISKS

- 6 x risk with body shaving
- 2 X risk with turf burns
- 5 C's
  - Crowding
  - Contact (frequent skin to skin)
  - Compromised skin
  - Contaminated items/surfaces
  - Cleanliness (lack of)

MRSA (methicillin-resistant staph aureus)

- Infection often worsens as traditional antibiotics do not cover MRSA
- Often misdiagnosed as a spider bite
- F/U wounds much more closely than was previously necessary

MRSA (methicillin-resistant staph aureus)

- CDC observations from locker/training rooms:
  - Lack of regular access to hand hygiene products among ATC's that provided wound care
  - Frequent towel/jersey/equipment sharing on the field among players
  - Infrequent showering before players entered communal whirlpools
  - No routine for cleaning weight-training machines & PT equipment

MRSA (methicillin-resistant staph aureus)

- Inducible Clindamycin resistance in Erythromycin-resistant isolates
- Place Clindamycin & erythromycin disks adjacent to each other on agar plate
- Lack of clearance around erythromycin disk & partial clearing around the clindamycin disk adjacent to the erythromycin disk is a + D-test

- Indications of MRSA
  - Clindamycin, Bactrim, Doxycycline, Tetracycline
  - Vancomycin (IV), Linezolid (oral or IV), daptomycin (IV)
  - Incise & Drain (I & D)
  - Treat the nares of MRSA patients with mupirocin (Bactroban) BID for 1 week & repeat 1 month later (do not do nasal culture)
  - Use Hibiclens or Phisohex in shower 3x per week for 2 weeks then weekly for 2 weeks
  - No bar soap
  - No RTP until all lesions are crusted & dry

- MRSA (methicillin-resistant staph aureus)

- MRSA (methicillin-resistant staph aureus)
PREVENTION

- Ozone cleaners have no proven benefit
- Spraying/fogging rooms/surfaces not proven helpful
- Clean surfaces that bodies contact
- Cleaners/detergents – remove soil, dust, germs (virus, bacteria, fungi)
- Sanitizer – reduce germs to safe levels
- Disinfectants – destroy or inactivate germs (must follow instructions & leave disinfectant wet on a pre-cleaned surface for the required time) – chlorine bleach
- Alcohol based hand cleaners (must wash hands for 30 seconds to eradicate staph)

PREVENTION

- Wash clothes as instructed by label (do not need to use hot water/bleach – can use soap/detergent) - CDC
- Properly disinfect & store water containers
- Follow guidelines for disinfecting whirlpools, saunas, ice machines, swimming pools
- Cover all wounds

PREVENTION

- Do not share equipment (pads, cell phones, keyboards, whirlpool tubs, etc.)
- Throw away all weight benches, furniture, etc. that cannot be easily cleaned
- Always shower after activity
- Handouts

MRSA

- Infectious Disease Society of America – new guideline
- February 1 - Clinical Infectious Diseases
- Ceftaroline (IV) new cephalosporin but newer In October than guidelines.

MONONUCLEOSIS

- Mononucleosis & Athletic Participation – An Evidence –Based Subject Review - Clinical Journal of Sports Medicine - 7/08
- No evidence based guidelines
- Common problem with difficult decisions due to rare complication of splenic rupture
- 30-50% college freshman susceptible to EBV with 1-3%/yr. incidence
- Oral secretion transmission (cough, sneeze, drinks, fomites?)
- Incubation 30-50 days so hard to determine source
- Symptoms last 4-8 weeks
- Clinical Diagnosis

MONONUCLEOSIS

- Hoagland's Triad – Fever, Pharyngitis (exudative 50% time), Lymphadenitis (usually posterior cervical)
- Pharyngitis 80%
- Splenomegaly 50-100%
- Palatal Petechiae 25%
- Rash – maculopapular, urticarial or petechial on trunk/arms 10-40% (more common if treated with ampicillin or amoxicillin but can occur with azithromycin, levofloxacin, & cephalaxin - but it is not an allergy)
MONONUCLEOSIS
- 50% lymphs
- 10% atypical lymphs
- Serologic test recommended to confirm the diagnosis
- Heterophile antibody test 87% sensitive (range 79-95%) & 91% specific (range 82-99%)
- False + with hepatitis, lymphoma & autoimmune disease
- False – 25% in 1st week, 5-10% week 2, 5% week 3

MONONUCLEOSIS
- EBV – Specific labs
- Viral Capsid Antigen (VCA) – IgG (occurs early & peaks 2-4 weeks) & IgM (occurs early & gone by 6 weeks)
- Early Antigen – IgM (peaks at 3-4 weeks then)
- Antibody to EB Nuclear Antigen (EBNA) – (occurs at 2-4 months & remains for life – if present – not an acute infection)

MONONUCLEOSIS
- Splenic rupture is rare 0.2% but splenomegaly occurs >50% of the time
- Rupture occurs spontaneously or with trauma but can occur with Valsalva
- Most vulnerable 3-4 weeks due to weak architecture so can rupture even if not enlarged
- POOR ability to tell splenomegaly by physical exam
- U/S good for rupture or capsular hematoma but CT has superior imaging capability (CT & US results correlate closely)

MONONUCLEOSIS
- Spleen size average is 12-14 cm
- Greater than 13 cm in 30% men & 17% women (norms not from an athletic population)
- Spleen size correlates with height
- Athletic study of 653 athletes had avg size 10.65 cm (range 5.59-17.06 cm) & 7% were greater than 13 cm
- RTP decision cannot be based on a single splenic spleen size measurement (must have a baseline)
- A 10 cm spleen could be 6 cm at baseline & still enlarged or a 14 cm spleen could be baseline but be interpreted as enlarged

MONONUCLEOSIS
- Cochrane Review of steroids showed diminished symptoms for 12 hours but lost by 2-4 days & since no evidence of benefit they should be avoided in mild cases since an immunocompromised EBV infected pt. could increase the risk of an EBV-mediated oncogenic complication (nasopharyngeal carcinoma & Burkitt’s lymphoma).
- Steroids may be indicated more for severely ill patients with airway compromise, massive spleen enlargement, myocarditis or hemolytic anemia

MONONUCLEOSIS
- RTP at 3 weeks regardless of spleen size as most fragility improved by then & most ruptures occur in 1st 3 weeks (although it has been documented as far as 7 weeks out)
- No recommendations for normal labs
- Afebrile with normal energy level
QUESTIONS?