Sports Medicine for APNs
18th Annual Pediatric APN Conference
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Attending Physician, Emergency Medicine
Assistant Professor of Pediatrics and Orthopaedics
Unlike UK Basketball Coach, I have no financial relationships with any product discussed in this presentation.
1. Recognize the epidemiology behind sports-related injuries in young athletes
2. Identify differences in acute vs chronic sports-related injuries
3. Implement strategies for recognizing and managing concussion
4. Formulate a plan for returning athletes to play
• 30 - 45 million children participate in some form of athletics

• > 7.3 million athletes participate at the high school level annually and numbers increasing
Sports Medicine for the Pros?

Reality check

Football
- 6-17y = 2,867,000
- Varsity = 1,029,435
- College = 57,593
- NFL = 1643

Much less resources for evaluation!!
Scope of the Injuries

- High school athletes account for >2 million injuries annually
  - > 500,000 doctor’s visits
  - > 30,000 hospitalizations

- Athletes < 14 yo are treated for more than 3.5 million sports injuries annually
Acute vs. Overuse Injuries

- **Acute** - injuries such as fractures, dislocations, sprains, strains result from a single event caused by maximal forces.

- **Overuse** - tendonitis, apophysitis, periostitis, stress fractures, and fasciitis result from repetitive, submaximal trauma and develop over time.
Why all the Problems?

- Increased risk due to immature bones, insufficient rest after injury, poor training, and poor conditioning
- Sports specialization earlier and earlier
- Year-round participation
- Tremendous pressure from peers, coaches, parents, and community
The Growing Bone...
Pearls for Assessing Sports Injuries

• Be a detective!
  – Isolated Acute injury?
  – Acute injury with chronic complaints?
  – Chronic injury/pain?
Case #1

12 y/o elite gymnast presents complaining of wrist pain that markedly worsens with tumbling
Radiographs
Gymnast Wrist

- Stress injury of the distal radial physis due to weight bearing
- Dorsal wrist pain during handstands and handsprings
- Tenderness to palpation over dorsal portion of distal radius
- + Pain with push-off testing
- Bilateral wrist films
• 13 yo baseball pitcher presents c/o of severe pain in R shoulder. Was trying to “shake it off” when he threw a pitch and pain markedly worsened
“Little League” Shoulder

Compare
Little League Shoulder

3 months later
**Little League Elbow**

- Medial elbow pain with throwing
- Widening of apophysis of medial epicondyle
Nearly 50% of all injuries sustained by middle school and high school students during sports are overuse injuries.*
### Causes of Overuse Injuries

<table>
<thead>
<tr>
<th>Extrinsic factors</th>
<th>Intrinsic factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of the sport</td>
<td>Age</td>
</tr>
<tr>
<td>- contact, endurance, etc</td>
<td>Maturation</td>
</tr>
<tr>
<td>Training regimens</td>
<td>Gender</td>
</tr>
<tr>
<td>- overtraining</td>
<td>Flexibility</td>
</tr>
<tr>
<td>Coaching</td>
<td>Alignment</td>
</tr>
<tr>
<td>Playing surface</td>
<td>Strength</td>
</tr>
<tr>
<td>Equipment</td>
<td>imbalances</td>
</tr>
<tr>
<td>Proprioception</td>
<td></td>
</tr>
</tbody>
</table>

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Treatment for Overuse Injuries

- Active rest until symptoms resolve
- Address technique, flexibility, and muscle imbalances with rehabilitation
- Vary positions/sports upon return
- Emphasize to young athletes and their families the importance of injury prevention
- Prevention is key - i.e. pitch counts, rest days, pitch types
STOP Sports Injuries

STOPS
SPORTS
INJURIES

SPORTS TIPS

BASEBALL INJURIES

Injuries in young athletes are on the rise, but elbow and shoulder injuries in children are on the verge of becoming an epidemic. Thousands of children are seen each year complaining of elbow or shoulder pain. Damage or tear to the ulnar collateral ligament (UCL) is the most common injury suffered and is often caused by pitchers throwing too much. This ligament is the main stabilizer of the elbow for the motions of pitching. When it becomes damaged, it can be difficult to repair and rehabilitate.

HOW IS AN ELBOW OR SHOULDER INJURY DIAGNOSED?

If a young athlete is throwing too hard, too much, too early, and without rest, a serious elbow or shoulder injury may be on the horizon. If the athlete complains of elbow or shoulder pain the day after throwing, or movement of the joint is painful or restricted compared to the opposite side, see a physician familiar with youth sports injuries immediately.

Maximum Pitch Counts

<table>
<thead>
<tr>
<th>Age</th>
<th>Pitches/Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>7–8</td>
<td>50</td>
</tr>
<tr>
<td>9–10</td>
<td>75</td>
</tr>
<tr>
<td>11–12</td>
<td>85</td>
</tr>
<tr>
<td>13–16</td>
<td>95</td>
</tr>
<tr>
<td>17–18</td>
<td>105</td>
</tr>
</tbody>
</table>

Source: Little League Baseball

Rest Periods Required

<table>
<thead>
<tr>
<th>Ages 7–16</th>
<th>Ages 17–18</th>
<th>Required # of Rest Pitches</th>
</tr>
</thead>
<tbody>
<tr>
<td>61+</td>
<td>76+</td>
<td>3 calendar days</td>
</tr>
<tr>
<td>41–60</td>
<td>51–75</td>
<td>2 calendar days</td>
</tr>
<tr>
<td>21–40</td>
<td>26–50</td>
<td>1 calendar day</td>
</tr>
<tr>
<td>1–20</td>
<td>1–25</td>
<td>None</td>
</tr>
</tbody>
</table>

Source: Little League Baseball
STOP Sports Injuries

SOFTBALL INJURY PREVENTION

Softball injuries in young athletes are on the rise and nearly as frequent as baseball injuries, but they generally result in less time lost to competition. These injuries most commonly involve the back, shoulder, forearm, wrist, and hand. Pitchers are not more prone to injury than position players; catchers and infielders have similar injury rates. However, pitcher injuries differ from position player injuries because pitchers use a windmill motion that places unique demands on the back, neck, shoulder, forearm, and wrist.

WHAT ARE THE MOST COMMON OVERUSE INJURIES IN SOFTBALL?

For pitchers, the most common overuse injuries are shoulder tendinitis (inflammation of the tendon), back or neck pain, and elbow, forearm, and wrist tendinitis.

For catchers, back and knee problems in addition to overhead throwing shoulder problems are the most common. For other position players, overhead shoulder and sometimes elbow problems predominate.

Maximum Pitch Counts

<table>
<thead>
<tr>
<th>Age</th>
<th>Pitches/Game</th>
<th>Pitches/Day Days 1 &amp; 2</th>
<th>Pitches/Day Day 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>8–10</td>
<td>50</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>10–12</td>
<td>65</td>
<td>95</td>
<td>0</td>
</tr>
<tr>
<td>13–14</td>
<td>80</td>
<td>115</td>
<td>80</td>
</tr>
<tr>
<td>15–over</td>
<td>100</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

REST PERIODS

Once girls begin to play competitively, they often play two games per day on two or three consecutive days. Two days of rest for pitchers is essential to prevent injuries. Additional guidelines include:

Girls < 12 years - only 2 days of consecutive pitching
Girls > 13 years - only 3 days of consecutive pitching

Rest means no live pitches, including batting practice. Pitchers may need to 'loosen up' with a flexibility routine on the second rest day and can participate in hitting and field drills.
The pitcher should never play what other position?
Case #4

- A 15 y/o female basketball player comes to your office with a large, swollen right knee
- She injured the knee last night during basketball practice
- She remembers a “pop” and has had difficulty walking due to pain and the large amount of swelling
Acute Traumatic Knee Effusions

- High risk for pathology!!
- Exam very difficult initially due to guarding
- Must be re-examined in 3-5 days for optimal exam
- Most are eventually diagnosed with either an ACL tear, patella dislocation, osteochondral injury, or fracture
Ligamentous injuries

- More recognized in teenage athletes (rare before 11)
- ACL & PCL intra-articular so expect acute traumatic effusion
- Females risk > male
- MRI not a substitute for good exam and best used as a pre-operative tool!
- ACL repair NOT URGENT!
The ankle is the most commonly injured joint by student-athletes.

One study found the amount of money spent diagnosing and rehabilitating ankle injuries was comparable to the amount spent on coronary artery bypass surgery.
Ankle Fractures

- The SH I of the distal fibula - the “ankle sprain of the immature skeleton”
- Clinical diagnosis! Tenderness over the physis and mild soft tissue swelling
- X-rays usually normal except for soft tissue swelling
- Excellent prognosis & low risk
Ankle Injuries with Foot Pain

- Avulsion fractures of the 5th metatarsal
- Caused by pulling of the peroneus brevis
- Ask them to point directly to the pain!
Ankle Sprain Management

- Air stirrup or ASO
- Encourage ambulation
- NSAIDs
- Encourage ROM
- Grade III (rare) – rigid stirrup splint
- Proper take-home instructions
Discharge Instructions

- 80% incomplete & 50% lack any follow-up
- Think of your favorite radio-station...PRICE-FM

- P = protection
- R = rest
- I = ice
- C = compression & cast/splint care
- E = elevation
- F = follow-up
- M = medications & mobility
Returning to Play After an Injury

- Gradual return
- Pain-free with range of motion
- Minimal of 85-90% of baseline
- Clear understanding of risks
- Must demonstrate ability to perform sports-specific functions
- Awareness of coaches/athletes/families
Case #5

- 16 yo wrestler presents to your office c/o infected bruises after “skinning” himself up in match last week.
- He also reports mild malaise and some subjective fevers.
- He doesn’t know anyone else with similar symptoms...yet!
Herpes Gladiatorium

- Endemic among wrestlers and rugby players
  
  Herpes gladiatorum
  Herpes rugbiaforum

  - Herpes accounted for 39% of all skin infections

- Almost exclusively caused by HSV-1
Herpes Gladiatorum

- 15 Reported studies from 1964-2001

Prevalence
- High School 2.6 - 29%
- Collegiate 7.6 - 12.8%
- Division I 20 - 40%

*median prevalence 20%
Herpes Gladiatorum: Return to Play

- Must be on antivirals for at least 5 days
- No new lesions for 72 hrs before competition
- All lesions must be dried and covered with an adherent crust
- No systemic symptoms
Sports

Nathan Stiles collapses and dies after taking a hit during a Spring Hill football game

By Justin Kendall, Fri., Oct. 29 2010 @ 11:00AM
Categories: News, Sports

Spring Hill senior Nathan Stiles died after suffering an injury a football game at Osawatomie last night.

KSHB Channel 41 reports that Stiles intercepted an Osawatomie pass and took a hard hit on the play. The senior linebacker walked to the sidelines afterward but collapsed. The Miami County EMS responded to a "traumatic injury" call around 8:23 p.m. Thursday. Stiles was unconscious and was flown to the University of Kansas Medical Center where he died early this morning.
Why all the fuss?

- 1999 - estimated 300,000 concussions/yr

- 2009 - 3.8 million sport-related concussions
Why such a change?

- Original estimates only included concussions with loss of consciousness (<10% have any LOC)
- Improved recognition of symptoms
- Concerns about long-term consequences and deaths related to head injury
- Maybe sports have changed too...
- Still underestimated?
• Incidence highest in football (6/10,000)
• Increasingly recognized in all sports, including non-contact sports like baseball
• Also marked increases in girls soccer, basketball, lacrosse, wrestling, and ice hockey
• Concussions now represent 9% of all high school athletic injuries

Is it all about football?
What we know ➔

What we don’t know ➔
Concussion

definition from 3rd Int’l Conference on Concussion in Sport (Zurich 2008)

- A complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.
- Concussion may be caused either by a direct blow to the head, face, neck, or elsewhere on the body with an “impulsive” force transmitted to the head.
• Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously.

• Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a disturbance rather than structural injury.
Concussion Analogy

- Old fashion phone switchboards
- Bang the console and all the plugs fall out temporarily
- Slowly put all the plugs back into their proper location
- May be no permanent harm, but service has definitely been disrupted
"Metabolic mismatch"  
Hovda, 1999

- Higher energy demand and glucose metabolism
- Decrease in energy supply and cerebral blood flow
On-field and Sideline Evaluation

- Keep the helmet on!
- Determine level of consciousness
- Assess ABC’s and neck pain
- Maintain C-spine in neutral position
- Transfer to sideline if stable or call EMS for medical facility
Symptoms

- Headache - most common feature (83%)
- Dizziness - frequent (65%)
- Confusion - (57%)
  Answers slowly, forgets plays, dazed, etc
- Amnesia - (25%)
- Loss of consciousness (<10%) **
- Nausea/vomiting/convulsions
A myriad of symptoms...

<table>
<thead>
<tr>
<th>Physical</th>
<th>Cognitive</th>
<th>Emotional</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>Feeling mentally &quot;foggy&quot;</td>
<td>Irritability</td>
<td>Drowsiness</td>
</tr>
<tr>
<td>Nausea</td>
<td>Feeling slowed down</td>
<td>Sadness</td>
<td>Sleeping more than usual</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Difficulty concentrating</td>
<td>More emotional</td>
<td>Sleeping less than usual</td>
</tr>
<tr>
<td>Balance problems</td>
<td>Difficulty remembering</td>
<td>Nervousness</td>
<td>Difficulty falling asleep</td>
</tr>
<tr>
<td>Visual problems</td>
<td>Forgetful of recent information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td>Confused about recent events</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>Answers questions slowly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>Repeats questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dazed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stunned</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Phone Apps
Designed for coaches, ATC’s, parents, and health care professionals
Give ‘em a Plan...

- ?? School
- Provide expectations - 90% recover in 2-4 weeks
- Avoid ibuprofen, naproxen, alcohol, sleeping aids
- Cognitive and physical rest
- NO driving or sports!
- Review return-to-play requirements and return-to-school recommendations!
- Emphasize proper medical supervision
The Concussion Toolbox...
Who Needs Imaging?

• Concussion is a functional injury and *not* a structural injury
• Rarely of any benefit
• Head CT when less than 72 hours
  • Any neurologic deficit
  • Worsening headache or symptoms
  • Prolonged LOC > 1 minute
• Consider MRI if subacute or more chronic - identifies structural abnormalities
Neurocognitive Testing

- First used in 1982
- Attempts to measure attention span, memory, problem solving capabilities, and reaction time
- ?? change in outcomes
- Baseline testing in football would cost $44 million/yr
- Needs unbiased research
## Table 1. Cantu Grading System for Concussion

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No loss of consciousness; posttraumatic amnesia less than 30 minutes</td>
</tr>
<tr>
<td>2</td>
<td>Loss of consciousness less than 5 minutes in duration or posttraumatic amnesia lasting longer than 30 minutes but less than 24 hours in duration</td>
</tr>
<tr>
<td>3</td>
<td>Loss of consciousness for more than 5 minutes or posttraumatic amnesia for more than 24 hours</td>
</tr>
</tbody>
</table>


## Table 2. Colorado Medical Society Grading System for Concussion

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Confusion without amnesia; no loss of consciousness</td>
</tr>
<tr>
<td>2</td>
<td>Confusion with amnesia; no loss of consciousness</td>
</tr>
<tr>
<td>3</td>
<td>Loss of consciousness</td>
</tr>
</tbody>
</table>

## Table 3. AAN Practice Parameter (Kelly and Rosenberg) Grading System for Concussion

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transient confusion; no loss of consciousness; concussion symptoms or mental status abnormalities on examination resolve in less than 15 minutes</td>
</tr>
<tr>
<td>2</td>
<td>Transient confusion; no loss of consciousness; concussion symptoms or mental status abnormalities on examination last more than 15 minutes</td>
</tr>
<tr>
<td>3</td>
<td>Any loss of consciousness, either brief (seconds) or prolonged (minutes)</td>
</tr>
</tbody>
</table>

Concussion Grading since 2008

• Unanimous agreement to abandon all grading systems

• Individualized care emphasized over any grading system!
"Yo, Dewey! Got another one over here when you're done."
Return-to-Sports Guidelines

- Must be *asymptomatic at rest* before starting any return to play protocol
- No medications
- Beware of symptom minimization !!
- Step-wise return to play - *each step takes at least 24 hours or longer*
- Consider more gradual return in younger athletes & repeat concussions
Return-to-Play Protocol

Cognitive & physical rest until **asymptomatic**

↓

Light aerobic exercise- e.g. stationary bike (<70% max HR)

↓

Sport-specific exercise (>70% max HR)

↓

Non-contact drills (light resistance training)

↓

Full contact drills after medical clearance!

↓

Return to competition (game play)
Lystedt Laws

Teen, family reach settlement for brain injury

By Matt Markovich & KOMO Staff

MAPLE VALLEY, Wash. -- A teen on a long road to recovery from a debilitating injury has finally reached a settlement to the Tahoma School District.

Nearly three years ago, Zack Lystedt suffered a concussion on the football field while making a tackle for his his team at Mount Tahoma Junior High.

Even though the 13 year old grabbed his head in pain, his coaches, who had been hired by the district, put him back in the game several plays later.

Lystedt's brain began bleeding, but no one noticed until he started losing his balance near the end of the game. He eventually collapsed at the end of the game.

As of May 2012 - 38 states (KS & MO)

Requires evaluation by a healthcare professional before return-to-play

Develops educational materials for athletes, coaches, and parents
Prevention

• The role of the PPE
  • Screen for previous concussions
  • Education about symptoms & need for care
  • Establish baselines
• Protective equipment
  • Mouthguards
  • Helmets
Excellent Resources:

1. CDC “Heads-Up” Campaign - Lots of free posters for office and locker room along with educational materials for players, coaches, and families

2. STOP Sports Injuries campaign

3. www.childrens-mercy.org/sportsmedicine
What are your patients doing?
The nice thing about sports medicine is it allows us to take something kids are excited about (sports), and hopefully teach them about something they’re not always excited about…*their health*.

Vito Perriello, Jr, MD, FAAP
• Acute sports-related injuries
• Sports-related fractures
• Sports-related concussion
• Overuse Syndromes

• Sports-fellowship trained physicians
• RAPID Access appointments for acute injuries
• Scheduling Hotline (816) 701-HURT