Prevention of Overuse Throwing Injuries
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Now What?

• Common Injuries
• Biomechanical Faults
• What else can I do?
Case

- 1990-1994: Teammate
- Top LHP in State of Illinois and USA
- 6’4” and could throw 91 mph as of 16 y.o.
- 1st Round draft pick of NY Mets and considered #10 prospect in the Mets system after his first year in the Minors
Hindsight is 20/20

• 1994: HS Senior Year Season
  – 70 innings between April and May (lived in Chicago)
  – Summer Travel League while negotiating
  – 39 innings first pro season from July-August
  – TOTAL = between 110-140 innings not including Spring Training for HS and Bullpens for Professional

• 1995: Frist Full Year in Professional Baseball
  – 139 innings at A level
  – Pitched with some elbow discomfort
Spring Training 1996

• Elbow Pain
• Tommy John/Ulnar Collateral Ligament Replacement Surgery
• Made a brief comeback but ultimately never made it to “The Show”
• “Sean Johnston was one of the eight players the Mets selected in the first 98 picks of the 1994 Draft. He allowed no hits in his first 10 professional innings. Two years later, he was one of 17 players who had undergone Tommy John surgery while in the Mets' employ.”
Epidemiology-Baseball

- 15 million children & adults play baseball annually in USA
- 5.7 million 8^{th} grade and younger
- 17% of the 130,000 high school baseball related injuries between 2005 and 2007 shoulder related. (>22,000 INJURIES!)
- Pitching was the most common mechanism causing shoulder injury

Little League Online Baseball & Softball.
Epidemiology-Sofball

• In the past decade, 16% growth at HS level
• Incidence of injury ranged between 1-5 per 1,000 athlete exposures for softball players.
• Most HS softball shoulder injuries occurred early in the season
  – Related to an increase in game participation

Serious Elbow/Shoulder Injury

- 5% for ages 9-14 y.o.
- Extremely high number

1 in 20 pitchers will need surgery or retire!

Davis JT, et al. AJSM, 2009
Tommy John Surgery by Age

- 1995-2000: 38/276 HS and Younger
- 2001-2005: **158**/702 HS or Younger
- 2006-2010: **182**/620 HS or Younger

- 3x increase in TOTAL
- 5x increase in HS or Younger

Little League Baseball: Protecting Young Pitching Arms
Signs and Symptoms

Elbow or Shoulder Pain
Elbow or Shoulder Pain
Elbow or Shoulder Pain
Elbow or Shoulder Pain
Elbow or Shoulder Pain
Elbow or Shoulder Pain
Elbow or Shoulder Pain
Pitching with Arm Fatigue

• Average > 80 pitches = 4x risk of surgery
• Pitch competitively > 8 months/year = 5x likelihood of injury
• *Pitching regularly with fatigued arm = 36x as likely to have an injury and potentially need surgery!*

Olsen SJ, et al. AJSM. 2006
Prevention Strategies

• Preseason conditioning
• Attention to proper throwing technique
• Gradual increase in the number and intensity of pitches, built-in rest periods, and strict adherence to pitch count guidelines (to follow) should help in preventing injury.
• Age appropriate pitches
Pitch Type

• Slider
  – 86% elbow pain

• Curve ball
  – 52% shoulder pain

• Change-up
  – 12% elbow pain
  – 29% shoulder pain

Lyman et al, AJSM 2002
# Prevention Guidelines

*From Stop Sports Injuries.org and ASMI 2010*

<table>
<thead>
<tr>
<th>Warm-up Properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotate playing other positions besides P &amp; C</td>
</tr>
<tr>
<td>Adhere to pitch count guidelines</td>
</tr>
<tr>
<td>Don’t pitch with Elbow or Shoulder pain</td>
</tr>
<tr>
<td>Avoid pitching on multiple teams</td>
</tr>
<tr>
<td>Don’t pitch on consecutive days</td>
</tr>
<tr>
<td>Don’t play year round</td>
</tr>
<tr>
<td>Never use a radar gun</td>
</tr>
<tr>
<td>Communicate how your arm is feeling</td>
</tr>
<tr>
<td>Develop Skills that are age appropriate</td>
</tr>
<tr>
<td>Master the fastball 1st &amp; change-up 2nd</td>
</tr>
<tr>
<td>Emphasize Control, accuracy, and good mechanics</td>
</tr>
<tr>
<td>Speak with Sports Medicine Provider or ATC if ANY concerns</td>
</tr>
</tbody>
</table>
Example A: Kerry Wood

- Senior Year of High School final start before the 1995 draft.
- Threw **175 pitches in a doubleheader**.
- Wood, his father Garry, and Coach Mike McGilvray defended the pitch count, pointing out *that this was not the first time Wood had thrown this much on a single day*.
- Chicago Cubs drafted Wood as the 4th overall selection in the 1995 Amateur Draft.
- 1998 (only 20 years old): Threw **133 pitches** on August 26 and **116 pitches** on August 31 *(249 TOTAL in 5 days)*,
  - Wood woke up on September 1 with his elbow throbbing.
  - Wood did not pitch again until game 3 of the NLDS, going 5 innings and allowing only one run, against the Atlanta Braves.
- During spring training of 1999, Wood underwent Tommy John surgery to repair damage to the ulnar collateral ligament in his right elbow, missing the entire season.
Lessons?

• So what can we learn from Kerry Wood?
  – Thousands of other potential examples
# Throwing Guidelines

<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>

<table>
<thead>
<tr>
<th>Ages 14 &amp; Under</th>
<th>15-18</th>
<th>Required # of Rest</th>
</tr>
</thead>
<tbody>
<tr>
<td>66+</td>
<td>76+</td>
<td>4 calendar days</td>
</tr>
<tr>
<td>51-65</td>
<td>61-75</td>
<td>3 calendar days</td>
</tr>
<tr>
<td>36-50</td>
<td>46-60</td>
<td>2 calendar days</td>
</tr>
<tr>
<td>21-35</td>
<td>31-45</td>
<td>1 calendar day</td>
</tr>
<tr>
<td>1-20</td>
<td>1-30</td>
<td>none</td>
</tr>
<tr>
<td>1-20</td>
<td>1-30</td>
<td>none</td>
</tr>
</tbody>
</table>

Little League Baseball

![Baseball player throwing a ball](image)
Softball Specific Rest Periods

- Ladies often play 2 games/day for 2-3 consecutive days.
- 2 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 'loosen up' with a flexibility routine on the second rest day and can participate in hitting and field drills.

# Softball Specific Pitch Guidelines

<table>
<thead>
<tr>
<th>Age</th>
<th>Pitches/Game</th>
<th>Pitches Day 1 &amp; 2 (Total)</th>
<th>Pitches 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+</td>
<td>100</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

## Age to Learn Various Pitches

<table>
<thead>
<tr>
<th>Pitch</th>
<th>Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fastball</td>
<td>8 +/- 2</td>
</tr>
<tr>
<td>Change-Up</td>
<td>10 +/- 3</td>
</tr>
<tr>
<td>Curveball</td>
<td>14 +/- 2</td>
</tr>
<tr>
<td>Knuckleball</td>
<td>15 +/- 2</td>
</tr>
<tr>
<td>Slider and Forkball</td>
<td>16 +/- 2</td>
</tr>
<tr>
<td>Screwball</td>
<td>17 +/- 2</td>
</tr>
</tbody>
</table>

JR Andrews and GS Fleisig, ASMI, 2010
Youth Baseball Interval Throwing Programs

Before throwing after injury, following must occur:

1) Pass a comprehensive orthopedic examination.
2) Present with no pain during Rehabilitation.
3) Demonstrate complete “throwers” ROM, appropriate strength and endurance in the throwing extremity, & demonstrate good dynamic stability.
4) Complete proper rehabilitation progression.

Zeppieri 2011
Variability Based on Age

• No set timetable to advance from stage to stage.
• Advancement when demonstration of proper technique, fundamentals, accuracy, and number of throws for that day’s stage has been achieved.
• *Signs of fatigue, pain, or any other aberrations will result in a cessation of progression through the throwing guidelines.*
• The YITP is designed so that each stage is achieved without complication before advancement to next stage is initiated.

Zeppieri 2011
## Youth Baseball Interval Throwing Programs

- **Age**
- **Minor v Major Injury**

<table>
<thead>
<tr>
<th>Age</th>
<th>Minor</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Tendon/Ligament (Mild)</td>
<td>Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)</td>
</tr>
<tr>
<td>9-10</td>
<td>Tendon/Ligament (Mild)</td>
<td>Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)</td>
</tr>
<tr>
<td>11-12</td>
<td>Tendon/Ligament (Mild)</td>
<td>Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)</td>
</tr>
<tr>
<td>13-16</td>
<td>Tendon/Ligament (Mild)</td>
<td>Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)</td>
</tr>
<tr>
<td>17-18</td>
<td>Tendon/Ligament (Mild)</td>
<td>Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)</td>
</tr>
</tbody>
</table>

Zeppieri 2011
# Example of 13-16 Throwing Program: Minor Injury

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 4</th>
<th>Phase 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 feet</td>
<td>45 feet</td>
<td>75 feet</td>
<td>90 feet</td>
</tr>
<tr>
<td>Warm-up 15-20 feet 30 feet 20 throws Rest 1-2 minutes Warm-up 15-20 feet 30 feet 20 throws Rest 1-2 minutes Warm-up 15-20 feet 30 feet 20 throws Cool-down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up 15-30 feet 45 feet 20 throws Rest 1-2 minutes Warm-up 15-30 feet 45 feet 20 throws Rest 1-2 minutes Warm-up 15-30 feet 45 feet 20 throws Rest 1-2 minutes Warm-up 15-30 feet 45 feet 20 throws Cool-down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up 20-60 feet 75 feet 20 throws Rest 1-2 minutes Warm-up 20-60 feet 75 feet 20 throws Rest 1-2 minutes Warm-up 20-60 feet 75 feet 20 throws Cool-down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm-up 20-75 feet 90 feet 20 throws Rest 1-2 minutes Warm-up 20-75 feet 90 feet 20 throws Rest 1-2 minutes Warm-up 20-75 feet 90 feet 20 throws Cool-down</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Example of 13-16 Throwing Program: Major Injury

<table>
<thead>
<tr>
<th>Phase 1 Fastball</th>
<th>Phase 3 FB &amp; Other Pitch Types</th>
</tr>
</thead>
</table>
| **Step 1:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  20 throws off mound at 50% | **Step 10:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  30 throws off mound at 75%  
  20 throws off mound 50% Breaking Balls*  
  (Change-ups, 14-16 yr olds Curve-balls only)  
  35 throws in live BP (fastballs only) |
| **Step 2:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  35 throws off mound at 50% | **Step 11:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  30 throws off mound at 75%  
  20 throws off mound 75% Breaking Balls*  
  (Change-ups, 14-16 yr olds Curve-balls only)  
  35 throws in live BP (fastballs only) |
| **Step 3:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  50 throws off mound at 50% | **Step 12:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  30 throws off mound at 75%  
  60 throws in live BP mixing in Breaking Balls*  
  (Change-ups, 14-16 yr olds Curve-balls only) |
| **Step 4:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  70 throws off mound at 50% | **Step 13:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  Simulated Game – 6 minute rest between innings (95 pitches or 5 innings-which ever comes first)  
  Return to Overhead Competition |
| **Step 5:** Interval throwing 20-90 feet~30 throws or 5-7 minutes  
  60 throws off mound at 50%  
  30 throws off mound at 75% | |
Post-Pitching Recovery

• 1. Consistent Routine
• 2. Cool Down Activity
• 3. Static Flexibility Program
• 4. Review Pitching Performance
• 5. Visual Analog Scale (before, during, after)
• 6. Ice x 12-15 minutes
• 7. Done for the day!
• 8. Balance, Strength, and Coordination between starts

Outreach Website

• [http://www.ortho.ufl.edu/outreach](http://www.ortho.ufl.edu/outreach)

• Handouts
• Presentations
Thank You!

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