



Adolescent & HS Sports Medicine Outreach Program | 01/26/2013

# 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.
- 1<sup>st</sup> Round draft pick of NY Mets and considered #10 prospect in the Mets system after his first year in the Minors

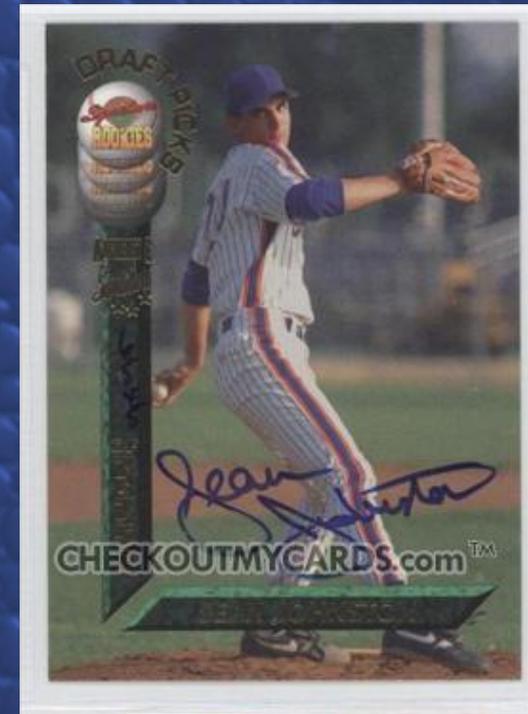


# Hindsight is 20/20

- 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<sup>th</sup> 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

Lyman S et al. Med Sci Sports Exerc. 2001.

Little League Online Baseball & Softball.

Collins CL, Comstock RD. Pediatrics 2008;121: 1181-1187.

# Epidemiology-Softball

- 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

Shanley E, et al. Shoulder range of motion, pitch count, and injuries among interscholastic female softball pitchers: a descriptive study. *The International Journal of Sports Physical Therapy* . October 2012

# 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  
Fleisig GS & Andrews JR. Sports Health, 2012.

# Signs and Symptoms

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

Warm-up Properly

Rotate playing other positions besides P & C

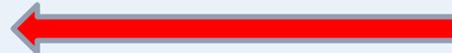


Adhere to pitch count guidelines



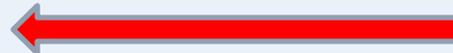
Don't pitch with Elbow or Shoulder pain

Avoid pitching on multiple teams

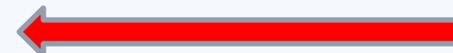


Don't pitch on consecutive days

Don't play year round



Never use a radar gun



Communicate how your arm is feeling

Develop Skills that are age appropriate

Master the fastball 1st & change-up 2nd

Emphasize Control, accuracy, and good mechanics

Speak with Sports Medicine Provider or ATC if ANY concerns

# 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

Age	Pitches/Game
7-8	50
9-10	75
11-12	85
13-16	95
17-18	105

Little League Baseball

Ages 14 & Under	15-18	Required # of Rest
66+	76+	4 calendar days
51-65	61-75	3 calendar days
36-50	46-60	2 calendar days
21-35	31-45	1 calendar day
1-20	1-30	none

Little League Baseball



# 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.



Source: Softball Injuries Sports Tips: <http://www.stopsportsinjuries.org/softball>

# Softball Specific Pitch Guidelines

Age	Pitches/Game	Pitches Day 1 & 2 (Total)	Pitches Day 3
8-10	50	80	0
10-12	65	95	0
13-14	80	115	80
15+	100	140	100

Source: Softball Injuries Sports Tips: <http://www.stopsportsinjuries.org/softball>

# Age to Learn Various Pitches

Pitch	Age (years)
Fastball	8 +/- 2
Change-Up	10 +/- 3
Curveball	14 +/- 2
Knuckleball	15 +/- 2
Slider and Forkball	16 +/- 2
Screwball	17 +/- 2

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

Age	Minor	Major
8	Tendon/Ligament (Mild)	Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)
9-10	Tendon/Ligament (Mild)	Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)
11-12	Tendon/Ligament (Mild)	Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)
13-16	Tendon/Ligament (Mild)	Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)
17-18	Tendon/Ligament (Mild)	Bruise/Bone Tendon/ligament injury (moderate, severe, or postoperative)

# Example of 13-16 Throwing Program: Minor Injury

<p><b>Phase 1</b></p> <p><b>30 feet</b></p>	<p>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</p>	<p><b>Phase 4</b></p> <p><b>75 feet</b></p>	<p>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</p>
<p><b>Phase 2</b></p> <p><b>45 feet</b></p>	<p>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 Cool-down</p>	<p><b>Phase 5</b></p> <p><b>90 feet</b></p>	<p>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</p>
<p><b>Phase 3</b></p> <p><b>60 feet</b></p>	<p>Warm-up 20-45 feet 60 feet 20 throws Rest 1-2 minutes Warm-up 20-45 feet 60 feet 20 throws Rest 1-2 minutes Warm-up 20-45 feet 60 feet 20 throws Cool-down</p>		

# Example of 13-16 Throwing Program: Major Injury

<p><b>Phase 1</b> <b>Fastball</b></p>	<p>Step 1: Interval throwing 20-90 feet~30 throws or 5-7 minutes 20 throws off mound at 50%</p> <p>Step 2: Interval throwing 20-90 feet~30 throws or 5-7 minutes 35 throws off mound at 50%</p> <p>Step 3: Interval throwing 20-90 feet~30 throws or 5-7 minutes 50 throws off mound at 50%</p> <p>Step 4: Interval throwing 20-90 feet~30 throws or 5-7 minutes 70 throws off mound at 50%</p> <p>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%</p> <p>Step 6: Interval throwing 20-90 feet~30 throws or 5-7 minutes 40 throws off mound at 50% 40 throws off mound at 75%</p> <p>Step 7: Interval throwing 20-90 feet~30 throws or 5-7 minutes 15 throws off mound at 50% 75 throws off mound at 75%</p>	<p><b>Phase 3</b> <b>FB &amp; Other Pitch Types</b></p>	<p>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, 14-16yr olds Curve-balls only) 35 throws in live BP (fastballs only)</p> <p>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)</p> <p>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)</p>
<p><b>Phase 2</b> <b>Fastballs &amp; BP</b></p>	<p>Step 8: Interval throwing 20-90 feet~30 throws or 5-7 minutes 45 throws off mound at 75% 25 throws in live BP</p> <p>Step 9: Interval throwing 20-90 feet~30 throws or 5-7 minutes 45 throws off mound at 75% 40 throws in live BP</p>	<p><b>Phase 4</b> <b>Simulated Game</b></p>	<p><b>Step 13: Interval throwing 20-90 feet~30 throws or 5-7 minutes</b> <b>Simulated Game – 6 minute rest between innings (95 pitches or 5 innings-which ever comes first)</b></p> <p><b>Return to Overhead Competition</b></p>

# 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

Ronai J. Eight Essentials of Post-Pitching Recovery. 2009.

# Outreach Website

- <http://www.ortho.ufl.edu/outreach>
- Handouts
- Presentations

# Thank You!



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