SPORTS PARTICIPATION WITH BLEEDING DISORDERS: KEEPING IT SAFE

Sports medicine perspective

Brian T. Vernau, MD CAQSM
Pediatric and Adolescent Sports Medicine
Region III Annual Meeting
April 13, 2018
DISCLOSURES

None
OBJECTIVES

• Counsel patients to be active for life
• Apply injury risk data from the general population to hemophilia patients
• Summarize current concussion treatment
• Assist families in evidence-based decision making
“We should ask the people who restrict physical activity to show us the evidence.”

-Joachim Boos, MD
CAN I PLAY?
RISK VS. BENEFIT

- Severe bleeds
  - Brain, fracture
- Joint arthropathy
- Minor injuries

- Cardiovascular health
- Weight control
- Well being
- Joint protection
  - Strength, balance
- NORMALCY
PEDIATRIC OBESITY

• “Exercise deficit disorder”

• “Electronic” barriers to activity

• Couch inertia

Photo credits:
Jim MacDonald, MD CJSN Blog
Peter Merholz, Peterme on Flickr
Brian Vernau, MD private collection
Figure 5. Trends in obesity prevalence among adults aged 20 and over (age-adjusted) and youth aged 2–19 years:

2Test for linear trend for 2003–2004 through 2013–2014 not significant (p > 0.05).
NOTE: All adult estimates are age-adjusted by the direct method to the 2000 U.S. census population using the age groups 20–39, 40–59, and 60 and over.
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey.
OBESITY IN HEMOPHILIA

• Obesity rates similar to general population

• Overweight rates may be greater\textsuperscript{1}
  • CDC 2005: 16.4% with hemophilia
    13.7% general population

OBESITY IN HEMOPHILIA

• Not clear whether BMI affects target joints

• But BMI is a risk factor for arthropathy and poor joint ROM
  • May have osteoarthritis relationship
  • May be independent of hemophilia severity

BENEFITS OF EXERCISE
BENEFITS OF EXERCISE IN HEMOPHILIA

• Same as the general population!

• Children with hemophilia have higher injury risk
  • Lower fitness, anaerobic power, muscle strength¹

• Chronic arthropathy further impairs neuromuscular function and strength

BENEFITS OF EXERCISE IN HEMOPHILIA

• Muscle strength protects joints\textsuperscript{1, 2}
  • Improved balance/proprioception
  • Control
  • Confidence
  • Inertia

• Regular exercise may prevent progression of arthropathy\textsuperscript{3}

1. Buzzard BM, CORR 1997
3. Harris S, Bogio LN Haemophilia 2006
BENEFITS OF EXERCISE IN HEMOPHILIA

• Active children bleed less than sedentary peers\(^1\)

• Resistance training may reduce bleeding episodes\(^2\)

• Inclusion

• Normalcy

1. NHF *Playing it Safe* 2005
2. Tiktinsky R et al. *Haemophilia* 2002
RISKS OF EXERCISE

• Intracranial Hemorrhage and TBI

• Target joints/arthropathy

• Soft tissue injury
JOINT ARTHROPATHY
JOINT ARTHROPATHY

• 299 high impact seasons, 46 low impact seasons
• No differences in injuries, joint bleeds, no new target joints
JOINT ARTHROPATHY

Association Between Physical Activity and Risk of Bleeding in Children With Hemophilia

Carolyn R. Broderick, MBBS
Robert D. Herbert, PhD
Jane Latimer, PhD
Chris Barnes, MBBS
Julie A. Curtin, MBBS
Erin Mathieu, MPH
Paul Monagle, MD
Simon A. Brown, MD

**Context** Vigorous physical activity is thought to increase risk of bleeds in children with hemophilia, but the magnitude of the risk is unknown.

**Objective** To quantify the transient increase in risk of bleeds associated with physical activity in children with hemophilia.

**Design, Setting, and Participants** A case-crossover study nested within a prospective cohort study was conducted at 3 pediatric hemophilia centers in Australia between July 2008 and October 2010. A total of 104 children and adolescent boys aged 4 through 18 years with moderate or severe hemophilia A or B were monitored for bleeds for up to 1 year. Following each bleed, the child or parent was interviewed to ascertain exposures to physical activity preceding the bleed.

- 2012 study, ~100 athletes, most prophylaxed
- Increase in relative bleeding risk for category 2 and 3 activities compared to inactivity
- Absolute risk was low

Broderick CR, et al. JAMA 2010
JOINT ARTHROPATHY

Association Between Physical Activity and Risk of Bleeding in Children With Hemophilia

- 1/5 yearly bleeds attributable to sport
- Higher factor level reduced bleeding risk
- Exposure time may play a role

Broderick CR, et al. JAMA 2010
JOINT ARTHROPATHY

Physical activity participation and bleeding characteristics in young patients with severe haemophilia

R. TIKTINSKY,*† G. KENET,† Z. DVIR, * B. FALK, ‡ M. HEIM, § U. MARTINOWITZ† and M. KATZ-LEURER*

*Department of Physical Therapy, Tel Aviv University, Tel Aviv, Israel; †National Hemophilia Center, Chaim Sheba Medical Center, Tel Hashomer, Israel; ‡Department of Physical Education and Kinesiology, Brock University, St. Catharines, ON, Canada; and §Department of Orthopaedics, Chaim Sheba Medical Center, Tel Hashomer, Israel

• 2009 study, 44 children, severe, no prophylaxis
• Leisure activity (low intensity and frequency)
• Similar bleeding rates between vigorous and light activity levels

Tiktinsky R et al. Haemophilia 2009
JOINT ARTHROPATHY

Physical activity participation and bleeding characteristics in young patients with severe haemophilia

R. TIKTINSKY,* † G. KENET, † Z. DVIR, * B. FALK, ‡ M. HEIM, § U. MARTINOWITZ† and M. KATZ-LEURER*
*Department of Physical Therapy, Tel Aviv University, Tel Aviv, Israel; †National Hemophilia Center, Chaim Sheba Medical Center, Tel Hashomer, Israel; ‡Department of Physical Education and Kinesiology, Brock University, St. Catharines, ON, Canada; and §Department of Orthopaedics, Chaim Sheba Medical Center, Tel Hashomer, Israel

• No association with strength
• PA levels nowhere near sports participation levels
JOINT ARTHROPATHY

CONCLUSIONS

• Risk of bleeding as sport intensity increases may be trivial
  • Even when target joints are present?
  • Even without prophylaxis?

• Exercise does not appear to create target joints

• Need bigger prospective studies
JOINT ARTHROPATHY
“MINOR” INJURIES
“MINOR” INJURIES

• May lead to target joints
• Morbidity
• Factor treatment/Cost
• ED?

• Primary prevention!
INJURY RATES

- “New” Injuries
- /10000 AE

<table>
<thead>
<tr>
<th>Rank</th>
<th>Sport</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Boys’ swimming and diving</td>
<td>1.81</td>
</tr>
<tr>
<td>2</td>
<td>Boys’ tennis</td>
<td>1.71</td>
</tr>
<tr>
<td>3</td>
<td>Boys’ basketball</td>
<td>13.56</td>
</tr>
<tr>
<td>4</td>
<td>Boys’ field hockey</td>
<td>15.73</td>
</tr>
<tr>
<td>5</td>
<td>Boys’ track and field</td>
<td>8.27</td>
</tr>
<tr>
<td>6</td>
<td>Girls’ field hockey</td>
<td>8.67</td>
</tr>
<tr>
<td></td>
<td>Boys’ soccer</td>
<td>16.36</td>
</tr>
<tr>
<td></td>
<td>Girls’ cross-country</td>
<td>10.28</td>
</tr>
<tr>
<td></td>
<td>Girls’ volleyball</td>
<td>11.26</td>
</tr>
<tr>
<td></td>
<td>Boys’ volleyball</td>
<td>6.23</td>
</tr>
<tr>
<td></td>
<td>Girls’ softball</td>
<td>6.01</td>
</tr>
<tr>
<td></td>
<td>Girls’ swimming and diving</td>
<td>2.55</td>
</tr>
<tr>
<td></td>
<td>Boys’ swimming and diving</td>
<td>1.81</td>
</tr>
<tr>
<td></td>
<td>Girls’ gymnastics</td>
<td>15.46</td>
</tr>
<tr>
<td></td>
<td>Boys’ ice hockey</td>
<td>19.47</td>
</tr>
<tr>
<td></td>
<td>Girls’ basketball</td>
<td>16.66</td>
</tr>
<tr>
<td></td>
<td>Boys’ lacrosse</td>
<td>18.11</td>
</tr>
<tr>
<td></td>
<td>Boys’ wrestling</td>
<td>21.20</td>
</tr>
<tr>
<td></td>
<td>Girls’ lacrosse</td>
<td>13.47</td>
</tr>
<tr>
<td></td>
<td>Boys’ basketball</td>
<td>13.56</td>
</tr>
</tbody>
</table>

# Ankles

<table>
<thead>
<tr>
<th>Sport</th>
<th>Number of Injuries</th>
<th>Injury Rate</th>
<th>Injury Rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>1667</td>
<td>4.67</td>
<td>5.88 (5.34–6.48)</td>
</tr>
<tr>
<td><strong>Soccer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>429</td>
<td>3.14</td>
<td>3.55 (2.92–4.30)</td>
</tr>
<tr>
<td>Girls</td>
<td>538</td>
<td>4.59</td>
<td>3.80 (3.19–4.52)</td>
</tr>
<tr>
<td>Volleyball</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys†</td>
<td>15</td>
<td>4.24</td>
<td>1.32 (0.47–3.70)</td>
</tr>
<tr>
<td>Girls</td>
<td>452</td>
<td>3.90</td>
<td>1.08 (0.89–1.31)</td>
</tr>
<tr>
<td><strong>Basketball</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>831</td>
<td>5.16</td>
<td>2.22 (1.94–2.55)</td>
</tr>
<tr>
<td>Girls</td>
<td>660</td>
<td>5.03</td>
<td>3.02 (2.59–3.52)</td>
</tr>
<tr>
<td>Wrestling</td>
<td>167</td>
<td>1.36</td>
<td>1.78 (1.30–2.43)</td>
</tr>
<tr>
<td><strong>Baseball</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Softball</td>
<td>112</td>
<td>0.91</td>
<td>2.86 (1.96–4.18)</td>
</tr>
<tr>
<td>Girls’ field hockey‡</td>
<td>140</td>
<td>1.50</td>
<td>3.24 (2.30–4.56)</td>
</tr>
<tr>
<td>Girls’ gymnastics‡</td>
<td>57</td>
<td>1.78</td>
<td>2.26 (1.35–3.80)</td>
</tr>
<tr>
<td>Boys’ ice hockey‡</td>
<td>30</td>
<td>4.88</td>
<td>2.45 (1.17–5.15)</td>
</tr>
<tr>
<td>Lacrosse‡</td>
<td>16</td>
<td>0.72</td>
<td>3.51 (1.27–9.64)</td>
</tr>
<tr>
<td>Boys</td>
<td>76</td>
<td>2.24</td>
<td>3.11 (1.97–4.90)</td>
</tr>
<tr>
<td>Girls</td>
<td>60</td>
<td>2.45</td>
<td>2.76 (1.66–4.59)</td>
</tr>
<tr>
<td><strong>Swimming and diving‡</strong></td>
<td></td>
<td>0</td>
<td>0.00 (N-A)‡</td>
</tr>
<tr>
<td>Boys</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Track and field‡</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>35</td>
<td>0.45</td>
<td>1.09 (0.48–2.50)</td>
</tr>
<tr>
<td>Girls</td>
<td>61</td>
<td>0.98</td>
<td>2.61 (1.55–4.38)</td>
</tr>
<tr>
<td>Cheerleading†</td>
<td>25</td>
<td>0.68</td>
<td>1.30 (0.56–3.01)†</td>
</tr>
</tbody>
</table>

Swenson DM et al. CJSN 2013
ICH AND CONCUSSION
INTRACRANIAL HEMORRHAGE

Associations between intracranial haemorrhage and prescribed prophylaxis in a large cohort of haemophilia patients in the United States

Summary

Intracranial haemorrhage (ICH) is the most serious type of bleeding for people with haemophilia. It can occur spontaneously or as a result of trauma.

• 2010 study, first in prophylaxis era, UDC data
• 1.9% of 10K patients had ICH
• 20% mortality (*2.5% in more recent study)
• 44% had head injury

Witmer CM et al. BJH 2010
Witmer CM Haemophilia 2015
INTRACRANIAL HEMORRHAGE

Utility of computed tomography of the head following head trauma in boys with haemophilia

C. M. WITMER, L. J. RAFFINI and C. S. MANNO
Division of Hematology, The Children’s Hospital of Philadelphia, Department of Pediatrics, University of Pennsylvania
School of Medicine, Philadelphia, PA, USA

- 2007 retrospective ED head injury study
- 10 years, 97 patients, 295 CT scans
- 3% hemorrhage (0.9% PECARN)
- 54% of bleeds were asymptomatic

Witmer CM et al. Haemophilia 2007
Kuppermann N et al. Lancet 2009
INTRACRANIAL HEMORRHAGE
CONCLUSION

• Increased rates
• Morbidity 50%+
• Cost
  • Money
  • Time
  • Radiation
CONCUSSION AND HEMOPHILIA
**CONCUSSION RATES**

**TABLE 1**

<table>
<thead>
<tr>
<th>Activity</th>
<th>2005-2006 (95% CI)</th>
<th>2011-2012 (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys football</td>
<td>0.47 (0.41, 0.53)</td>
<td>0.94 (0.86, 1.03)</td>
</tr>
<tr>
<td>Soccer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>0.22 (0.16, 0.31)</td>
<td>0.41 (0.32, 0.52)</td>
</tr>
<tr>
<td>Girls</td>
<td>0.36 (0.27, 0.47)</td>
<td>0.73 (0.60, 0.89)</td>
</tr>
<tr>
<td>Girls volleyball</td>
<td>0.05 (0.02, 0.10)</td>
<td>0.17 (0.12, 0.24)</td>
</tr>
<tr>
<td>Basketball</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>0.07 (0.04, 0.11)</td>
<td>0.24 (0.18, 0.31)</td>
</tr>
<tr>
<td>Girls</td>
<td>0.22 (0.16, 0.30)</td>
<td>0.37 (0.28, 0.47)</td>
</tr>
<tr>
<td>Boys wrestling</td>
<td>0.17 (0.12, 0.25)</td>
<td>0.57 (0.46, 0.70)</td>
</tr>
<tr>
<td>Boys baseball</td>
<td>0.04 (0.02, 0.08)</td>
<td>0.14 (0.09, 0.20)</td>
</tr>
<tr>
<td>Girls softball</td>
<td>0.07 (0.03, 0.12)</td>
<td>0.30 (0.21, 0.41)</td>
</tr>
<tr>
<td>Overall</td>
<td>0.23 (0.21, 0.25)</td>
<td>0.51 (0.48, 0.55)</td>
</tr>
</tbody>
</table>

*CI, confidence interval.

**Graph**

*Overall rate of concussion per 1,000 athlete-exposures over academic years 2005-2012.*

Rosenthal JA et al. *AJSM 2014*
<table>
<thead>
<tr>
<th>Sport</th>
<th>Rate per 10,000 AEs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Competition</td>
</tr>
<tr>
<td>Football</td>
<td>22.9</td>
</tr>
<tr>
<td>Boys’ ice hockey</td>
<td>14.6</td>
</tr>
<tr>
<td>Boys’ lacrosse</td>
<td>10.4</td>
</tr>
<tr>
<td>Girls’ soccer</td>
<td>9.2</td>
</tr>
<tr>
<td>Girls’ lacrosse</td>
<td>8.6</td>
</tr>
<tr>
<td>Girls’ basketball</td>
<td>5.5</td>
</tr>
<tr>
<td>Boys’ soccer</td>
<td>5.3</td>
</tr>
<tr>
<td>Boys’ wrestling</td>
<td>4.8</td>
</tr>
<tr>
<td>Girls’ field hockey</td>
<td>4.1</td>
</tr>
<tr>
<td>Boys’ basketball</td>
<td>3.9</td>
</tr>
<tr>
<td>Girls’ softball</td>
<td>2.9</td>
</tr>
<tr>
<td>Girls’ gymnastics&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2.4</td>
</tr>
<tr>
<td>Cheerleading&lt;sup&gt;e&lt;/sup&gt;</td>
<td>1.2</td>
</tr>
<tr>
<td>Boys’ baseball</td>
<td>1.1</td>
</tr>
<tr>
<td>Girls’ volleyball</td>
<td>1.0</td>
</tr>
<tr>
<td>Girls’ swim/dive&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.4</td>
</tr>
<tr>
<td>Girls’ track/field&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.4</td>
</tr>
<tr>
<td>Boys’ track/field</td>
<td>0.3</td>
</tr>
<tr>
<td>Boys’ swim/dive&lt;sup&gt;d&lt;/sup&gt;</td>
<td>—</td>
</tr>
</tbody>
</table>

Gender comparable<sup>f</sup>

| Boys          | 2.8 | 0.3 | 1.0 |
| Girls         | 4.7 | 0.5 | 1.7 |
- Mechanism of injury
- Player to player most common
- Heading the ball is not the issue.

Marar M et. al AJSM 2012
CONCUSSION MANAGEMENT: UPDATES

Old:
• Rest until symptoms resolve

New:
• “Cocoon” therapy only for a few days
• Returning to school and exercise before symptoms resolve
• More active recovery
REST AFTER CONCUSSION

• Conflicting data on length

• Thomas et al
  • ED RCT
  • 11-22yo, n=88
  • Strict rest had higher symptoms and slower recovery at 10 days
  • Emotional symptoms

Thomas DG et al. *Pediatrics* 2015
REST AFTER CONCUSSION

• Timing matters

• Taubman B et al
  • Immediate rest more likely to recover within 30 days compared to those who delayed 1-7 days
  • Within that 30 day group, 4.6 days sooner

REST AFTER CONCUSSION

• But...

• Doing too much also prolongs symptoms

Brown NB et al. *Pediatrics* 2014
REST AFTER CONCUSSION

• The verdict?

• Rest until feeling better (2-3 days)
• Then advance cognitive activity slowly
• Day 0-1 are probably the most important
CONCUSSION MANAGEMENT

Autonomic Nervous System

Vestibular – Ocular Systems

Cognitive

Emotional

Headache

Slide courtesy Matt Grady, MD
VESTIBULAR-OCULAR SYSTEM

- 100 children at CHOP with concussion
- 69% had vision problems
- 55% had vestibular problems
- 49% had both

VESTIBULAR-OCULAR SYSTEM

- Problems with school
  - Reading
  - Taking notes

- Saccades
- Gaze stability
- Visual Motion Sensitivity
- Convergence
- Balance
AUTONOMIC NERVOUS SYSTEM

• Dizziness, exercise intolerance, light and noises sensitivity

• Cerebral blood flow regulation

• Exercise is treatment
  • Similar to other dysautonomia management
  • Retrain the blood flow
EXERCISE IN CONCUSSION

• Exercise is safe in concussion\(^1\)
  • Even on day one (RCT)\(^2\)
  • *With caveats

• Walking is good!

• Advance as tolerated based on symptoms
  • Exercise should not make symptoms significantly worse
  • Should not affect sleep or school
  • “Subthreshold”

---

EXERCISE IN CONCUSSION

• Kurowski et al. randomized to subthreshold aerobic activity vs. stretching program
• Small study (n=26)
• Aerobic activity may be helpful
• Compliance was worse

Kurowski BG et al. J Head Trauma Rehab 2017
EXERCISE IS MEDICINE

• Determine threshold where symptoms occur
  • >2 point increase
  • 1 new symptom
• Exercise at 90% of that for 20 minutes
• Advance by 10bpm every 1-2 weeks

• Trained athletes tolerate this better
• Do less for non-athletes

• Not necessarily cleared!

COGNITIVE SYMPTOMS

• Concentration, focus, memory

• Decrease cognitive load

• Self pacing

• Extra time, quiet testing
EMOTIONAL SYMPTOMS

• Stress and anxiety
  • School
  • Sport
• Out of sport
• Maybe forever?
• Barrier to recovery
PROLONGED SYMPTOMS

• Multifactorial
• Oculomotor/vestibular systems
  • Vestibular therapy
• Autonomic system
  • Fluids, exercise
• Cognitive
  • School, brain games
• Emotional
  • Support, counseling, stress management
  • Exercise!
LIGHTNING ROUND

• Medications
  • Don’t work, no evidence\(^1\)
  • Sleep aids may be helpful in prolonged concussions

• Soccer headbands
  • Don’t work, no evidence
  • May play more aggressively

Halsted ME, *Sports Health* 2016
LIGHTNING ROUND

• Mouthguards
  • Great for tooth protection
• CTE
  • We don’t know yet
  • Football and boxing are probably bad for you
• No grading systems anymore
• When in doubt, sit out
CONCUSSION MANAGEMENT

• Old view: rest until symptom free

• New view:
  • Relative rest – progressively less
  • Gradual return to learn and exercise without making symptoms significantly worse
  • No contact until concussion resolves
  • Most resolve in a few weeks
  • The others need rehabilitation
HELPING FAMILIES DECIDE
SPORT CHOICES - SAFE

• Seuser et al. ranked sports by a database of 5 million injuries

Water polo
Walking
XC Skiing
Golf
Cycling (stationary)

Swimming
Gymnastics (apparatus)
Dumbbells
Table tennis
Rowing

## SPORT CHOICES - RISKIER

- Seuser et al. ranked sports by a database of 5 million injuries

<table>
<thead>
<tr>
<th>Football/rugby</th>
<th>Wrestling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squash</td>
<td>Basketball</td>
</tr>
<tr>
<td>Luge</td>
<td>Weightlifting</td>
</tr>
<tr>
<td>Water-skiing</td>
<td>Handball</td>
</tr>
<tr>
<td>Bodybuilding</td>
<td>Inline skating</td>
</tr>
</tbody>
</table>
SPORT CHOICES

• “Playing it safe” from National Hemophilia Foundation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Category</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatics</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Archery</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Baseball</td>
<td>1.5–2.5</td>
<td>22</td>
</tr>
<tr>
<td>Basketball</td>
<td>1.5–2.5</td>
<td>23</td>
</tr>
<tr>
<td>Bicycling</td>
<td>1.5–3</td>
<td>24</td>
</tr>
<tr>
<td>BMX Racing</td>
<td>3</td>
<td>25</td>
</tr>
</tbody>
</table>
SPORT CHOICES

• Canadian Hemophilia Society – Destination Fitness

• Think Once!
• Think Twice!!
• Think Again!!!
HELPING FAMILIES DECIDE

• Individualized
• What can the patient do?
• Exposure hours
• Prophylaxis compliance

• What is the implication of complications in this patient?
EXERCISE SCREENING

• Ask your friendly neighborhood physical therapist
  • Evaluate and treat for sport readiness (specific sport?)
  • Include home exercise program

• Sports medicine too!
EXERCISE SCREENING

• Seuser A et al. utilized a “fitness check”
  1. Balance-coordination. 20 sec single leg stance on force plate
  2. Core strength. Measured strength with trunk flexion and extension
  3. Aerobic endurance. Cycle ergometer testing.
  4. Flexibility check. Flexibility of hamstring and chest
  5. Body fat measurement.
HELPING FAMILIES DECIDE

• Do the “safe” sport choices allow for adequate aerobic and strengthening activity for your patient?

• Does your patient’s level of involvement in a “riskier” activity actually put them at high risk?
HELPING FAMILIES DECIDE

• How does *this* sport affect *this* patient?
  • Factor cost/compliance
  • Inhibitors/higher stakes of bleeding episodes
  • History of joint bleeds
  • ED visits

• Can *this* patient safely play *this* sport?
  • Will she put herself or others at risk?
  • Strength/coordination/athleticism
HELPING FAMILIES DECIDE
THANK YOU!

vernaub@email.chop.edu

“We should ask the people who restrict physical activity to show us the evidence.”

-Joachim Boos, MD