Getting Started with Concussion Vital Signs: “Try It” Pilot Program

A Complete Concussion Management System.

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AGENDA:
• Intro
• Concussion Vital Signs
• Baseline tests matter because of the invisible effects of concussions.
• How does a concussion affect learning?
• Complete Concussion Management System: Baseline & follow up
  bedside app & Clinician’s portal.
• Norms
• Training overview and orientation (www.concussionvitalsigns.com)

Why did Pearson Get Involved?
Trainers Spoke. Pearson Responded.

<table>
<thead>
<tr>
<th>Priority for Offering</th>
<th>Gap</th>
<th>Outcome Name</th>
<th>Outcome Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52%</td>
<td>Baseline for All</td>
<td>Baseline Availability for All Athletes</td>
</tr>
<tr>
<td>2</td>
<td>41%</td>
<td>Data Quality</td>
<td>Data for First Baseline to Pearson Technical and Clinical Concussion Management</td>
</tr>
<tr>
<td>3</td>
<td>37%</td>
<td>Communication</td>
<td>Communication for First Baseline to Pearson Technical and Clinical Concussion Management</td>
</tr>
<tr>
<td>4</td>
<td>36%</td>
<td>ID Concussive Events</td>
<td>Identifying and tracking Possible Concussions for Athletes</td>
</tr>
<tr>
<td>5</td>
<td>36%</td>
<td>R-F-P Decision</td>
<td>Maximize Likelihood that all Possible Concussive Events are Detected</td>
</tr>
<tr>
<td>6</td>
<td>31%</td>
<td>Concussion Education</td>
<td>Maximize Parent and Athlete Concussion Awareness and Compliancy</td>
</tr>
<tr>
<td>7</td>
<td>31%</td>
<td>Baseline Time</td>
<td>Minimize Time to Administer Baseline Assessment</td>
</tr>
<tr>
<td>8</td>
<td>30%</td>
<td>Concussion Mgmt</td>
<td>Maximize Confidence in Professional Knowledge &amp; concussion Management</td>
</tr>
<tr>
<td>9</td>
<td>26%</td>
<td>R-T-P Test Accuracy</td>
<td>Maximize Return to Play (R-T-P) Test Accuracy</td>
</tr>
<tr>
<td>10</td>
<td>20%</td>
<td>Reduce Costs</td>
<td>Maximize Efficiency and Address Concussion Issues</td>
</tr>
</tbody>
</table>

Pearson is a Learning Company. Expertise: Education & Assessments.

"The Return to Learn" takes priority over the "Return to Play" with student-athletes.
Invisible effects of concussions can extend after the visible symptoms are gone.

For example, if you can’t handle your normal academic load are you really symptom free?
This means that VALID and RELIABLE ASSESSMENTS MATTER. Pearson knows tests...
Simply relying upon symptom report or observation is risky. Executive Functioning also matters...
Concussions: A Neurometabolic Cascade

Concussions are not structural damage, but neurochemical damage.

A simple way to think about it is the software of the brain has been disrupted. In this sense it is not observable except through symptoms, but persists beyond symptoms. Internally there is an excitatory neurometabolic cascade:

- Calcium reflux, lasting up to 6 days.
- Glutamate response
- Potassium surge
- Ionic pumps work overtime to restore homeostasis
- Cerebral blood flow decreases
- Glucose disparity

There is an energy crisis... before normal functioning returns at about 6-10 days...

The neurochemical changes are exhausting for the brain. Rest is a critical factor in recovery. During recovery the brain is very vulnerable. Cognitive rest is even more important than physical rest...

Observable Symptoms of Concussion tell part of the story.

Visible Concussion Symptoms

But how can you tell what is going on inside the brain?

Invisible Effects of Concussion #1:

Over 4 seasons 19 high school football players wore Head Impact Telemetry System (HITS) to record head impact biomechanics. 10 concussions were sustained.

Severity of hit does NOT relate to the severity of cognitive effects. There were no significant relationships between the biomechanics of the hit (i.e., time from previous impact, peak linear acceleration, peak rotational acceleration, and HITS severity profile).

"There appears to be no association between head impact biomechanics and post-concussive outcomes." (Broglio, et al., 2011).
Why use Baseline Neurocognitive Tests?

Invisible effects of concussion #2

Brugoli, et al., 2007
N=21 college athletes, (16 men, 5 women).
- Neurocognitive decrements may persist when athletes no longer report concussion-related symptoms.
- Reliance on athlete-reported and concussion symptoms when making return-to-play decisions may expose athletes to subclinical injury if complete recovery has not occurred.
- A multifaceted approach to concussion assessment that includes evaluation of a myriad of functions is warranted.
- Risk for second impact syndrome.
- You can’t see it! You can’t just rely upon what the athlete tells you and what you observe.
- You need a VALID AND RELIABLE TEST.
- The exclusive use of symptom reports in making a return-to-play decision is not advised.

Invisible effects of concussion #3

- Long-term residual brain dysfunctions from mTBI are often overlooked by clinical criteria (Slobounov, et al., 2009).
- EEG wavelet information was used with 21 athletes (sample of 265) who suffered two concussive episodes within one athletic season and were tested on days 7, 14, and 21 post-first and second injuries.
- No neuropsychological deficits (as measured by neurocognitive tests) were present in concussed subjects beyond 7 days post-injury after first and second concussions.
- EEG-IQ measures were significantly reduced primarily at temporal, parietal and the occipital regions (ROIs) after first and especially after second MTBI ($p < 0.01$) beyond 7 days post-injury.
- Rate of recovery of EEG-IQ measures was significantly slower after second MTBI compared to those after the first concussion ($p < 0.01$).
- EEG-IQ measures may reveal alterations in the brain of concussed individuals that are most often overlooked by current assessment tools.

How are invisible effects made visible?
Valid and Reliable tests...

Quick definitions.
- Valid tests measure what you think they are measuring.
- Reliable tests show consistently similar scores over time.
- Without high validity you don’t know what you are measuring? Was an athlete “sandbagging”?

Test Psychometrics matter...
- Without high reliability the reason for a change in performance may not be a concussive event. It might be something different altogether.
- You can’t make sound decisions on bad data.

Remember what the trainers ranked 4th highest priority: ID concussive events.

The Brain is not the same as a sore foot…
Neuropsychology's role: "Neuropsychology is well positioned to provide valuable information to the forensic process about whether a child's cognitive abilities have been negatively affected by a disease or injury, the extent of the change in cognitive functioning, and the impact of cognitive problems on day-to-day functioning." (Brooks & Iverson, 2012).

"Neurocognition" refers to the higher brain functions: learning, remembering, concentrating, solving problems, and making decisions.

Concerns of memory impairment are common after mild traumatic brain injury (mTBI). Acute effects after mTBI may include posttraumatic amnesia, which may last up to 24 hours. In the postacute phase, memory concerns are usually linked with increased distractibility; impaired attention, working memory, retrieval; and executive dysfunction." (Flynn, 2010).

How might a concussion affect learning?

Distractibility, attention, working memory and executive functioning all have substantial impact upon learning.

"Concerns of memory impairment are common after mild traumatic brain injury (mTBI). Acute effects after mTBI may include posttraumatic amnesia, which may last up to 24 hours. In the postacute phase, memory concerns are usually linked with increased distractibility; impaired attention, working memory, retrieval; and executive dysfunction." (Flynn, 2010).

How do you know if he is Ready to return to learn...

Short Term Effects of Multiple Concussions:

1. Greater risk for even more concussions.
2. Risk of Second Impact Syndrome increases and thereby tragedies on the field.
3. With College football players (Collins, et al. 1999) 2 or more concussions resulted in attenuation of cognitive skills, which when combined with an associated LD leads to even further compromised functioning (Collins, et al. 1999).
4. 2 days post injury athletes with multiple concussions scored significantly lower on memory tests than athletes with a single concussion. Multiply concussed athletes were 7.7 times more likely to demonstrate a major drop in memory performance than those with no previous concussion (Covassin et al, 2008).
5. 5 days post concussion college athletes with a history of concussions performed significantly worse on verbal memory and reaction time than those without such history (Covassin et al 2008).
6. A concussion may result in increased symptoms of fatigue and drowsiness and decreased symptoms of sleeplessness (Price, 2009).
Executive Functions Strongly Correlate with Academic Performance.

3 subtests of Concussion Vital Signs tap Executive Functions:

- Stroop Test (ST): Approx. 4 - 5 Minutes
- Shifting Attention (SAT): Approx. 2.5 Minutes
- Continuous Performance Test (CPT): Approx. 5 Minutes

Executive Functions: Strongly Correlate with Academic Performance. The frontal lobes and temporal lobes of the brain are vulnerable in concussions; these areas of the brain are CRITICAL FOR LEARNING...

Unfortunately, most Athletic Trainers don’t use CNTs.

<table>
<thead>
<tr>
<th>Schools employing athletic trainers</th>
<th>42%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of Athletic trainers employed by schools if using a CNT</td>
<td>60%</td>
</tr>
<tr>
<td>(26.5% of all schools)</td>
<td></td>
</tr>
<tr>
<td>Districts testing only football, boys and girls soccer</td>
<td>90%</td>
</tr>
<tr>
<td>Districts testing all athletes</td>
<td>80%</td>
</tr>
<tr>
<td>Athletic trainers &amp; Physicians interpret CNT results</td>
<td>78%</td>
</tr>
<tr>
<td>Athletes tested with CNT less likely to return to play within 10 days</td>
<td>38% vs. 56%</td>
</tr>
</tbody>
</table>

Computerized neuropsychological baseline testing is underutilized by athletic trainers:

CNT’s preserve the health of student athletes & mitigate risk for schools
(Meehan et al., 2012)
Of athletic trainers using CNT for baseline testing, how many check the tests to be sure they are valid? (Covassin, et al., 2009)

- 1209 U.S. institutions were recruited and 399 AT’s responded to a survey.
- 51.9% AT’s examined the test for validity. If you do puts you in top 8%!
- 88.4% reported that they administer CNT’s to football players.
- 78.8% administer CNT’s to women’s soccer players.
- 71.2% administer CNT’s to men’s soccer players.
- 95.5% stated that they would not return a symptomatic athlete to play if the athlete’s neurocognitive scores were back to baseline.
- 96.5% stated that they not return a symptom free athlete whose scores were below baseline to play.
- 9.8% responded yes they would return such an athlete.
- 8.8% said it depended upon the importance of the competition.
- AT’s in this study reported that they relied more on symptoms than neurocognitive test scores when deciding return-to-play.

Learning is a lifetime endeavor. Concussion test norms should reflect that. Age 7 to over 90 does it.

Concussion Vital Signs normative sample of 1069 characteristics are:
- Sample subjects were in good health.
- Sample subjects had no past or present psychiatric or neurological disorders, head injury, or learning disabilities.
- Sample subjects were free of any centrally acting medications.
- Due to rapid brain development at early ages those groups had more frequent subdivisions.

Concussion Vital Signs normative sample subjects range in age from 7 to 90.

The table below lists the age bands each subject was placed in. The subgroups include the range of ages. Note that this is a normative sample that is not intended for use in specific clinical settings.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>100</td>
</tr>
<tr>
<td>11-12</td>
<td>200</td>
</tr>
<tr>
<td>13-15</td>
<td>300</td>
</tr>
<tr>
<td>16-18</td>
<td>400</td>
</tr>
<tr>
<td>19-20</td>
<td>500</td>
</tr>
<tr>
<td>21-25</td>
<td>600</td>
</tr>
<tr>
<td>26-30</td>
<td>700</td>
</tr>
<tr>
<td>31-36</td>
<td>800</td>
</tr>
<tr>
<td>37-42</td>
<td>900</td>
</tr>
<tr>
<td>43-48</td>
<td>1000</td>
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<tr>
<td>49-54</td>
<td>1100</td>
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<tr>
<td>55-60</td>
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<tr>
<td>61-65</td>
<td>1300</td>
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<tr>
<td>66-70</td>
<td>1400</td>
</tr>
<tr>
<td>71-75</td>
<td>1500</td>
</tr>
<tr>
<td>76-80</td>
<td>1600</td>
</tr>
<tr>
<td>81-85</td>
<td>1700</td>
</tr>
<tr>
<td>86-90</td>
<td>1800</td>
</tr>
</tbody>
</table>

The Concussion Vital Signs normative data is presented in ten age groups: less than 10 years old, 10-14, 15-19; in decades to 70; and finally, 80 years or older.
"Try It" Pilot program.

The CVS "Try It" program provides 250 free student licenses for school districts and 50 free licenses for clinics working with students.

Restrictions apply: The district, clinic or medical provider will pay the regular license fee price for any "Try It" licenses over their free "Try It" licenses. To qualify for the "Try It" pilot program, you must agree to the following conditions:

1. "Try It" licenses will be provided for no more than 250 student licenses per school district or 50 student patients per clinic or medical provider for the 2013-2014 school year.
2. Participants must agree to the CVS License Agreement to qualify and participate in the "Try It" pilot program.
3. "Try It" licenses include one baseline assessment and no more than two post-injury assessments per student patient.
4. Any student or student patient baseline assessment must be concluded before November 30, 2013, to participate in the "Try It" pilot program.
5. Schools use the promo code: "fallpilot"; Clinics use the promo code: "clinicpilot".
After you click “athlete testing” this window will pop up:

All Athletes will use the same user name and password that you provided!

Important:

Athlete Reference/ID

**Athlete Identification:**

3. **ENTER** the Athlete Reference/ID (Athletes can use text font and CLICK the Text Button)

**Important:** The Athlete Reference/ID is generally assigned based on school policy and should be a unique identifier used throughout the athlete’s career. The baseline testing and post-concussion testing is recorded via a user-generated impact by the athlete referring to the Athlete Reference/ID.

**Important:** What distinguishes an athlete’s test is this Athlete Reference/ID. You or your policies will determine how to generate Athlete Reference IDs & you will communicate this to your athletes. Example: CS012774 (initials, DOB-dmmmyy)

Next Confirm: Athlete Reference/ID

Identify

Type of assessment,

Supervision,

Testing Environment.

**Concussion Vital Signs**

**Athlete Testing**

www.concussiovitalsigns.com
Take the test!

- Required: Computers with internet access.
- Time: about 30 minutes.
- Rested, Unhurried athletes.
- Set the frame clearly for athletes: "Your Brain is Your Life. Take this seriously."
- Do not distract each other.
- If you don’t listen to the instructions your report will be invalid.
- You will take it again until it is valid.
- Until your test is valid you don’t practice for your sport.
- Use a Setting with limited distractions.
- Use Similar settings across administrations.

Note to those administering the test: Take it yourself a few times so you will know how to orient athletes to the test. Also, read: Resources: Test Administration Guide.

Athlete History Can come later by athletes or parents.

Administrative Login: Reviewing Athletes Reports

Remember:
You created your admin user and password at registration.
You will not get your admin password in the email so remember it or write it down!
After Admin Login

The Account folder is presented.

This folder will allow for report viewing, logging of account activity, viewing history, providing for the development of rosters...

From here you can also enable and edit the account’s profile, set up rosters, retire athletic records, and an athlete’s demography.

Administrative Features
Default Assessments in last 60 days.

Quick Search with Partial Name
Cool Admin Feature:
Search All Invalid Tests in last X days.

Cool Report Feature:
Which subtest was invalid?

Baseline Testing:
Quick Scan of Validity Indicators
Tells you why.

This Example:
NCI, CPT & Choice Reaction Time All Invalid!
Reviewing post-injury reports.
After validity, back to baseline?

See this example in resources: 1st post-injury report, p. 1
"1st Post Injury report".
1st?: is it valid?
2nd?: is he back to baseline?

Reviewing post-injury reports
Graphic clarity.

See this example in resources: 1st post-injury report, p. 2.
Quick scan tells you how far the athlete is from baseline.

Reviewing 2nd post-injury report
Graphic clarity.

See this example in resources: 2nd Post Injury report, p. 2.
Is he back to baseline?
Again, quick scan tells you how far the athlete is from baseline.

Data goes directly to same URL as baseline and follow up tests.

**Pocket Scat 2**

Concussion Evaluation: SCAT2

Standardized Assessment of Concussion: SAC

Immediate Memory

Concentration
Continuity of care made easy:
Clinician's Portal.

Additional Clinical Training not required.

Parents provide Clinicians with pertinent info.

Needed to access report online:
2. Clinician registration.

Concussion Vital Signs Product Training

• Provided to Physician by Parent
• Physician administers post-injury
• Can pre-pay for an account to speed testing
• Clinician’s can purchase a bundle for “Concussion Clinic”
• Do not have to have a "CNSVS" approved doctor, freedom to choose your own physician.
• Improves communications between parents, trainers, physicians
• Allows physician to see full concussion history if parents provide access
• Billing codes: 96118, 96120

How might you recover from poorer sustained attention?

Cogmed Working Memory Training has been shown to improve working memory and attention in over 25 peer-reviewed published studies.

All the products share the same underlying design – the only difference is in the user interface.