Linking Physical Therapy Concussion Management Practice to Research and Research to Practice

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Jason Hugentobler, PT, DPT, SCS, CSCS
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Disclosures

• Catherine Quatman-Yates
  – Member of APTA sponsored Concussion CPG Development Team
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• Jason Hugentobler
  – Evidence in Motion Concussion Program Faculty
  – Ohio EMS Grant (2), Cincinnati Children’s Trustees Program Award (2)

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• Katie Hugentobler, PT, DPT, MBA
• CCHMC OTPT leadership and staff
• CCHMC sports medicine physicians and staff
Learner Objectives

- Identify at least one potential opportunity to bridge the evidence practice gap for concussion management within your clinical practice or setting.

- Identify at least one potential barrier and corresponding strategy to bridge the evidence practice gap for concussion management within your clinical practice or setting.

INTRODUCTION

EBP in Healthcare

- 1992: “Evidence based medicine” introduced by Guyatt to shift emphasis in clinical decision making from “intuition, unystematic, clinical experience, and pathophysiologic rationale” to scientific, clinically relevant research

- 1996: Sacket et al.—Emphasis on a combination of clinical expertise and patient’s preferences

- 2008: US Congress asks IOM to undertake a study on best methods used in developing clinical practice guidelines; IOM report—standards should be created, mechanisms should be created to support EBP practices

- 2011: IOM publishes Clinical Guidelines We Can Trust; Guidelines.gov embraces the standards

- 2013/14: IOM standards revised with greater emphasis on better transparency of systematic review process and synthesis processes and the processes used to form guidelines
Recognized EBP Barriers

- There is no adequate evidence available
  - Or there is but clinicians may...
  - Be unaware
  - Disagree with it
  - Have trouble accessing it
  - Have trouble knowing how to apply it
  - Experience cultural and/or system barriers

Cincinnati Children’s Division of OTPTTR Evidence Based Practice Journey
Scientific Discovery and Dissemination

- Discovery Identification and Synthesis (BESts and Guidelines)
- Discovery Integration and Care Quality Improvement
- Practice-Based Evidence Discovery
- - IRB Approved Registry and Pilot Project Data Extractions in Progress
- - 7 PhD trained clinicians, more in progress
- - $5 in Grant Funding
- - 70 peer reviewed publications
- - 75 ESP Guidelines/Write Statements
- - 10 RCIC Teams
- - 8 I2S2 Projects
- - 2 AIM projects
- - 1 I2S Success

Practice-Based Evidence Discovery

- - IRB Approved Registry and Pilot Project Data Extractions in Progress
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Percentage of CMT Patients Achieving Full Resolution within 6 Months

Self-Assessment Activity

How Can We Work Together to Build Evidence-Practice Bridges?

- **Supportive Infrastructure (QI)**
  - High capacity to integrate evidence at the point of care

- **Evidence-Based Practice (EBP)**
  - High capacity to generate evidence at the point of care

- **Practice-Based Evidence (PBE)**
  - High capacity to generate evidence at the point of care

- **Research**

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What is your practice setting already doing well in terms of bridging the evidence-practice gap?

Opportunities for bridging the evidence-practice gap in your practice setting?
Key Limitations and Barriers

Brief Recap...

Infrastructure

TBI (starting with mild)

Way back when...
An estimated 1.6 - 3.8 million people sustain TBIs each year in the U.S.

The majority are mild TBI or concussions.

Head injuries ≠ Brain injuries.

Conventional imaging may NOT capture structural damage.

MOST mild TBIs result in only short-term functional limitations.

10-30% of mild injuries result in prolonged symptoms and functional impairments.

For those with prolonged symptoms—it can be very DISRUPTIVE to the child’s and family’s daily life.
TBI is one of the most prominent known environmental risk factors for long-term neurodegenerative sequelae…

Not just a “brain” injury

- Musculoskeletal system
- Vestibular system
- Oculomotor system
- Sensorimotor processing
- Motor coordination
- Exertional/autonomic adaptation

And these are just the systems, PTs are most directly concerned with…

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Rebekah Mannix—Prognostic Biomarkers and Genetic Markers in Prod. Concussion (Figure courtesy of Ron Hayes)

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Rebekah Mannix—Prognostic Biomarkers and Genetic Markers in Prod. Concussion (Figure courtesy of Ron Hayes)
Body of Evidence Surrounding PT Concussion Assessments

All mTBI Studies
Diagnostic Evaluation and Medical Management
PT Scope of Practice
Valid and Reliable for Our Needs?

It may be able to capture impairments acutely and at a population level, but how do these translate into individual patients?

Proliferation of options, but very few direct comparisons—can we really say one is better than the other?

An assessment technique may be more sensitive from a research perspective, but does the benefit outweigh the cost of implementation?

If designed for the sideline, how useful is it for us in the clinic?

Is this truly within a PT’s scope of practice?

Can we simply borrow from other PT assessment techniques, even though studies specific to concussion have not been done?

8 studies...a few more since then

Physical Rehabilitation Interventions for Post-mTBI Symptoms Lasting Greater Than 2 Weeks: Systematic Review

Research Report
CCHMC PT Concussion Management Program
Evidence-based classification system

### Evidence-based classification system

**Concussion**
- Initial assessment
  - If weeks
- Secondary assessment
  - No symptoms at rest
- Sensations at rest
- Sensation at rest

**Graded Treadmill Test**
- Sensation at rest
- Sensation at rest

**Physiologic PCD**
- Vestibulo-ocular PCD
- Cervicogenic PCD

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### Post-concussion classification

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### Evaluation of post-concussion disorders

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### Physiologic post-concussion disorder (PCD)
- Sensory symptoms: dizziness, light-headedness, imbalance, fatigue, and emotional instability.
- Vestibulo-ocular symptoms: visual disturbances, photophobia, and sensitivity to light.
- Physiologic symptoms: headache, fatigue, and sleep disturbances.

### Vestibulo-ocular PCD
- Vestibulo-ocular symptoms: visual disturbances, photophobia, and sensitivity to light.

### Cervicogenic PCD
- Cervicogenic symptoms: neck pain, stiffness, and muscle spasms.

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### Management options

- Physical therapy
- Vestibular rehabilitation
- Cervical spine therapy
- Cognitive behavioral therapy
- Education and support groups
- Physical and occupational therapy

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What are we seeing?

- "Typical" Athlete vs Athlete with PCS
  - Typical athlete will progress through RTP stepwise progression
  - Pass all Concussion Testing
- Athlete with Post-Concussion Syndrome
  - PCS can occur in up to 14% of athletes 6-18 – OLD DATA (pre 2010)
  - Between 20-30% at CCHMC have prolonged recovery
    - Zemek et al. 2016 – Pediatric Emergency Research Canada (PERC)
      - 3063 pts from 8/13 – 10/14 → 883 (31%) had persistent post-concussion symptoms 28 days later
  - WHO = 3 or more symptoms for > 6 weeks
    - Headache, dizziness, fatigue, intractability, insomnia, concentration difficulty, memory difficulty
  - Predictors of protracted recovery (Lau, 2011)

Role of PT CCHMC Model

Call Over Tests and Measures

Postural Control

- Why?
  - Control of posture requires the CNS to process and integrate information from visual, somatosensory and vestibular systems to produce an appropriate and coordinated response
  - Concussion injuries can often disrupt or lead to changes in these processes (Guskiewicz, 2011; De Beaumont et al., 2011; Cavanaugh et al., 2006; Riemann, et al., 2000)
  - Injury to corticospinal tract and corticoreticular pathway associated following mTBI (Lee HD, Jang SH 2015, Jang SH, Kim SY 2015)
Balance Error Scoring System

- **Equipment needs:**
  - Foam pad
  - Stop watch
  - Spotter
  - BESS testing protocol
  - BESS score card
- **Stance positions:** bipedal, single limb, tandem
  - Floor/ground surface
  - Foam surface
Balance Error Scoring System

- Each trial is 20 seconds
- Errors include:
  - Moving hands off iliac crests
  - Opening eyes
  - Step, stumble or fall
  - ABD or FLX of hip beyond 30°
  - Lifting forefoot or heel off of the testing surface
  - Remaining out of the proper test position for > 5 seconds

Limitations to BESS

- Designed as a sideline test (3-5 days post-injury)
  - Our patients are often 5+ days post-injury
- Tested with college athletes
  - Hip strength had likely stabilized vs. maturational changes
  - Pre-season baseline assessments vs. normative estimates
- Need for challenging stances
  - More difficult for youth?
- Observer-rated
  - Too subtle to detect with eye? Rater reliability issues?
- Learning Effects

Role of PT CCHMC Model

- Activity/Exercise Tolerance
- Balance Training
- Vestibular Therapy
- Gaze Stability
- Dual Tasking

Call Over Tests and Measures

Athletes with Protracted Recovery

Full Evaluation and Treatment
King-Devick (K-D) test

- Rizzo et al. “methodology for assessment of normative data for the king-devick test”
  - Slowed reading times acutely concussed
  - Looked at normal behavior of eyes
  - 12 controls
    - K-D reading time 51.24 (+/- 9.7) seconds
    - Total of 145 saccades (+/-15)
    - Average peak velocity 299.5 deg/s
    - Subjects with fewest saccades tended to blink more causing larger missed data/errors

History

- Timeline of events (Pt and Parent)
  - When did injury occur
  - Injury mechanism
  - Description of onset of symptoms
  - Description of current symptoms
- Previous concussion/head injury history
- Previous lower extremity or spinal injury
- ADHD/other health-related concerns
- Activity level prior to injury (sports, school, etc)
- Pertinent family history

Rehab A → Z

1. Symptoms/Vitals
   - Beginning and periodic
2. Aerobic Exercise
   - Manual Therapy
   - Stretching
   - Strengthening/Resistance
   - Sport-specific/Interval training
   - Balance/Vestibular/Oculomotor
3. Patient Education
Vitals are VITAL

Light Aerobic Exercise

- Growing literature
- Prolonged rest can lead to deconditioning, depression, and fatigue
- Consensus recommends intensity of < 70% of maximum predicted heart rate (McCrary et al., 2012)
  - Study by Leddy et al. used 80% of symptom threshold HR

Aerobic Exercise

- Mode of Exercise
  - Bike
  - Treadmill
  - Clinic Area
  - Elliptical
  - Swimming
- Intensity of Exercise
  - HR
  - Perceived Exertion
- Time

http://maxform.com/a-simple-workout-intensity-scale-sppa
Symptom Re-assessment within session

Pay attention to:
- Headache
- Nausea
- Balance problems
- Dizziness
- Fatigue
- Sensitivity to light/sound
- Feeling slowed down
- Visual problems

Don’t pay attention to:
- Trouble falling asleep
- Sleeping more/less
- Irritability
- Sadness
- Nervousness
- Feeling more emotional

Rehab A → Z

1. Symptoms/Vitals
   - Beginning and periodic

2. Aerobic Exercise
   - Manual Therapy
   - Stretching
   - Strengthening/Resistance
   - Sport-specific/Interval training
   - Balance/Vestibular/Oculomotor

3. Patient Education
Manual Therapy

- Joint Mobility
  - Upper vs Lower Cervical
  - Upper Thoracic
- Soft-tissue Mobility
  - Suboccipital region
  - Scalenes
  - Upper Trapezius
  - Levator Scapulae
  - SCM
- Headaches

Cervicogenic Headache (CEH)

- Systematic Review 2012 (Chaibi)
  - 7 RCT’s
    - Physiotherapy
    - Cervical spinal manipulative therapy (SMT)
  - RCT’s suggest that physiotherapy and SMT might be an effective treatment in management of CEH
- Other causes of headache
  - Tension-type
  - Migraine
  - Autonomic Dysfunction

Headaches

Migraine

- Recurs every 3-72 hours
- Headache localized to head or neck
- Headache relieved by rest or administration of aspirin or other pain-relieving drug

Tension Headache

- Temporal–Occipital Headache
  - Headache localized to temple and occipital areas
- Headache relieved by rest or administration of aspirin or other pain-relieving drug

Cervicogenic Headache

- Tension type headache associated with pericranial tenderness
- Evidence that pain is attributed to a neck disorder or lesion within the cervical spine or soft tissues
- Clinical features may include neck pain, focal neck tenderness, history of trauma, mechanical exacerbation of pain, unilaterality, shoulder pain, decreased cervical ROM, nausea, photophobia, phonophobia
- Pain resolves within 3 months of successful treatment of the underlying cause

*International Headache Society Classification of Headache Disorders 3rd edition*
Stretching/Strengthening Exercise

• NO Evidence in Concussion
  – Ylinen et al. 2010 RCT – Neck Ex and CEH
  • Stretching was LESS effective alone than when combined with muscle endurance and strength training
  • Focus on DNFs and Scapula

• Mechanism of Injury:
  – Whiplash
  – Rotational

• Posture Presentation

Deep Neck Flexor Endurance Test

• Range of norms
  – 20-40 seconds

• Neck pain
  – 20-25 seconds

http://ptjournal.apta.org/content/ptjournal/85/12/1349/F2.small.jpg
Strength Training

- Follow stepwise progression
  - Light resistance initially
- Set parameters
  - Sets, reps, resistance, rest times
- If asymptomatic during exercise → progress
  - Need to account for cumulative effect of exercise
- Collins et al 2014 → 6600 HS athletes
  - Concussed vs uninjured
    - Smaller mean neck circumference
    - Small mean overall neck strength

Vestibulo-ocular dysfunction in pediatric SRC

- 76% → acute SRC (less than 30 days)
  - 29% → criteria for VOD
- 24% → post-concussion syndrome
  - 63% → criteria for VOD
- Evidence of VOD acutely → greater chance of developing PCS

VOMS

- Designed for use with subjects ages 9-40
  - When used with patients outside this age range, interpretation may vary
- Abnormal findings or provocation of symptoms with any test may indicate dysfunction
  - Help to guide treatment
VOMS Equipment

- Tape measure (cm)
- Metronome
- Target w/ 14 point font print
  - Provided to each of the satellites
  - Re-usable tongue depressor with “E”
- Scoring sheet
- Instruction reference sheet

VOMS

- Baseline symptom assessment 0-10 scale
  - Headache
  - Dizziness
  - Nausea
  - Fogginess

Smooth Pursuits

- Test the ability to follow a slowly moving target
- The patient and the examiner are seated
- The examiner holds a fingertip at a distance of 3 ft. from the patient
- The patient is instructed to maintain focus on the target as the examiner moves the target smoothly in the horizontal direction 1.5 ft. to the right and 1.5 ft. to the left of midline
- One repetition is complete when the target moves back and forth to the starting position, and 2 repetitions are performed
- The target should be moved at a rate requiring approximately 2 seconds to go fully from left to right and 2 seconds to go fully from right to left
- The test is repeated with the examiner moving the target smoothly in the vertical direction 1.5 ft. above and 1.5 ft. below midline for 2 complete repetitions up and down
- Again, the target should be moved at a rate requiring approximately 2 seconds to move the eyes fully upward and 2 seconds to move fully downward
- Record: Headache, Dizziness, Nausea & Fogginess ratings after the test
VOMS

• Smooth Pursuit PRACTICE

VOMS

• Saccades- horizontal and vertical
  – Test the ability of the eyes to move quickly between targets
  – Patient and examiner are both seated for testing

VOMS

• Horizontal saccades
  – The examiner holds two single points (fingertips) horizontally at a distance of 3 ft. from the patient, and 1.5 ft. to the right and 1.5 ft. to the left of midline so that the patient must gaze 30 degrees to left and 30 degrees to the right
  – Instruct the patient to move their eyes as quickly as possible from point to point
  – One repetition is complete when the eyes move back and forth to the starting position, and 10 repetitions are performed
  – Record: Headache, Dizziness, Nausea & Fogginess ratings after the test
• Vertical saccades
  – Repeat the test with 2 points held vertically at a
distance of 3 ft. from the patient, and 1.5 feet above
and 1.5 feet below midline so that the patient must
gaze 30 degrees upward and 30 degrees downward
  – Instruct the patient to move their eyes as quickly as
possible from point to point
  – One repetition is complete when the eyes move up
and down to the starting position, and 10 repetitions
are performed
  – Record: Headache, Dizziness, Nausea & Fogginess
ratings after the test

• Horizontal and Vertical Saccade

  • Convergence
    – Measure the ability to view a near target without double vision
    – The patient is seated and wearing corrective lenses (if needed)
    – The examiner is seated in front of the patient and observes their eye movement during this test
    – The patient focuses on a small target (approximately 14 point font size) at arm’s length and
slowly brings it toward the tip of their nose
    – The patient is instructed to stop moving the target when they see two distinct images or when
the examiner observes an outward deviation of one eye
    – Blurring of the image is ignored
    – The distance in cm. between target and the tip of nose is measured and recorded
    – This repeated a total of 3 times with measures recorded each time
    – Record: Headache, Dizziness, Nausea & Fogginess ratings after the test
    – Abnormal: Near Point of convergence 2-6 cm from the tip of the nose
      • ≥ 4 cm for measurement of true change + symptom ↓
VOMS

• Convergence

VOMS

• Vestibular-Ocular Reflex (VOR) Test
  – Assess the ability to stabilize vision as the head moves
  – The patient and the examiner are seated
  – The examiner holds a target of approximately 14 point font size in front of the patient in midline at a distance of 3 ft

VOMS

• Horizontal VOR Test
  – The patient is asked to rotate their head horizontally while maintaining focus on the target
  – The head is moved at an amplitude of 20 degrees to each side and a metronome is used to ensure the speed of rotation is maintained at 180 beats/minute (one beat in each direction)
  – One repetition is complete when the head moves back and forth to the starting position, and 10 repetitions are performed
  – Record: Headache, Dizziness, Nausea and Fogginess ratings after the test is completed
**VOMS**

- **Vertical VOR Test**
  - The test is repeated with the patient moving their head vertically
  - The head is moved in an amplitude of 20 degrees up and 20 degrees down and a metronome is used to ensure the speed of movement is maintained at 180 beats/minute (one beat in each direction)
  - One repetition is complete when the head moves up and down to the starting position, and 10 repetitions are performed
  - Record: Headache, Dizziness, Nausea and Fogginess ratings after the test

**VOMS**

- **Near Point Convergence and VOR (vertical and horizontal) practice**

- **Visual Motion Sensitivity (VMS) Test**
  - Test visual motion sensitivity and the ability to inhibit vestibular-induced eye movements using vision
  - The patient stands with feet shoulder width apart, facing a busy area of the clinic
  - The examiner stands next to and slightly behind the patient, so that the patient is guarded but the movement can be performed freely
  - The patient holds arm outstretched and focuses on their thumb
  - Maintaining focus on their thumb, the patient rotates, together as a unit, their head, eyes and trunk at an amplitude of 80 degrees to the right and 80 degrees to the left
  - A metronome is used to ensure the speed of rotation is maintained at 50 beats/minute (one beat in each direction)
  - One repetition is complete when the trunk rotates back and forth to the starting position, and 5 repetitions are performed
  - Record: Headache, Dizziness, Nausea & Fogginess ratings after the test
VOMS

• VMS Test PRACTICE

Sports Specific Return to Play

IJSPT article May et al. 2014

• Football
• Gymnastics
• Cheerleading
• Wrestling
• Soccer
• Basketball
• Lacrosse
• Baseball
• Softball
• Ice Hockey
### Appendix A

#### Return to Physical Activity Following Concussion

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<th>Activity</th>
<th>Soccer Specific Exercise</th>
<th>Objective of the Stage</th>
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<td>Recovery and elimination of symptoms</td>
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<td>Light activity (light jogging, light stretching)</td>
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<td>Increase aerobic activity and monitor for symptom recurrence</td>
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<tr>
<td>3</td>
<td>Moderate activity (light resistance training)</td>
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<td>Increase aerobic activity and monitor for symptom recurrence</td>
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<td>4</td>
<td>Non-contact football specific skills</td>
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<tr>
<td>5</td>
<td>Limited contact football skills</td>
<td>Limited contact football skills</td>
<td>Increase aerobic activity and monitor for symptom recurrence</td>
</tr>
<tr>
<td>6</td>
<td>Full contact (after medical clearance)</td>
<td>Full contact (after medical clearance)</td>
<td>Increase aerobic activity and monitor for symptom recurrence</td>
</tr>
<tr>
<td>7</td>
<td>Return to play</td>
<td>Return to play</td>
<td>Increase aerobic activity and monitor for symptom recurrence</td>
</tr>
</tbody>
</table>

* Progress to the next stage may occur every 24 hours as long as symptoms do not recur. *

* It is recommended that you seek further medical attention if you feel that more than 3% damage occurs in a stage. *
Sport-specific/Interval Training

- Criteria
  - Steady decline in symptoms
  - Able to remain symptom free during aerobic portion of exercise
  - Increasing resistance levels with strength exercise
- Begin with appropriate work:rest ratio
  - Example: 10 seconds on: 50 seconds off

Wrestling
- Lacrosse
- Soccer
- Football
- Baseball

Registry Research

- 175 patients (108 females, 67 males; mean age 14.2 years; range, 6-21 years)
- November 1, 2014 to January 31, 2016
- Tolerability
- Outcome
Tolerability

- Tolerability was measured in two ways:
  - 1) symptom changes between the beginning and end of initial evaluation session measured by the Post-Concussion Symptom Inventory (PCSI)
  - 2) an unplanned visit to an emergency department, urgent care, or pediatrician’s office for symptom exacerbation any time during the PT episode of care
- Initial exam session PCSI changes were categorized into:
  - improved/no symptom changes
  - mild increase (1-10 points)
  - large increase (11 or more)

Mean duration of care 53.7 days (about 8 weeks)
- No patients needed emergent care during or immediately following an in-clinic or home exercise session
- Seven patients (4.0%) sought additional care due to symptom exacerbation at some point prior to discharge
- Changes in PCSI during the initial evaluation session were as follows:
  - 31 (17.7%) patients reported improvement or no change
  - 106 (60.6%) reported a mild increase
  - 38 (21.7%) reported a large increase in symptoms.
- Safety and tolerability indicators did not differ between the early, middle, or late cohorts (p < .05).

Impairments

- Classify the type of impairments present
  - Musculoskeletal
  - Physiological
  - Vestibulo/Ocular
  - Sensorimotor
- Impairment classifications were based on a set of pre-determined criteria relative to the standardized assessment and documentation protocols used by physical therapists at the institution.
Outcome

• Outcome
  – Good
  – Fair
  – Poor
  – Unable to be determined

• Outcome classifications were based upon a predetermined set of criteria relative to:
  – Post-Concussion Inventory Symptom Scale (PCIS) scores
  – Outcome measures
  – Resolution of documented physical exam impairments
  – Return-to-pre-injury activity

Impairments

• Impairments identified
  – 86.3% had musculoskeletal impairments
  – 74.7% had physiologic impairments
  – 87.9% had vestibulo-ocular impairments

Impairments and Outcomes

• Outcome classifications resulted in:
  – 108 (61.7%) GOOD outcome
  – 48 (27.4%) FAIR outcome
  – 6 (3.4%) had poor outcomes or showed no improvement
  – 13 (7.4%) had outcomes that were unable to be determined due to no follow-up after initial evaluation
Outcomes

- A subset of 137 patient records had both PCSI from initial and final visits assessments available.
- 85 female, 52 male (mean 14.38 ± 2.46 years)
- There was a statistically significant decrease in PCSI scores from initial visit (22.1 ± 20.86) to the final visit (9.15 ± 15.35) (p < .001).
- The mean decrease in scores was 12.95 with a 95% CI ranging from (CI of 9.6 to 16.28).
Improvement Planning Activities

High-Level Process Map Worksheet

Process: Staff "Productivity" Reports

Beginning Boundary: Staff treat patients/complete projects

Ending Boundary: Goal setting and action planning for next year

Customers: Frontline Clinicians

Outputs/Outcomes: Quantitative Dashboards of Individual, Team, and Divisional "Productivity"

Start

Stop
Map Your Chosen Process

High-Level Process Map Worksheet

Process:

Beginning Boundary:

Ending Boundary:

Customers:

Outputs/Outcomes:

Start

Stop

Process Name _________________________________

CURRENT PROCESS

FAILURE MODES

INTERVENTIONS

FAILURE MODES

INTERVENTIONS
I struggle to know what ball to catch. I think about the many tasks at hand and not many make it onto my to-do list. I find it hard to remember why I'm working. I struggle to know how to tell my supervisor about the issues that I'm facing. I take a list of tasks to the staff meeting, but it's not enough.

I can't control the billable time I manage. I struggle to get feedback from supervisors. I realize the site volume, low census, and low control of clinician staff are outside of their control. I don't meet goal because some of the activities I'm facing are not meeting goal.
### Division of OTPT Structure

200+ OTs, PTs, TRs
- Outpatient Neurodevelopmental (150+ therapists)
- Sports/Orthopedic (28+ therapists)
- Inpatient (18+ therapists)

### Target Testing Population

- Sports/Ortho PTs (~28 FTE)
- Highly motivated to perform well in patient care and value-added activities
- Similar style of patient flows
  - 2-3 visits per week
  - High volume during "Family Friendly Hours"
  - Lower volume during school day
  - Seasonal ebbs and flows in volume
- Design and implement at Winslow then spread to other Sports/Ortho sites
- Eventually spread to inpatient and outpatient ND teams

### How do CCHMC PT clinicians spend their time?

Billed Units → Partial Transparency

Non-Billed Time Utilization → ?
Operational Definition

1. We know how time was spent
2. Able to aggregate for individual and group levels

\[ \text{Transparent Time Utilization} = \frac{\text{Billed Time} \times \text{Non-Billed Time}}{\text{Total Hours Paid for the Week}} \]

---

Increasing the Transparency of OT and PT Clinicians’ Clinical Excellence Activities

Key Driver Diagrams (KDD)

Project Leader(s): Catherine Quatman

Revision Date: 1/9/2017 (v4)

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<table>
<thead>
<tr>
<th>Test</th>
<th>What</th>
<th>Who (population)</th>
<th>When</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST 1</td>
<td>Excel Feasibility</td>
<td>CQ</td>
<td>7/6/16 - 7/6/16</td>
<td>Abandon</td>
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<tr>
<td>TEST 2</td>
<td>Access Feasibility</td>
<td>CQ</td>
<td>7/8/16 - 7/29/16</td>
<td>Abandon</td>
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<tr>
<td>TEST 3</td>
<td>Outlook Feasibility</td>
<td>CQ</td>
<td>8/8/16 - 8/15/2016</td>
<td>Adapt</td>
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<td>TEST 4</td>
<td>Outlook Categories Codes</td>
<td>CQ, MP, CZ, JH</td>
<td>10/3/2016 - 10/3/2016</td>
<td>Adapt</td>
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<th>Test</th>
<th>What</th>
<th>Who (population)</th>
<th>When</th>
<th>Act</th>
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</thead>
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<tr>
<td>TEST 1</td>
<td>Outlook appt subject lines</td>
<td>Team leader</td>
<td>7/7/16 - 7/15/16</td>
<td>Adapt</td>
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<tr>
<td>TEST 2</td>
<td>Outlook theme builds</td>
<td>Winslow PTs</td>
<td>7/11/16 - 7/25/16</td>
<td>Adapt</td>
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<tr>
<td>TEST 3</td>
<td>3 non sports clinicians</td>
<td>AB, JL, KH</td>
<td>7/27/16 - 8/3/16</td>
<td>Adapt</td>
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<tr>
<td>TEST 4</td>
<td>Tracking Tip Sheet</td>
<td>Mason team</td>
<td>11/7/2016 - 11/12/2016</td>
<td>Adopt</td>
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</table>

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<th>What</th>
<th>Who (population)</th>
<th>When</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST 1</td>
<td>Tracking consistency self-report</td>
<td>CQ</td>
<td>8/9/16 - 8/9/16</td>
<td>Adapt</td>
</tr>
<tr>
<td>TEST 2</td>
<td>Self-report consistency aggregated</td>
<td>6 participants</td>
<td>8/9/16 - 8/10/16</td>
<td>Abandon</td>
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<tr>
<td>TEST 3</td>
<td>Evaluate current billed time tracking</td>
<td>Sports/ortho team</td>
<td>9/8/16 - 9/10/2016</td>
<td>Adapt</td>
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<tr>
<td>TEST 4</td>
<td>Metrics for billed time simulations</td>
<td>Sports/ortho team</td>
<td>9/12/2016 - 9/20/2016</td>
<td>Adapt</td>
</tr>
</tbody>
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Quality Transformation April 6, 2007

1. Tracking System
2. Habit of Tracking
3. Data Aggregation
System for Tracking Non-Billed Activities

<table>
<thead>
<tr>
<th>Category Description</th>
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<tbody>
<tr>
<td>Administrative Random activities</td>
</tr>
<tr>
<td>Commute/Travel Time Commuting</td>
</tr>
<tr>
<td>Direct Patient Care Patient care</td>
</tr>
<tr>
<td>Documentation Notes completed outside of clinic</td>
</tr>
<tr>
<td>EBP/QI/Registry/Outcomes Activities related to EBP, QI, Registry, or Outcome efforts</td>
</tr>
<tr>
<td>Educator/Mentor Efforts Activities that involve the act of teaching or mentoring</td>
</tr>
<tr>
<td>Indirect Patient Care Activities other than notes associated with patient care</td>
</tr>
<tr>
<td>Lunch/break Break and no other activity occurs during this time</td>
</tr>
<tr>
<td>On-field For sports residents</td>
</tr>
<tr>
<td>Outreach Community outreach</td>
</tr>
<tr>
<td>Professional Development CEUs, trainings</td>
</tr>
<tr>
<td>Research Activities associated with grant funded research projects</td>
</tr>
<tr>
<td>Service Time spent on meetings or deliverables pertaining to service role</td>
</tr>
<tr>
<td>Training Room Sports resident training room time</td>
</tr>
<tr>
<td>Unknown 15 min or greater slot of time in which you cannot recall what occurred</td>
</tr>
</tbody>
</table>

Outlook Aggregator

Trackers Share Calendar with Full Details

Ortho/Sports Team Weekly Time Transparency (Billed Time Non-Billed Time/Paid Time) from 4/24/16 - 12/18/16
Getting a 2nd parking pass, saves me 6 hours of commuting per week.

I had to do a lot of tracking for my residency hours anyway—this system got all my tracking in one place and allows my mentors to view it in real-time.

I enjoy tracking as it shows me where my time is spent and honestly I think it keeps me on task.

Putting a few minutes each day allows me to see that I am making progress, even when it doesn’t feel like it.

In just the first week, I realized about 20 tasks I should have delegated or said no to doing...I won’t be making those mistakes again!

Keeping track encourages me to use my time wisely...I want my calendar to be full of productive time.

Staff perceptions of new system...
Draft a SMART Aim and Key Driver Diagram

<table>
<thead>
<tr>
<th>Global Aim</th>
<th>Key Drivers</th>
<th>Interventions (LOR #)</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Adopted: Intervention (LOR #)
- Potential intervention
- Active intervention
- Abandoned: Intervention (LOR #)

Plan your first small test of change

- **Plan**
  - What will you do and which driver will it target?
  - Who will be in your testing group?
  - When will you do it and for how long?
  - How will you assess whether change is helpful or not?
  - What do you predict will happen?

- **Do**
  - Carry out the test

- **Study**
  - How did your results align with your prediction?
  - What went well?
  - What did not work well?

- **Act**
  - Will you adopt, adapt, or abandon the change?
Questions?

• Follow-up contact information
  – catherine.quatman@cchmc.org
  – jason.hugentobler@cchmc.org

Appendix

Deliverable Selection

What are you hoping to accomplish?

- Evidence summary
- Annotated bibliography
- Narrative
- Review/Commentary
- Systematic Review
- Meta-Analysis
- Clinical Practice Guidelines

What expertise and motivation elements do you need?

- Education
- Visual cues or alerts
- Case algorithms
- Tracking/audits for care bundle completion
- QI projects/PDSA ramps for improvement

What resources do you have available?

- Case studies or small scale retrospective case series
- Prospective small scale studies
- Prospective large scale studies
- PBE/registry studies
Deliverable Selection

What are you hoping to accomplish?  
What expertise and motivation elements do you need?  
What resources do you have available?

Evidence Awareness:
- Evidence summary (no plan to publish)
  → 1 or more people, systematic search of literature, table for relevant studies
  - Annotated bibliography (no plan to publish)
    → 1 or more people, evidence summary/table expansion focused on direct utility and take home points, gaps in knowledge
  - Narrative Review/Commentary (plan to publish)
    → 1 or more people, writing skills, large blocks of dedicated time
  - Systematic Review (plan to publish)
    → 3 or more people, methodological expertise, large blocks of dedicated time, writing skills
  - Meta-Analysis (plan to publish)
    → 3 or more people, methodological expertise, large blocks of dedicated time, analytics skills, writing skills
  - Clinical Practice Guidelines (plan to publish)
    → Team of experts, methodological expertise, large blocks of time, experience with CPG publication, writing skills, project management skills

Evidence Integration:
- Education
  → 1 or more people with domain expertise
- Visual cues or alerts
  → Low technology (e.g., visual signs in clinic space)
  → Alerts in electronic documentation system, informatics collaboration
  → Design of documentation (e.g., docflow sheet)
- Care Algorithms
  → Knowledge of evidence, knowledge of systems
  → Team of domain experts, dedicated time, methodologist/QI consultant
- Tracking/ Audits/ Optimization
  → Objective: to test, optimize, publish = QI expertise, analyst, writing skills
  → Objective: to publish = + writing skills in health delivery systems research

* Sustainability will necessitate infrastructure that rewards and motivates clinicians to adhere to the model

Evidence Generation:
- Case Studies
  → 1 or more people with domain expertise, well documented case data
- Prospective small, scale studies
  → 1 or more people (typically need to be CITI trained), have skills to apply for and adhere to IRB compliance regulations
  → Participant recruitment infrastructure
  → Analytics, writing support
- Prospective large, scale studies
  → Study team with ability to pull off large scale project
  → Often a need for grant funding, which entails higher level expertise and grant management skills
  → Data management, analytics, and writing expertise
- PBE/Registry studies
  → Knowledge of evidence, knowledge of systems
  → High fidelity data collection processes
  → Analytics and writing expertise
Enablers

**Evidence Awareness**
- Librarian
- Software to help support management of process
- Distiller SR
- RevMan
- Endnote
- Webinars and training sessions
- Grants to support process
  - e.g., APTA CPG grants

**Evidence Integration**
- QI/Improvement Science webinars and texts
- QI consultants
- Informatics support

**Evidence Generation**
- Informatics support for medical record extraction
- Data management support for building data warehouses for prospective data collection
- Statistics/Analytics support

**Infrastructure References:**
Concussion References


Concussion References

...three new guidelines.

...directions for discussions: oxidative and nitrosative stresses...

...management of sports concussion in female athletes.

...cognitive rests and position statements, practice parameters, and clinical practice guidelines.

...frequent analysis unveils cardiac autonomic parameters and clinical practice guidelines.

...symptoms in children and adolescents. 

...guidelines for diagnosing and managing pediatric concussion: Ontario Ministry of Health and Long-Term Care, Ontario Science Council.

...after traumatic brain injury at 3 and 12 months post-injury: a prospective study. 

...currents through recovery.

...in patients with postconcussion syndrome undergoing exercise treatment: a pilot study.


...head trauma in the United States: Steps to prevent and treat brain injury.

...risk of depression in retired professional football players. Med Sci Sports Exerc.

...symptoms in pediatric mild traumatic brain injury.


...in patients with postconcussion syndrome undergoing exercise treatment: a pilot study.


...special considerations in primary care practice: American Academy of Family Physicians.

...progressive tauopathy after repetitive head injury. Neurology. 


...a comparison of three sets guidelines. J Neurotrauma. 

...exercise.


