IMPROVING CONCUSSION MANAGEMENT: LESSONS LEARNED

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Evolution of Concussion Knowledge

JAMA Pediatrics | Special Communication

Centers for Disease Control and Prevention Guideline on the Diagnosis and Management of Mild Traumatic Brain Injury Among Children

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IMPORTANCE Mild traumatic brain injury (mTBI), or concussion, in children is a rapidly growing public health concern because epidemiologic data indicate a marked increase in the number of emergency department visits for mTBI over the past decade. However, no

+ Editorial
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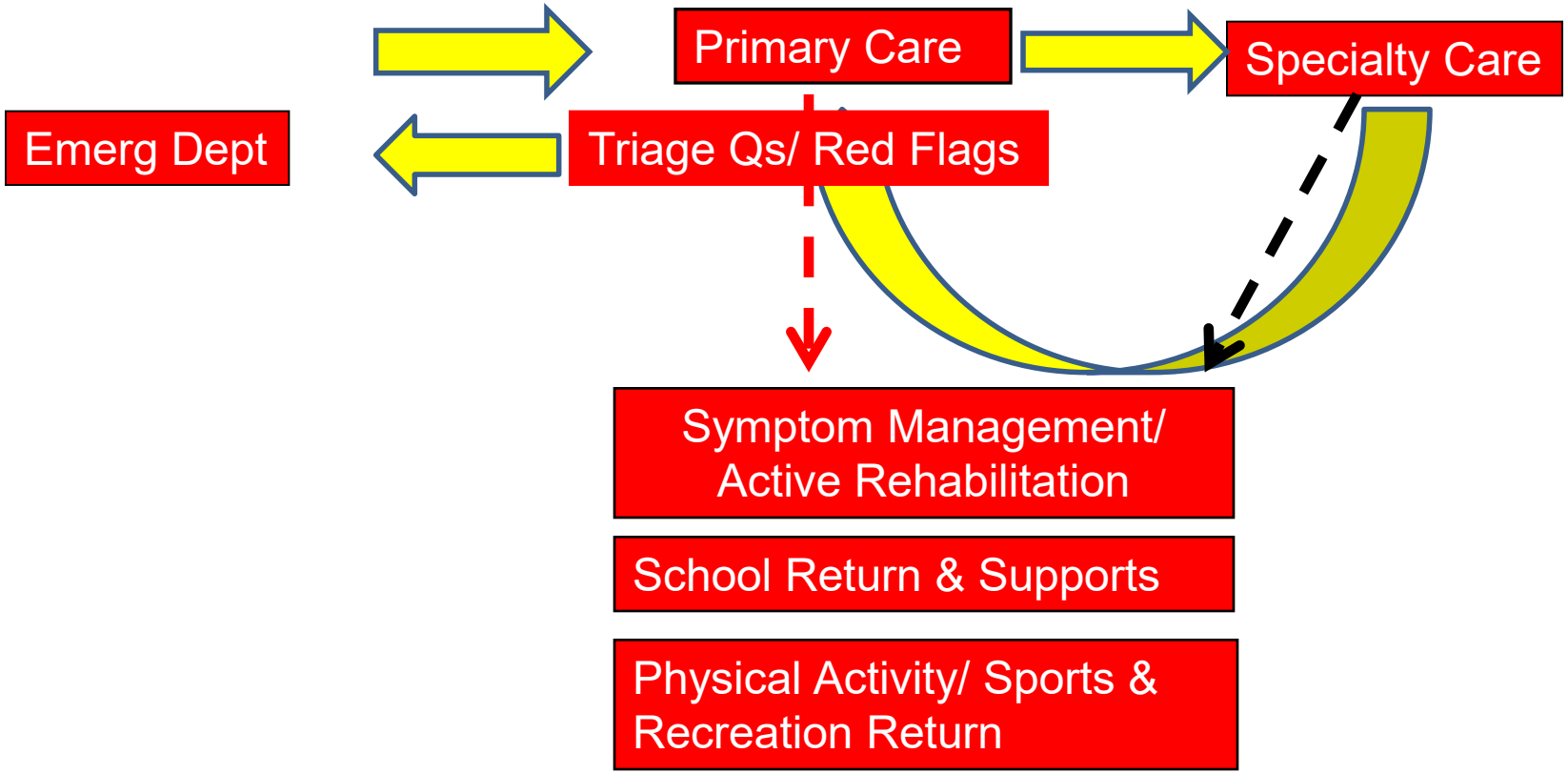
Concussion Definition

- Sport related concussion is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilised in clinically defining the nature of a concussive head injury include:
- SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.
- SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.

Concussion Definition

- SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.).
- SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged.
- The clinical signs and symptoms cannot be explained by drug, alcohol, or medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc) or other comorbidities (eg, psychological factors or coexisting medical conditions

Concussion's Medical Neighborhood



Recovery from Concussion Typical/ Atypical

- Largest study to date (n=3000, age 5-18; Zemek, 2016) indicates 70% recover within 4 weeks
- Risk factors for longer recovery
  - Demographics: Adolescent, Female
  - Hx: concussion > 1 week, Migraine
  - Sx: headache, sensitivity to noise, fatigue, answering questions slowly
  - Balance exam: ≥4 errors on tandem stance

Original Investigation

Clinical Risk Score for Persistent Postconcussion Symptoms Among Children With Acute Concussion in the ED

Roger Zemek, MD; Nick Barrowman, PhD; Stephen B. Freedman, MDCM, MSc; Jocelyn Gravel, MD; Isabelle Gagnon, PhD; Candice McGahern, BA; Mary Aglipay, MSc; Gurinder Sangha, MD; Kathy Boutis, MD; Darcy Beer, MD; William Craig, MDCM; Emma Burns, MD; Ken J. Farion, MD; Angelo Mikrogianakis, MD; Karen Barlow, MD; Alexander S. Dubrovsky, MDCM, MSc; Willem Meeuwisse, MD, PhD; Gerard Gioia, PhD; William P. Meehan III, MD; Miriam H. Beauchamp, PhD; Yael Kamil, BSc; Anne M. Grool, MD, PhD, MSc; Blaine Hoshizaki, PhD; Peter Anderson, PhD; Brian L. Brooks, PhD; Keith Owen Yeates, PhD; Michael Vassilyadi, MDCM, MSc; Terry Klassen, MD; Michelle Keightley, PhD; Lawrence Richer, MD; Carol DeMatteo, MSc; Martin H. Osmond, MDCM; for the Pediatric Emergency Research Canada (PERC) Concussion Team

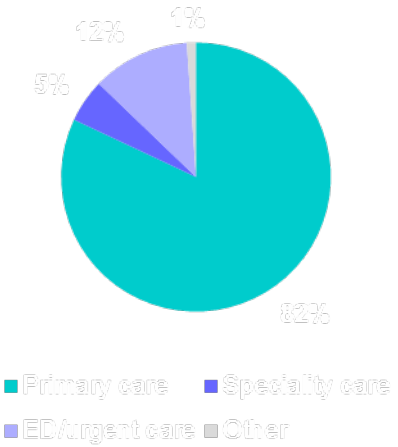
CHOP/ CDC study

Original Investigation

Point of Health Care Entry for Youth With Concussion Within a Large Pediatric Care Network

Kristy B. Arbogast, PhD; Allison E. Curry, PhD; Melissa R. Pfeiffer, MPH; Mark R. Zonfrillo, MD, MSCE; Juliet Haarbauer-Krupa, PhD; Matthew J. Breiding, PhD; Victor G. Coronado, MD, MPH; Christina L. Master, MD

- 8083 patients with diagnosed concussions
- First visit point of entry
  - Primary care = 81.9%
  - ED = 11.7%
  - Specialty care = 5.7%
- Age variation: 0-4 yrs 52% to ED, > 75% 5-17 to PC
- Insurance status: Medicaid 37% to ED, pvt 7% to ED



PRIMARY CARE CLINICAL PATHWAY CONCUSSION MANAGEMENT

Primary Care Clinical Pathway - Concussion

G. Gioia CAST Program 2017-2018

	Event	Action	Tools	Communication
1	Injury Notification (via Phone Call)	Tri	ger Questions Signs/Symptoms) *CDC 12 Red Flags*	**To Family:** If positive Red Flags, refer to ED If negative Red Flags, Office visit
2a	Office Visit 1 - Diagnosis	As Est	cussion Evaluation (ACE)	**To Family, School:** Symptom Checklist (Return to School Letter)
2b	Office Visit 1 - Management	Concussion Education Develop management strategy Sch Symptom profile	*CDC Instructions* *ACE Care Plan* o School Letter	**To Family:** Education & reassurance about diagnosis & reinjury risks, early symptom-based management guidance **To School:** Letter re: return date, safety &
		Sports/ PE/ Recreation	*CDC Instructions/ ACE Care Plan*	
3	Office Visit - Follow Up (Weekly)	Monitor symptoms, exertional response to ma	*Post-Concussion Sympt Inventory-PCSI* (Parent	
		Home Management	*ACE Care Plan*	cognitive/school, social, physical activity
		School progress update	*School Symptom Monitor*	**To School:** ACE Care Plan w updated symptom profile, input on accommodations & adjustments
4a	Office Visit - Clearance	Assess for full recovery 1. No symptoms at rest/ no medication use to m 2. contact physical and cognitive activities 3. Cognitive functions at typical baseline 4. Normal balance and coordination 5. No other medical/neuro complaints	**PCSI (Student, Parent)* **Medical Clearance for al Return (Full Return s completion of gradual RTP program)* **Gradual Return to Sport guide*	**To Family:** counsel on gradual return process **To School:** clearance to return to PE/recess **To Sport:** clearance to begin gradual Return to Play protocol; monitor until Final Clearance
4b	Referral Criteria for Prolonged/ Complicated Recovery		list Referral Criteria	**To Family:** Discuss referral to specialist, make referral to concussion clinic

Injury Notification

Office Visit 1 - Diagnosis

Office Visit 1 – Mgt.

Office Visit – Follow Up

Office Visit – Clearance

Prolonged/Complicated Recovery - Referral

Return to Activity
School
Physical Activity
Social

Concussion as ADHD in 1980

ADHD

- 1980: Most kids were evaluated and treated by specialists
- 2019: Most kids treated by primary care physicians
  - Refer Complex Cases

Concussion

- Pre-2019: Care is more variable. More ED/ Urgent Care/ specialists
- 2019+: Most kids treated by primary care physicians
  - Refer Complex Cases

CONCUSSION ACADEMY SKILLS TRAINING PROGRAM (CAST)

Goals/ Intended Outcomes for Providers

- Increase skill & confidence in clinical evaluation/ management, using clinical pathway, tools
- Improve communication with school, assi[illegible]arn
- Solidify understanding of reco[illegible]d, return to risk
- Differentiat[illegible]x cases and make appropriate r[illegible]specialty care

Improve Concussion Care for children & adolescents

Elements of the Primary Care Clinical Pathway

1. **Triage questions and "red flags"** asked at first contact
2. Patients were appropriately **referred to the ED**
3. An **Acute Concussion Evaluation (ACE)** protocol was completed
4. The patient was sent home with an **ACE Care plan**
5. Patients provided a **return to school letter**
6. **Post-concussion symptom inventory** was used in follow up
7. **Medical clearance** was documented
8. The patient was **referred to a specialist** if appropriate
9. Concussion diagnosis was **coded properly**

Concussion Learning Sessions (5)

- September, 2017
  - Kickoff General Overview: Primary Concussion Care
  - Diagnosis & initial education/ management (incl. triage/red flags)
- November, 2017
  - Management principles & practice
- January, 2018
  - Return to School: communication & management issues
- March, 2018
  - Criteria for Recovery & Return to Risk (Sport, etc.)
- May, 2018
  - Rehabilitation & specialty medical management

Needs Assessment

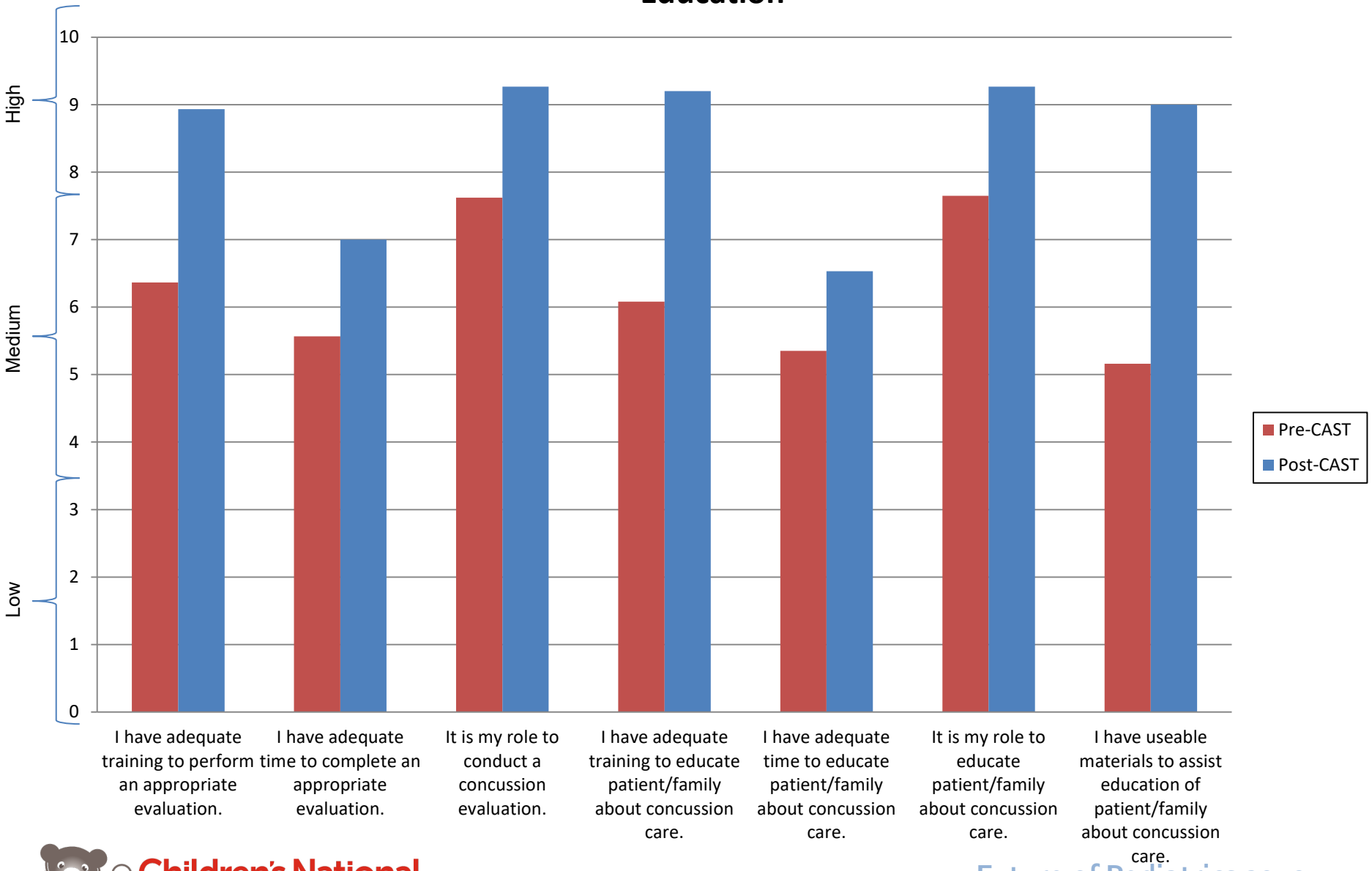
Least Confident In

- Concussion management skills
- Patient/family education
- Return to School guidance
- Return to Play guidance

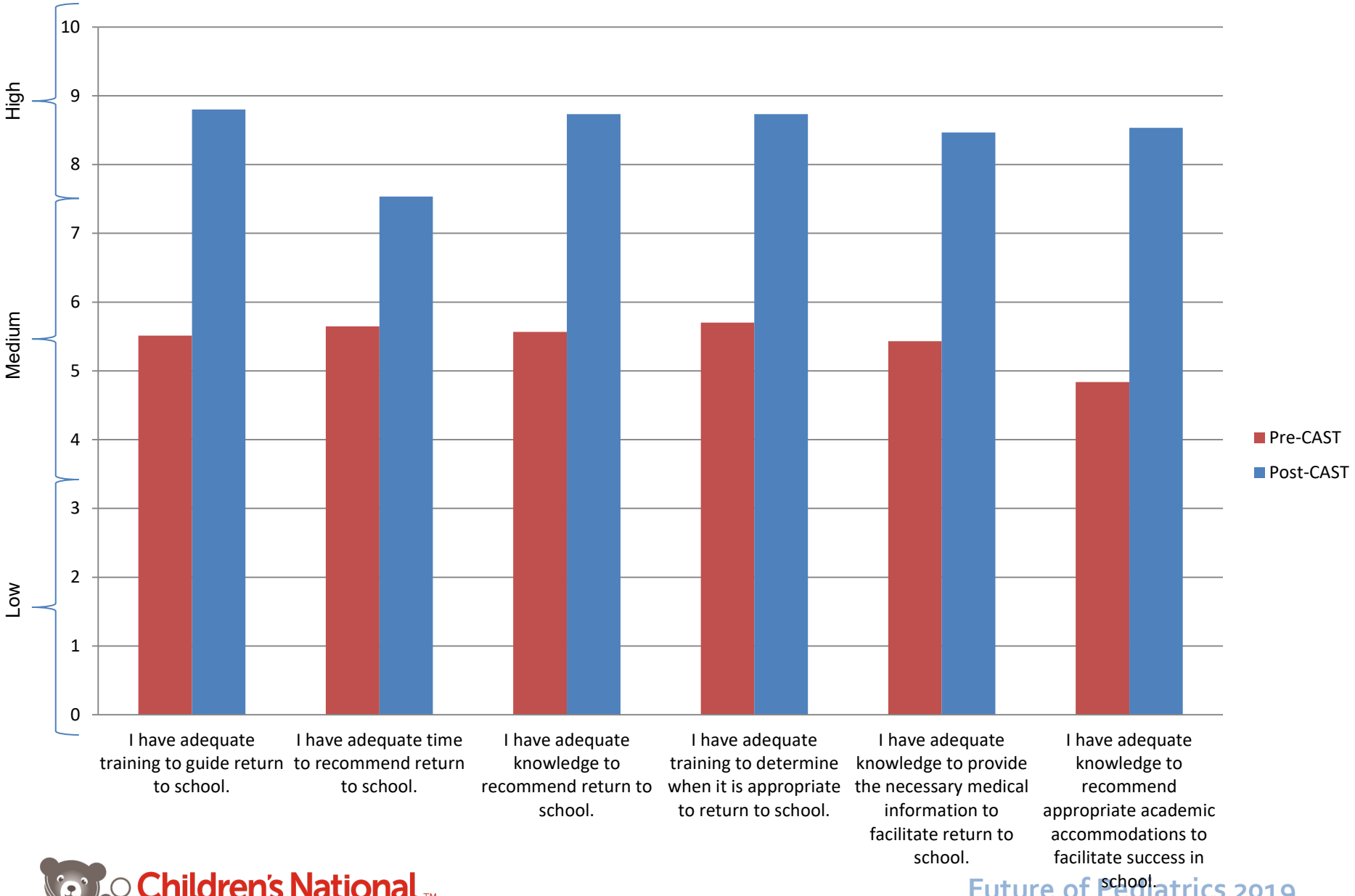
Reasons to Refer Out

- Lack of resources
- Patients with prolonged recovery
- Uncomfortable with management

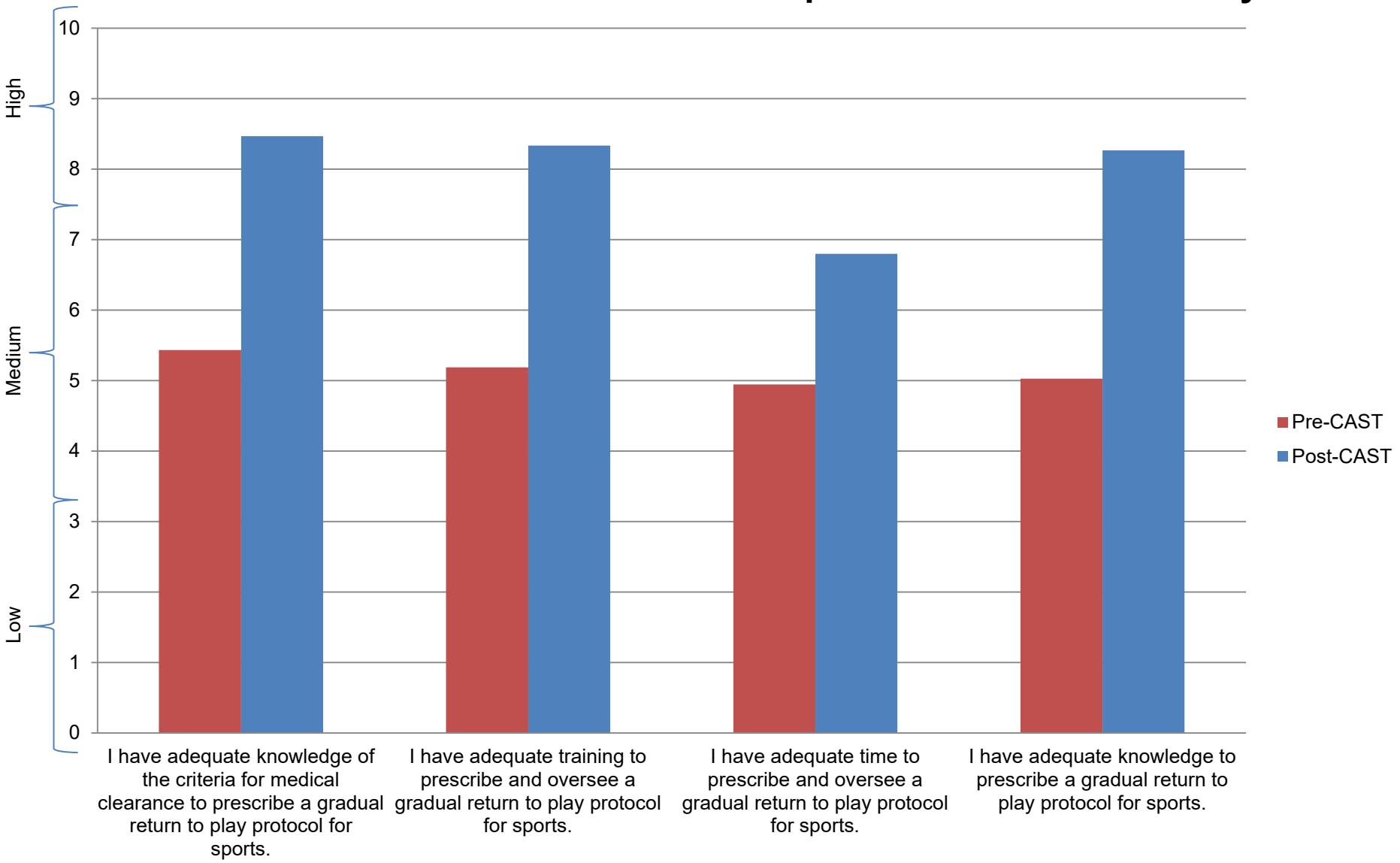
Provider Pre- and Post-CAST Confidence About Evaluation and Patient Education



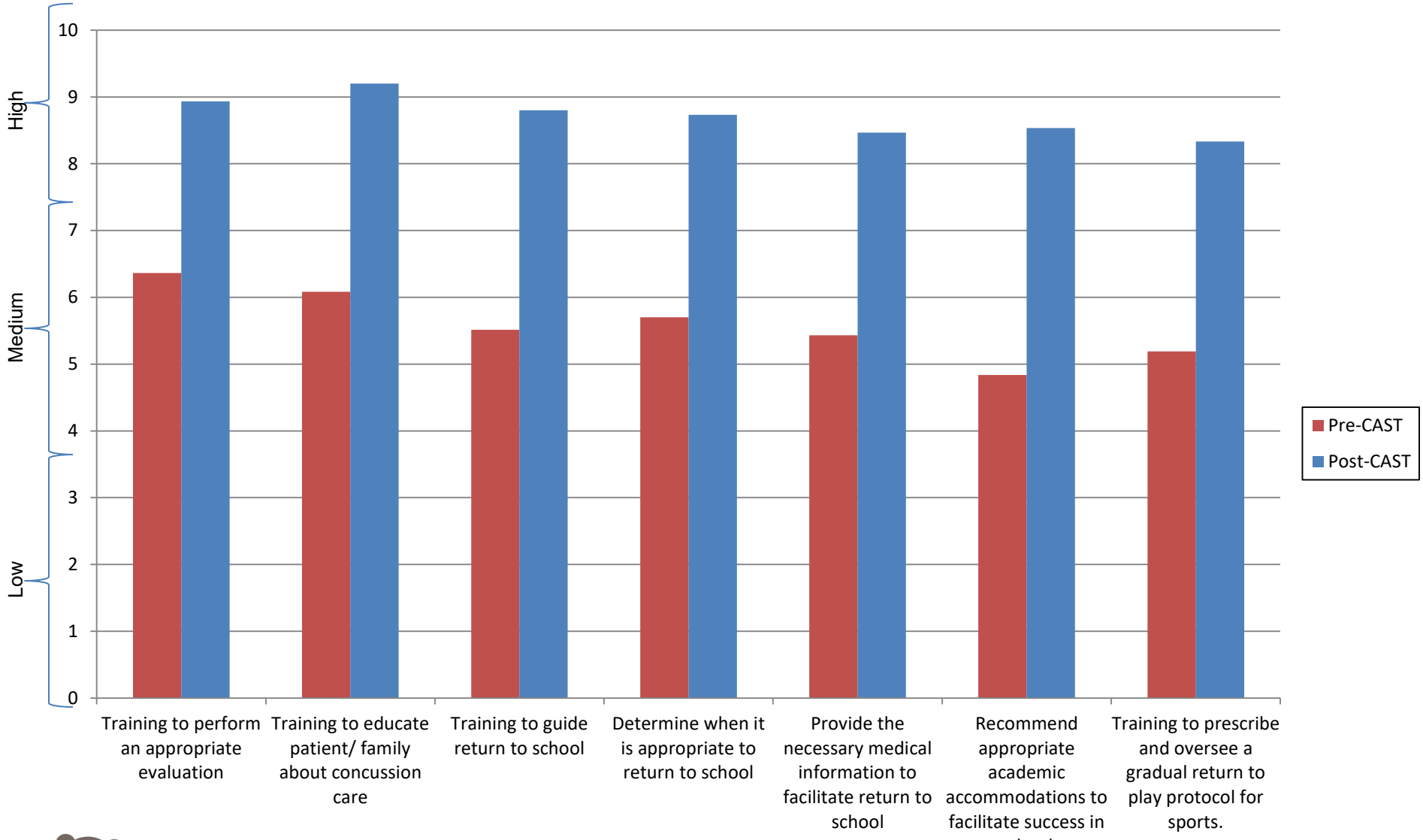
Provider Pre- and Post-CAST Perception About Return to School



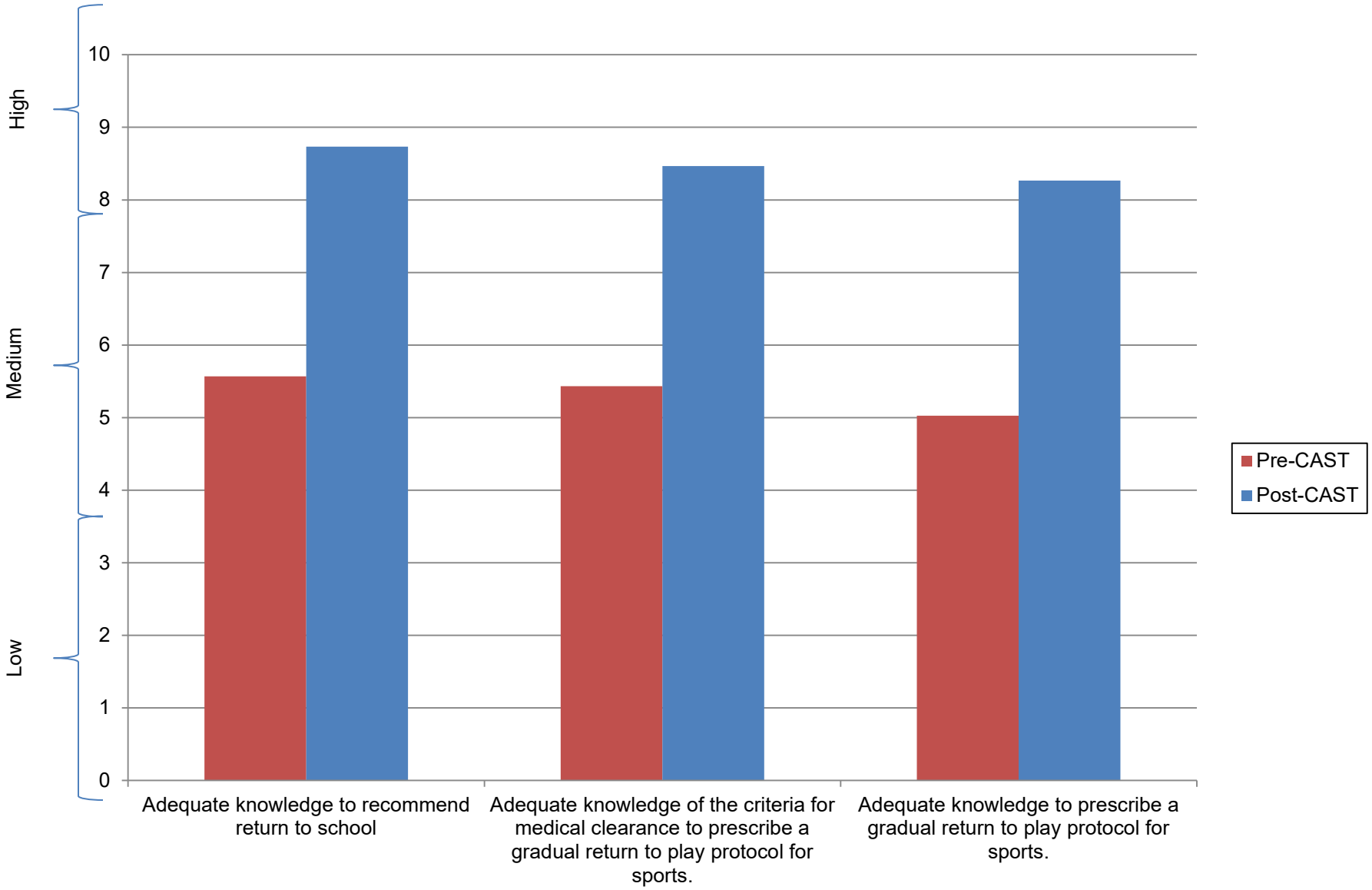
Provider Pre- and Post-CAST Perception About Return to Play



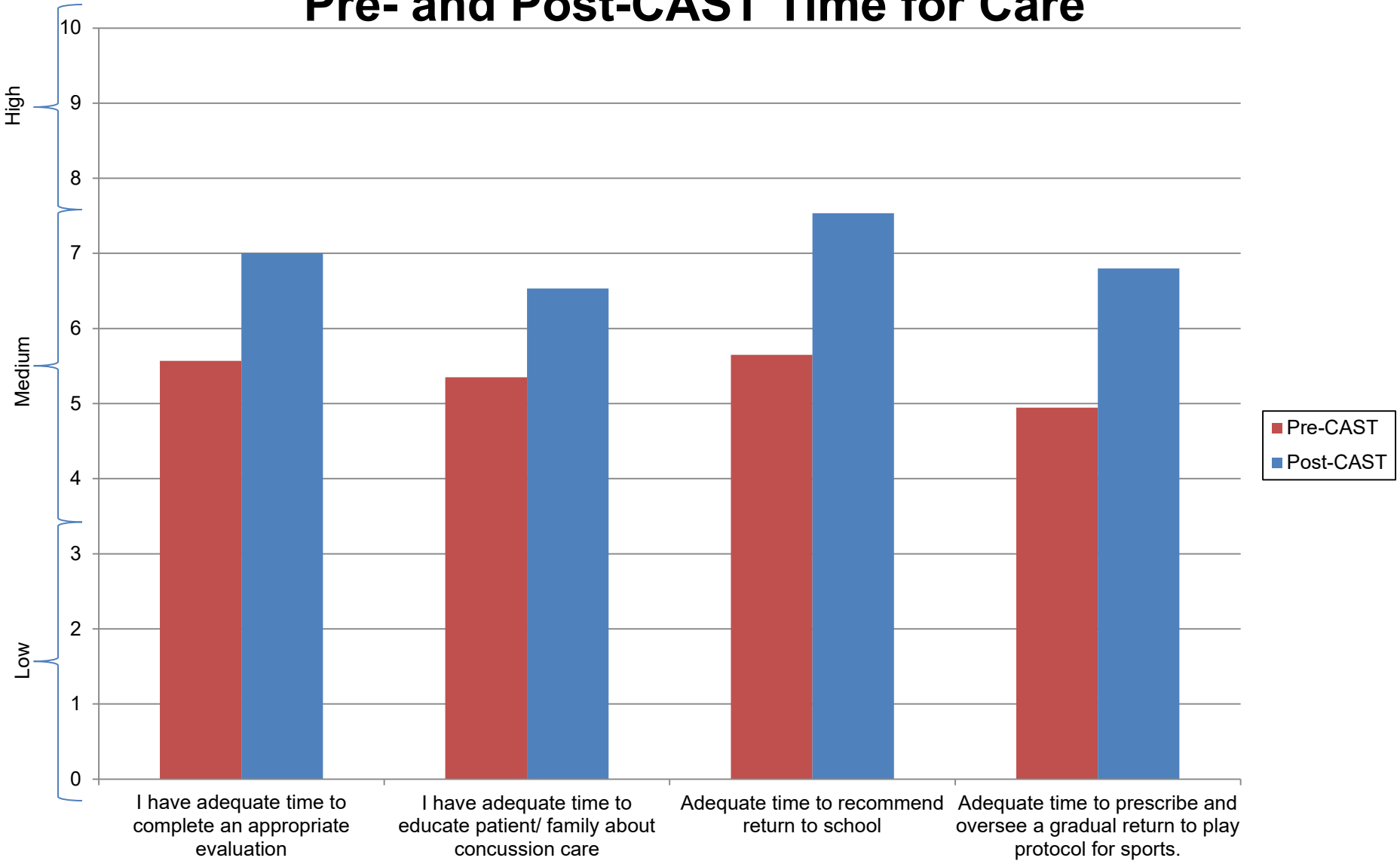
Confidence in Training Pre- and Post-CAST



Provider Knowledge Pre- and Post-CAST



Pre- and Post-CAST Time for Care



Resource Needs

ACUTE CONCUSSION EVALUATION (ACE)
CARE PLAN

Gerard Gioia, PhD[1] & Micky Collins, PhD[2]
[1]Children's National Medical Center
[2] University of Pittsburgh Medical Center

Name:_____
Age:_____
Date of birth: _____

TODAY'S DATE_____INJURY DATE_____

You have been diagnosed with a concussion, also known as a traumatic brain injury. To prevent further injury, do not return to any high-risk activities (e.g., sports, physical education, driving, etc.) until cleared by a qualified healthcare professional. To promote recovery, **physical and cognitive activity must be carefully managed.** Pay attention to your symptoms (listed below) and avoid too much of any activity that makes your symptoms worse, as this may affect your recovery. As symptoms improve, you can increase the level of daily activity slowly and carefully. You may need the help of parents, school, and athletic personnel to recover and safely return to activities.

Today the following post-concussive symptoms are present (Circle or check): ____No reported symptoms

Physical		Cognitive	Emotional	Sleep
Headaches	Sensitivity to light	Feeling mentally foggy	Irritability	Drowsiness
Fatigue	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Visual problems	Nausea	Problems remembering	Feeling more emotional	Sleeping less than usual
Dizziness	Vomiting	Feeling more slowed down	Nervousness	Trouble falling asleep
Balance Problems	Numbness/ tingling	Other:		

Key Rule for Activity
"Not Too Little, Not Too Much"

KEY POINTS **Returning to Daily Activities**

Sleep: Be sure to get adequate sleep at night; no late nights or overnights; keep the same bedtime on weekdays and weekends. Take daytime naps or rest breaks when you feel tired or fatigued, unless they interfere with falling asleep at night.
Activity: Balance physical and cognitive activity with rest breaks. Too much activity may worsen symptoms and could affect your recovery. But be sure to not do too little activity! Find the right balance.
- Physical activity includes physical education, sports practices, weight-training, running, exercising, lifting, etc.
- Cognitive activity includes concentration, learning, reading or writing (e.g., schoolwork, job-related mental activity).

Use Symptoms as your guide: Pay attention to your symptoms. As they get better, **increase your activities gradually**. Carefully monitor for return or worsening of symptoms. Let the worsening and/or return of symptoms be your sign to slow down.
Food and Drink: Maintain adequate hydration (drink lots of fluids) and an appropriate diet during recovery.
Emotions: During recovery, it is normal to feel frustrated, nervous or sad because you do not feel right and your activity is reduced. Seek professional help if you feel unsafe or have thoughts of self-harm.
Driving: You are advised not to drive if you have significant symptoms or cognitive impairment, as these can interfere with safe driving.

Work-Rest-Work-Rest

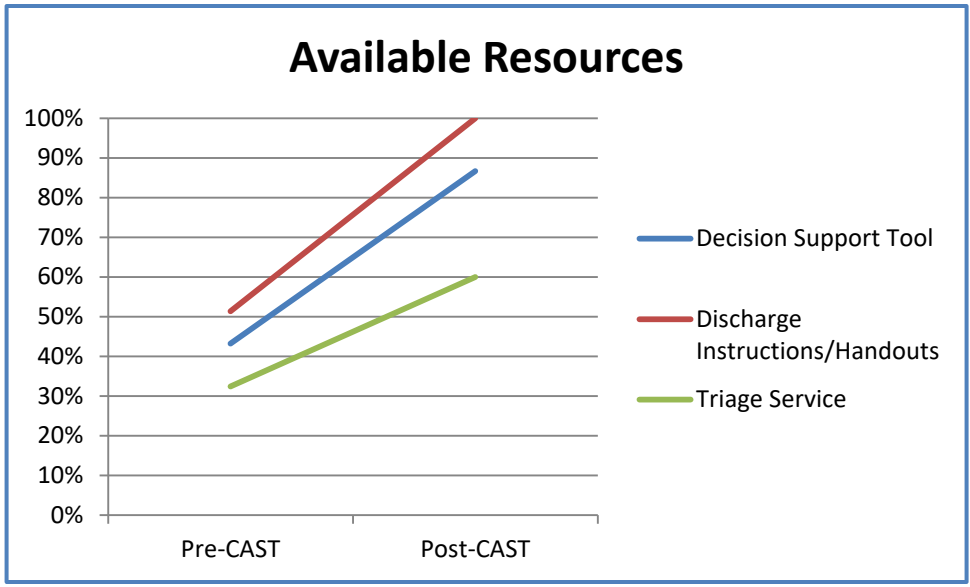
KEY POINTS **Returning to School**

- Students with symptoms and/or neuropsychological dysfunction after a concussion often need support to perform school-related activities. As symptoms decrease during recovery, these supports may be gradually removed.
- Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your injury and symptoms.
- School personnel should be instructed to watch for:

* increased problems paying attention or concentrating
* longer time needed to complete tasks or assignments
* increase in symptoms (e.g., headache, fatigue, etc.)
* increased problems remembering or learning new information
* greater irritability, less tolerance for stressors
* difficulty managing and completing complex assignments

Based on the above symptoms, the following supports are recommended: (Check all that apply)

__No return to school at this time. Return when _____.
__Return to school with following supports. **Monitor above symptoms, as they may increase** with cognitive exertion (mental effort)
__Shortened day. Recommend ___ hours per day until _____
__Shortened classes (i.e., rest breaks during classes). Suggested class length: _____ minutes
__Rest breaks during school day. ____ rest breaks/ day in quiet area. __ AM __PM __When symptoms worsen ("flash pass").____min.
__Allowances for extended time to complete coursework/assignments and tests
__Reduced homework load. Max. length of nightly homework (including studying):_____ minutes. 20-30' study, 10-15' rest break.
__ Assign **essential** work only. Modify assignments when possible, such as odd/ even numbered problems, requiring outline or bullet points instead of full written responses, allow oral responses to test questions, etc.
__No / Modified classroom/ standardized testing - only if symptoms do not interfere and adequately prepared; allow breaks as needed.
__Meet with academic coordinator to establish reasonable timeline for make-up learning/ work (only as symptoms permit).
__Request meeting of School Management Team to discuss this plan and coordinate accommodations.



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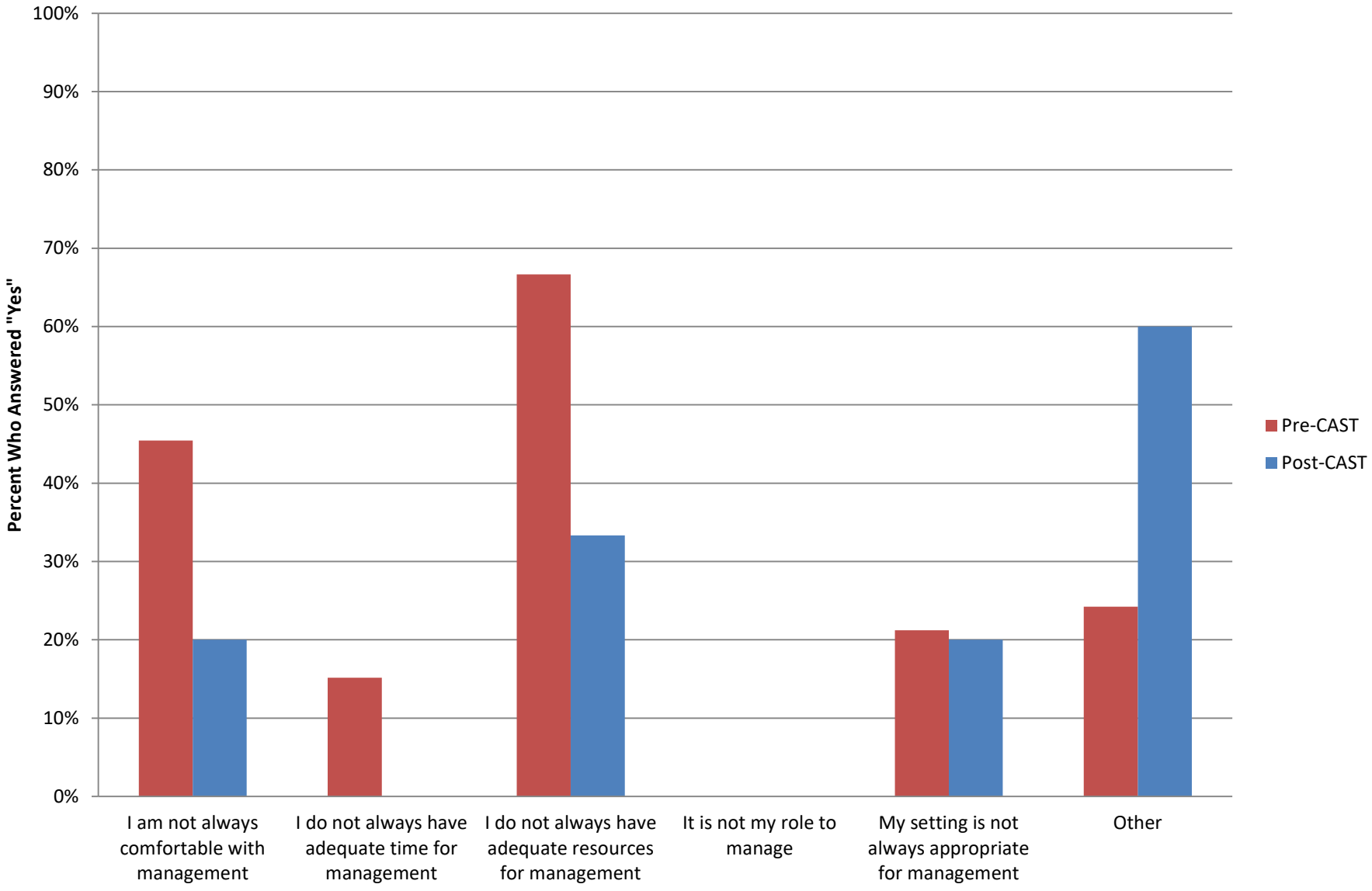
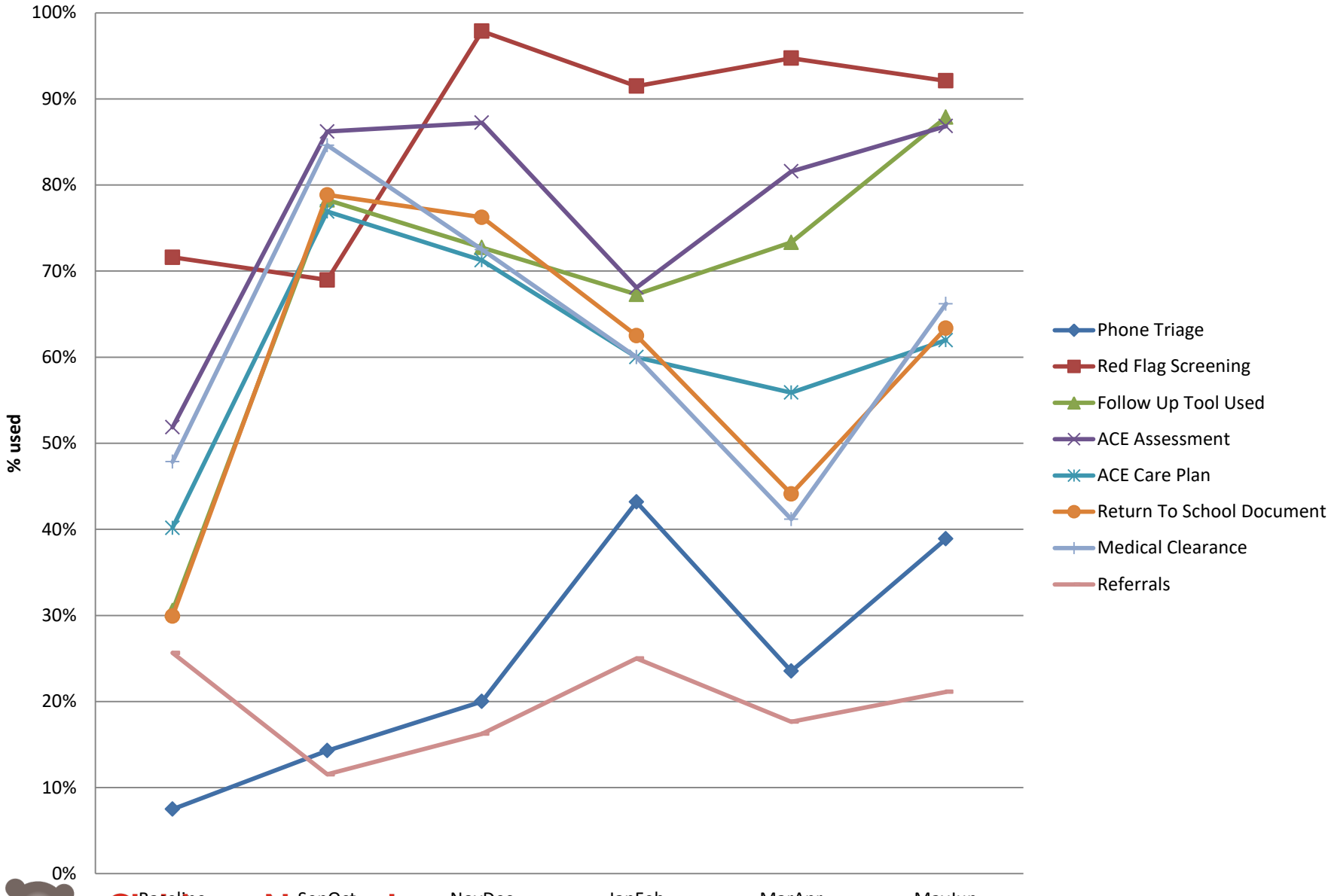
Reasons for Referral



CAST Skills Used Over Time



What We Learned - Successes

- The CAST program helps providers feel more confident in their assessment and management of concussions
- The CAST program increases the use of validated tools and best practices
- Providers want and benefit from having useful resources available to them
- Higher quality of referrals to neurology clinic

What We Learned - Challenges

- Incorporating forms into EMR made a big difference
- Different methods of triaging – answering service or not
- Many practices not seeing 10 concussion cases per month
  - Where are these patients being seen?
- It's a challenge to evaluate appropriateness of referral patterns, especially referrals to the ED

CAP'S SUCCESSFUL JOURNEY WITH CONCUSSION

Maya Nair, MD

The Beginning:

- Building templates into EMR
- Having a concussion encounter plan in EMR (*most **important** step*)
  - ACE (Acute Concussion Evaluation) forms
  - Concussion PE template
  - Assessment and Plan with patient instruction
  - CDC handout for patients
- Kick-off educational session

Doctor's Orders

Roadblocks:

- Lack of proper patient triaging
- Inconsistent use of ACE care plan
- Poor documentation of patient follow up
- **Inadequate guidance on back to school transition**

CAST QI

- Monthly webinars
- PDSA cycles
- Tools for providers, patient, and school

Patient Case

PDSA cycles explained

“John”

18 yo Male

Injured while wrestling via a direct hit to the nose

No evidence of skull fracture

No retrograde or anterograde amnesia

No LOC

No seizure

Hx of 4 prior concussions

Negative for prior h/a, developmental problems and psychiatric problems

Patient Case

11/12/18: Injury Date

Triaged using Concussion Screening

Patient brought in same day

PDSA CYCLE 1: *Phone triage*

CONCUSSION SCREENING

A. If a likely traumatic force to the body has occurred, ask the following two triage questions to determine if further evaluation of a suspected concussion is warranted.

1. **Was there a blunt force to the head and/or did the head move back and forth with a lot of force (like whiplash)?**
   - ☐ No – **No Trigger**
   - ☐ Yes – Next Question
2. **Was there a change in mental status (e.g., confusion; dazed, disoriented, or poor memory for events around the injury) or a change in the level of consciousness (seemed out of it, not responding as you normally do)?**
   - ☐ No – **No Trigger**
   - ☐ Yes

B. Assess for Red Flags for Neurological Deterioration to determine if patient should go immediately to the Emergency Department.

RED FLAGS: Consider sending to the Emergency Department with sudden onset of any of the following (check all that apply).					
Headaches that worsen		Look very drowsy, can't be awakened		Can't recognize people or places	
Seizures		Repeated vomiting		Increasing confusion	
Neck pain		Slurred speech		Weakness or numbness in arms or legs	
Significant irritability		Unusual behavior change		Loss of consciousness	

Patient Case

11/12/18: Initial Visit

Answered “yes” to:

- Headache
- Visual problems
- “Tingling”

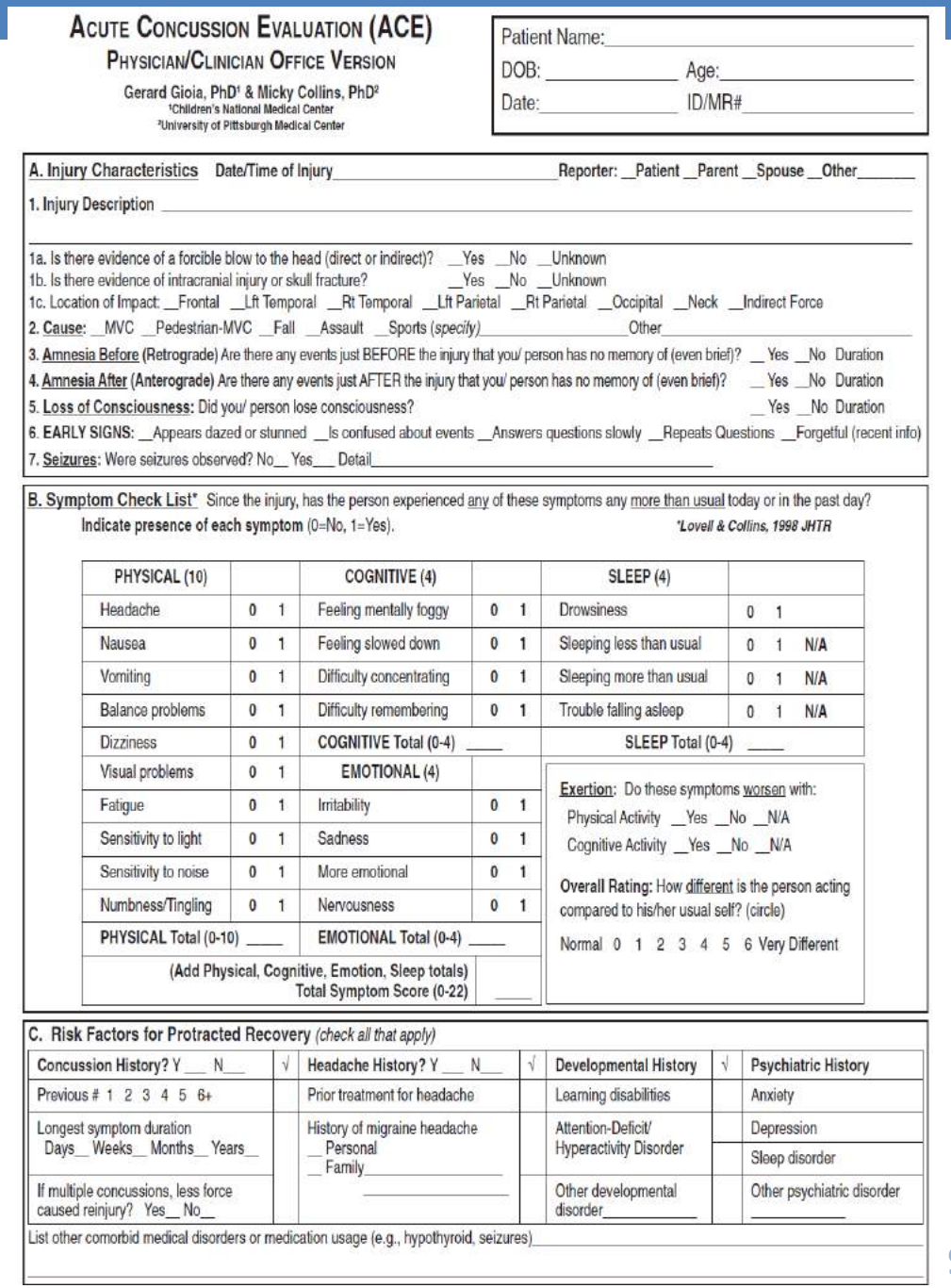
ACE Score = 3

F/u in 2 days

PDSA CYCLE 2: *Using the ACE*

PDSA CYCLE 3: *Documenting follow up*

PDSA CYCLE 4: *Providing the CDC Handout*



ACUTE CONCUSSION EVALUATION (ACE)

PHYSICIAN/CLINICIAN OFFICE VERSION

Gerard Gioia, PhD[1] & Micky Collins, PhD[2]
[1]Children's National Medical Center
[2]University of Pittsburgh Medical Center

Patient Name:_____
DOB:_____ Age:_____
Date:_____ ID/MR#_____

A. Injury Characteristics Date/Time of Injury_____ Reporter: __Patient __Parent __Spouse __Other_____

1. Injury Description _____

1a. Is there evidence of a forcible blow to the head (direct or indirect)? __Yes __No __Unknown
1b. Is there evidence of intracranial injury or skull fracture? __Yes __No __Unknown
1c. Location of Impact: __Frontal __Lft Temporal __Rt Temporal __Lft Parietal __Rt Parietal __Occipital __Neck __Indirect Force
2. Cause: __MVC __Pedestrian-MVC __Fall __Assault __Sports (specify)_____ Other_____
3. Amnesia Before (Retrograde) Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? __Yes __No Duration
4. Amnesia After (Anterograde) Are there any events just AFTER the injury that you/ person has no memory of (even brief)? __Yes __No Duration
5. Loss of Consciousness: Did you/ person lose consciousness? __Yes __No Duration
6. EARLY SIGNS: __Appears dazed or stunned __Is confused about events __Answers questions slowly __Repeats Questions __Forgetful (recent info)
7. Seizures: Were seizures observed? No__ Yes__ Detail_____

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day?
Indicate presence of each symptom (0=No, 1=Yes). **Lovell & Collins, 1998 JHTR*

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	COGNITIVE Total (0-4) ____		SLEEP Total (0-4) ____	
Visual problems	0 1	EMOTIONAL (4)			
Fatigue	0 1	Irritability	0 1		
Sensitivity to light	0 1	Sadness	0 1		
Sensitivity to noise	0 1	More emotional	0 1		
Numbness/Tingling	0 1	Nervousness	0 1		
PHYSICAL Total (0-10) ____		EMOTIONAL Total (0-4) ____			
(Add Physical, Cognitive, Emotion, Sleep totals) Total Symptom Score (0-22)					

Exertion: Do these symptoms worsen with:
Physical Activity __Yes __No __N/A
Cognitive Activity __Yes __No __N/A

Overall Rating: How different is the person acting compared to his/her usual self? (circle)
Normal 0 1 2 3 4 5 6 Very Different

C. Risk Factors for Protracted Recovery *(check all that apply)*

Concussion History? Y__ N__	√	Headache History? Y__ N__	√	Developmental History	√	Psychiatric History
Previous # 1 2 3 4 5 6+		Prior treatment for headache		Learning disabilities		Anxiety
Longest symptom duration Days__ Weeks__ Months__ Years__		History of migraine headache __Personal __Family_____		Attention-Deficit/ Hyperactivity Disorder		Depression
						Sleep disorder
If multiple concussions, less force caused reinjury? Yes__ No__				Other developmental disorder_____		Other psychiatric disorder _____

List other comorbid medical disorders or medication usage (e.g., hypothyroid, seizures)_____

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Patient Case

11/15/18: Follow up Visit

Answered “no” to all prompts

ACE Score = 0. Able to tolerate 30 mts of cognitive work without symptoms

Cleared for return to school using ACE Care Plan

PDSA CYCLE 5: ACE care

Work-Rest-Work-Rest

KEY POINTS **Returning to School**

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- Inform the teacher(s), school nurse, school psychologist or counselor, and administrator(s) about your injury and symptoms.
- School personnel should be instructed to watch for:

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__Shortened day. Recommend ___ hours per day until _____

__Shortened classes (i.e., rest breaks during classes). Suggested class length: _____ minutes

__Rest breaks during school day. ____ rest breaks/ day in quiet area. __ AM __PM __When symptoms worsen (“flash pass”).____min.

__Allowances for extended time to complete coursework/assignments and tests

__Reduced homework load. Max. length of nightly homework (including studying):_____ minutes. 20-30’ study, 10-15’ rest break.

__ Assign **essential** work only. Modify assignments when possible, such as odd/ even numbered problems, requiring outline or bullet points instead of full written responses, allow oral responses to test questions, etc.

__No / Modified classroom/ standardized testing - only if symptoms do not interfere and adequately prepared; allow breaks as needed.

__Meet with academic coordinator to establish reasonable timeline for make-up learning/ work (only as symptoms permit).

__Request meeting of School Management Team to discuss this plan and coordinate accommodations.

ACE Post-Concussion Gradual Return to School

Stage	Description	Activity Level	Criteria to Move to Next Stage	Date Criteria Met
0	No return, at home	Day 1 - Maintain low level cognitive and physical activity. No prolonged concentration. Cognitive Readiness Challenge: As symptoms improve, try reading or math challenge task for 10-30 minutes; assess for symptom increase.	To Move To Stage 1: (1) Student can sustain concentration for 30 minutes before significant symptom exacerbation, AND (2) Symptoms reduce or disappear with cognitive rest breaks* allowing return to activity.	
1	Return to School, Partial Day (1-3 hours)	Attend 1-3 classes, intersperse rest breaks. No tests or homework. Minimal expectations for productivity.	To Move To Stage 2: Symptom status improving, tolerates 4-5 hours of activity-rest cycles; 2-3 cognitive rest breaks built into school day.	
2	Full Day, Maximal Supports (required throughout day)	Attend most classes, with 2-3 rest breaks (20-30'), no tests. Minimal HW (≤ 60'). Minimal-moderate expectations for productivity.	To Move To Stage 3: Symptom number & severity improving, needs 1-2 cognitive rest breaks built into school day.	
3	Return to Full Day, Moderate Supports (provided in response to symptoms during day)	Attend all classes with 1-2 rest breaks (20-30'); begin quizzes. Moderate HW (60-90') Moderate expectations for productivity. Design schedule for make-up work.	To Move To Stage 4: Continued symptom improvement, needs no more than 1 cognitive rest break per day	
4	Return to Full Day, Minimal Supports (Monitor final recovery)	Attend all classes with 0-1 rest breaks (20-30'); begin modified tests (breaks, extra time). HW (90+') Moderate- maximum expectations for productivity.	To Move To Stage 5: No active symptoms, no exertional effects across the full school day.	
5	Full Return, No Supports Needed	Full class schedule, no rest breaks. Max. expectations for productivity. Begin to address make-up work.	N/A	

*Cognitive rest break: a period during which the student refrains from academic or other cognitively demanding activities, including schoolwork, reading, TV/games, conversation. May involve a short nap or relaxation with eyes closed in a quiet setting.

ACE Post-Concussion Gradual Return to School

Stage	Description	Activity Level	Criteria to Move to Next Stage
0	No return, at home	Day 1 - Maintain low level cognitive and physical activity. No prolonged concentration. Cognitive Readiness Challenge: As symptoms improve, try reading or math challenge task for 10-30 minutes; assess for symptom increase.	To Move To Stage 1: (1) Student can sustain concentration for 30 minutes before significant symptom exacerbation, AND (2) Symptoms reduce or disappear with cognitive rest breaks* allowing return to activity.
1	Return to School, Partial Day (1-3 hours)	Attend 1-3 classes, intersperse rest breaks. No tests or homework. Minimal expectations for productivity.	To Move To Stage 2: Symptom status improving, tolerates 4-5 hours of activity-rest cycles; 2-3 cognitive rest breaks built into school day.
2	Full Day, Maximal Supports (required throughout day)	Attend most classes, with 2-3 rest breaks (20-30'), no tests. Minimal HW (≤ 60'). Minimal-moderate expectations for productivity.	To Move To Stage 3: Symptom number & severity improving, needs 1-2 cognitive rest breaks built into school day.

Patient Case

11/19/18: Post-return to school

Answered “yes” to:

- Dizziness
- Sensitivity to light
- Mental fogginess
- Drowsiness
- Slowed down

ACE Score = 5

No longer cleared for school. Due to inability to tolerate cognitive work

11/23/18: Follow up

Answered “yes” to:

- Dizziness
- Sensitivity to light
- Mental fogginess
- Drowsiness
- Slowed down

ACE Score = 5 (intensity less)

Tolerating 2 hrs of cognitive work. Cleared for return to school per Post-Concussion Return to School letter

12/6/18: Follow up

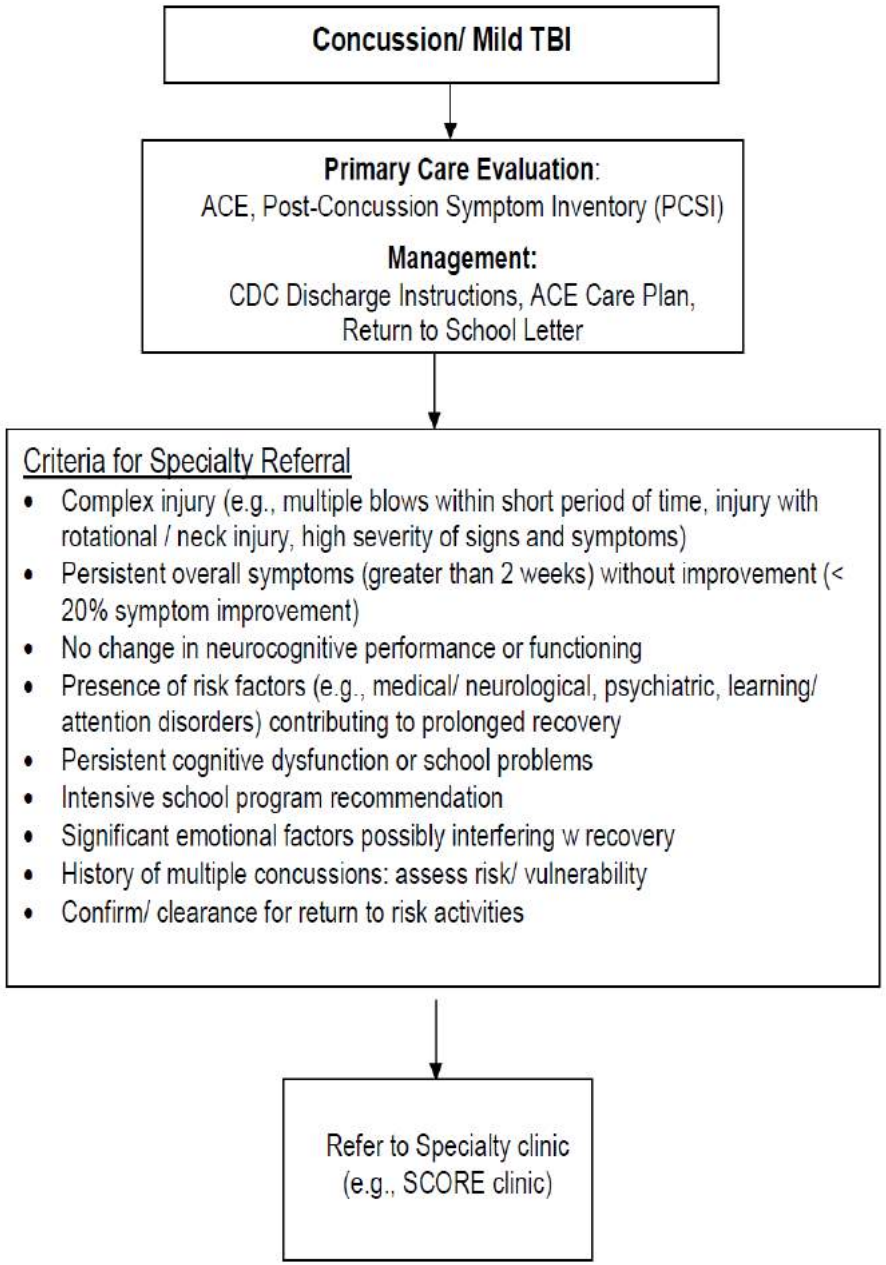
Answered “yes” to:

- Headaches
- Fatigue
- Mental fogginess
- Problems concentrating
- Slowed down
- Irritable
- More emotional
- Difficulty falling asleep

ACE Score = 8

Referred to Concussion Clinic due to lack of progression

Concussion Specialty Referral Guideline



Reasons for failure

- Poor adherence to cognitive rest
  - Circumstances ie: crucial school year
  - Thanksgiving break so he did not get adequate sleep and there was too much of screen time and partying.
- Hx of 4 prior concussions

CAP Data

Patient Cases received for Head Injury from 5/1/18-5/1/19

Total number of Calls Received	261
Appointment Made	178
Appointments Not Made	83

Patients who called but **not seen** for an appt

Appt cx	1
Homecare	43
Went to concussion clinic	1
Went to ER	**38**
Grand total	83

CAP Data

Breakdown of 38 ER visits

Types	# sent to ER	
Neck pain	2	Appropriate
No appts/After Hours	10	Potentially avoidable - *Triage education*
Parent decided	8	Potentially avoidable - *Parent education*
Vision/Hearing/Headache	10	Avoidable

Future Goals

- Improving triage
- Adequate neuro exam
  - Provider training
- PT/OT referrals
  - List of providers for clinical use
- Conducting neuro/psych testing
- Keeping relevant with current research
  - Adopting changes
  - Participating in Cast 2

CAST 2.0

- We were very successful and we want to offer it to more people
- Collect other useful data
  - Baseline vs. ongoing ER/urgent care utilization
  - Pre/post time to school return
  - How often is guidance given during pre-sports physicals
  - Monitor changes in referral patterns at SCORE and Neurology clinics
- Discuss preseason/post-concussion neuropsychological testing

CAST 2.0

- Can we tweak the model?
  - Practice champion engages in training and then disseminates to the group
  - More regular feedback to practices on performance
  - Have someone dedicated to help practices incorporate elements into EMR
  - Work on incorporating more case based discussion
  - Live sessions to teach the exam – with posted video
  - Offer it to other providers (ED/urgent care clinics, School Nurses, Athletic trainers, Neurologists)
- Integrate CAST 2.0 with the Pediatric Health Network members