

Concussion Clinical Pathway Executive Summary

Physician Owner: Dr. Kody Mofatt

PRIMARY OBJECTIVE

Develop a pathway that aides in recognizing, treating and managing concussion related symptoms until child can fully return to academic and physical activities.

RECOMMENDATIONS

Inclusion Criteria

- Children ≥ 5 years of age with head, neck, or body trauma clinically suspected of having a concussion within 4 weeks of injury

Exclusion Criteria:

- Children < 5 years of age
- Focal neurological deficits
 - Consider [acute stroke pathway](#) when symptoms have been present for < 24 hours
- Change in mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurological signs
- Persistent vomiting
- Evidence of skull fracture
- Post traumatic seizures
- Coagulopathy
- History of neurosurgery (e.g. shunt)
- Polytrauma

Presentation:¹

- Clinicians should consider concussion in patients who present with trauma to the head, neck or body. Common features that may be utilized in clinically defining the nature of a concussive head injury include:
 - Concussion may be caused by either a direct blow to the head, face neck or elsewhere on the body with an “impulsive” force transmitted to the head.
 - Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously. However, in some cases, signs and symptoms may evolve over a number of minutes to hours.
 - Concussion 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.
 - Concussion results in a graded set of clinical 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.

Assessment:

- Review signs & symptoms for concussion¹:
 - Glasgow coma scale (GCS) when patient presents immediately after injury (See Appendix A)
 - All patients with a GCS < 15 should be sent to the ED (if not already there)
 - Graded symptom check list (See Appendix B)
 - Another clinically acceptable alternative to the graded system checklist is to utilize the Sport in Concussion Assessment Tool-5th Ed. SCAT5 (SCAT5) for children 5-12 years of age. The SCAT5 tool includes a symptom checklist, cognitive assessment, and a physical exam. However, to accurately complete the SCAT5 tool it takes a minimum of 30 minutes and its utility decreases significantly 3-5 days post injury.
 - Cognitive assessment

- Perform physical exams:
 - Neck exam
 - Manual muscle testing
 - Balance exam
 - Consider coordination exam
 - Evaluation of vision
 - Undilated fundus exam
 - Abnormal eye or vision exams may require immediate referral to ophthalmology
- A suspected diagnoses of concussion can include one or more of the following clinical domains:
 - o Symptoms – somatic (e.g. headache), cognitive (e.g. feeling like in a fog) and/or emotional symptoms (e.g. lability)
 - o Physical signs (e.g. loss of consciousness, amnesia, neurological deficit)
 - o Balance impairment (e.g. gait unsteadiness)
 - o Behavioral changes (e.g. irritability)
 - o Cognitive impairment (e.g. slowed reaction times)
 - o Sleep/wake disturbance (e.g. somnolence, drowsiness)
- If any one or more of these components is present, a concussion should be suspected and the appropriate management strategy instituted.

Clinical Management:

- **Exam positive for focal neurological findings**
 - Send to ED for emergent non-contrasted imaging of the head &/or neck, and consider consults with neurology or neurosurgery if positive imaging findings
 - Patient should be managed off the pathway, unless imaging negative and still suspected as having a concussion.
- **Discharge**
 - o Patients with a concussion diagnosis can be discharged with the following instructions: ¹
 - o Rest both physically & cognitively for 1-2 days, which includes keeping child out of school
 - Light activity is allowed
 - Recommending strict rest offers no benefit in adolescents. Restricting activity may in fact increase symptom reporting in this population.³
 - Avoid “cocooning” patient. While physical and mental rest is recommended, solitary confinement environments should be avoided.
 - o Limit/decrease use of electronic devices (do not eliminate use)
 - o Sleep is encouraged
 - o Acetaminophen as needed
 - Pharmacological therapy should only be considered by clinicians with specialized training and experience in treating concussions
 - Manage specific and/or prolonged symptoms (e.g. sleep disturbance, anxiety, etc.)
 - Modify the underlying pathophysiology of the condition with the aim of shortening symptoms of concussion
 - o Caregiver(s) should follow-up with primary care physician (PCP) in clinic or by phone within 2 days
 - o Clinical condition rarely deteriorates in the days after a concussion. However, clinicians should reassess the need for imaging and other studies at each appointment based on symptom presentation
 - o Weekly follow up post-concussion is recommended either in clinic or by phone to monitor symptom progression.
- **Approximately 2 days after concussion, PCPs should consider:**
 - Allowing patient to return to school with academic accommodations as needed (i.e. shortened school day, breaks during day, delayed test taking)
 - Encouraging a light increase in mental & physical activity as tolerated (physical contact sports/activities are not allowed)

- **Approximately 4 weeks after concussion; PCPs should consider:**

- Removing academic accommodations as symptoms resolve (symptoms may resolve much earlier than 4 weeks)
- Establishing an appropriate return to play transition based on age, activity, athlete versus non-athlete, availability of ImPACT testing and availability of athletic trainers, etc.
 - o 80-90% of patients diagnosed with concussion will be able to return to normal activities within 4 weeks if there is no additional trauma
 - It is acceptable for athletic trainers to clear patients to return to play after following protocol

Referrals to Consider:

- 10-20% of patients diagnosed with concussion may require a referral to a specialist if they are not well enough to return to normal activities within 4 weeks.
- Concussions resulting from a motor vehicle accident (MVA) or other mechanism (fall from great height, etc.), consult neurology and consider rehabilitation
- Concussions related to sports, recreation, or similar activities consult sports medicine
- Neurosurgery

Modifying Factors in Concussion Management:

- A range of pre-existing conditions may influence the investigation and management of concussion. In some cases, these conditions may predict the potential for prolonged or persistent symptoms.¹ Modifiers include:
 - o History of previous concussion
 - o History of anxiety
 - o Depression
 - o Migraine headache
 - o Attention Deficit Hyperactivity Disorder (ADHD)
 - o Learning disability
 - o Sleep disorders

Concussion Investigations:

- Advanced neuroimaging, fluid biomarkers and genetic testing are important research tools, but require further validation to determine their ultimate clinical utility in evaluation of concussion.¹

RATIONALE

- **Safety** : Shall be improved by gradually returning patients to school and social activities (prior to contact sports) in a manner that does not result in significant exacerbation of symptoms.
- **Quality**: Will be improved by utilizing consistent discharge instruction between providers.
- **Cost**: Shall be reduced by restricting brain imaging to those cases where there is suspicion of intra-cerebral or structural lesion (e.g. skull fracture) exists.
- **Delivery**: The concussion pathway will improve efficiency at first patient contact through the use of Order Sets which will contain links to the necessary assessment screening tools and patient discharge instructions.
- **Engagement**: Is created and supported by the involvement of a multidisciplinary team in the development and maintenance of the pathway.
- **Patient/Family Satisfaction**: Shall be improved by providing the highest quality care based on established guidelines and the latest evidence available in the literature.

IMPLEMENTATION ITEMS

- Concussion Smart Set (Children's Physicians)
- Return to play and Return to learn teaching sheets

METRICS PLAN

1. Concussion Order Set/Smart Set and discharge instruction usage of 60%.
2. Monitor % of patients with concussion with CT and MRI imaging.
3. Monitor the percentage of referrals to neurology for concussion.

SUPPORTING DOCUMENTS

- Glasgow Coma Scale
- Graded Symptom Checklist – 13 and Older
- Graded Symptom Checklist – 12 and Younger
- Graded Symptom Checklist – 12 and Younger Parent Report
- Concussion Algorithm
- Sport Concussion Assessment Tool -5th Edition-SCAT5
- Child SCAT5 – for children ages 5-12 years

TEAM MEMBERS

Dr. Kody Moffatt & Stephanie Roach RN (sports medicine), Dr. Nancy Knowles & Dr. David Tolo (pediatricians), Dr. Maria Johnson & Krisi Kult RN (ED), Dr. Geetanjali Rathore (neurology), Jess Bender (performance improvement), Tiffany Simon (trauma outreach coordinator)

EVIDENCE

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Appendix A

GLASGOW COMA SCALE		
Behavior	Response	Score
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place & person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys Commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	Best response	15
	Comatose client	8 or less
	Totally unresponsive	3

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Appendix B Graded Symptom Checklist – 13 and Older⁹

How do you feel?

“You should score yourself on the following symptoms based on how you feel right now.”

	None	Mild		Moderate		Severe	
Headache	0	1	2	3	4	5	6
“Pressure in head”	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like “in a fog”	0	1	2	3	4	5	6
“Don’t feel right”	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

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Appendix B Graded Symptom Checklist – 12 and Younger ⁸

How do you feel?

“You should score yourself on the following symptoms based on how you feel right now.”

	Never	Rarely	Sometimes	Often
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
I have neck pain	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3
Sadness	0	1	2	3
Nervous or Anxious	0	1	2	3

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Appendix B Graded Symptom Checklist – 12 and Younger Parent Report ⁸

How do you feel?

“You should score your child on the following symptoms based on what you have observed most recently.”

The child . . .	Never	Rarely	Sometimes	Often
has trouble sustaining attention	0	1	2	3
is easily distracted	0	1	2	3
has difficulty concentrating	0	1	2	3
has problems remembering what he/she is told	0	1	2	3
has difficulty following directions	0	1	2	3
tends to daydream	0	1	2	3
gets confused	0	1	2	3
is forgetful	0	1	2	3
has difficulty completing tasks	0	1	2	3
has poor problem solving skills	0	1	2	3
has problems learning	0	1	2	3
has headaches	0	1	2	3
feels dizzy	0	1	2	3
has a feeling that the room is spinning	0	1	2	3
feels faint	0	1	2	3
has blurred vision	0	1	2	3
has double vision	0	1	2	3
has a sore neck	0	1	2	3
experiences nausea	0	1	2	3
gets tired a lot	0	1	2	3
gets tired easily	0	1	2	3