



Concussion

An Integrated Care Pathway of the

Collaborative Care Network

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Learning Objectives

This CME material was designed to help you to:

- Identify concussion signs and symptoms
- Perform concussion testing
- Manage concussion recovery and return to work/school/sports
- Identify and prevent Second Impact Syndrome
- Identify need for specialist referral or imaging

First, a Friendly Reminder. . .

This Integrated Care Pathway was developed by and for members of the AAMC CCN.

These materials will refer to some resources available only to CCN members and their patients.

Not a CCN member?

We invite you to join the CCN! Contact Renee Kilroy at rkilroy@aaahs.org

These materials reference a Toolkit

This is provided to you by Renee Kilroy

It will include larger versions of the overview slides, plus screening tools, patient pamphlets, and phone numbers to call.

Disclaimer

No CME program, Tool Kit, algorithm, or recipe will address every scenario you encounter.

Use clinical judgment and call subject matter experts (info to follow) when you sense you need guidance! We are here to help.

Intended Audience and Scope

Intended Audience for this Pathway

- Primary, urgent care, and emergency providers treating patients with concussion

Scope of Pathway

- Guide care of concussion patients through evidence based guidelines

In these materials, we will describe:

Definition, signs, and symptoms of concussion

Danger signs

Concussion testing

Concussion recovery

- Return to work/school/sports

Referral and imaging recommendations

Let's Get Started!

What is a concussion?

- A type of minor traumatic brain injury—or TBI—caused by a bump, blow, or jolt to the head or by a hit to the body that causes the head and brain to move rapidly back and forth.
- This sudden movement can cause the brain to bounce around or twist in the skull, creating chemical changes in the brain and sometimes stretching and damaging brain cells.

Concussion Signs

- Can't recall events *prior to* or *after* a hit or fall
- Appears dazed or stunned
- Forgets an instruction, is confused about an assignment or position, or is unsure of the game, score, or opponent
- Moves clumsily
- Answers questions slowly
- Loses consciousness (*even briefly*)
- Shows mood, behavior, or personality changes

Concussion Symptoms

- Headache or “pressure” in head
- Nausea or vomiting
- Balance problems or dizziness, or double or blurry vision
- Bothered by light or noise
- Feeling sluggish, hazy, foggy, or groggy
- Confusion, or concentration or memory problems
- Just not “feeling right,” or “feeling down”

Concussion Onset

- Signs and symptoms generally show up soon after the injury
- In some cases symptoms may progress and may not show up for hours or days

Concussion Danger Signs

- Drowsiness or inability to wake up
- A headache that gets worse and does not go away
- Slurred speech, weakness, numbness, or decreased coordination
- Repeated vomiting or nausea, convulsions or seizures
- Unusual behavior, increased confusion, restlessness, or agitation
- Loss of consciousness
 - Even a brief loss of consciousness should be taken seriously

Natural History

- Symptoms normally are present at the time of injury, but may be delayed
- Usually symptoms are present for less than 72 hours with resolution in 7 to 10 days (80-90%)
- Prolonged headache (more than 60 hours), fatigue, tiredness, fogginess, or presence of more than three symptoms at presentation may be associated with prolonged recovery

Post-Concussion Syndrome (PCS)

- Cognitive, somatic, and emotional symptoms induced by neurobiological or psychological mechanisms, or both, which are not well understood
- Generally, PCS resolves within three months after the injury (acute PCS)
 - 20% to 40% may continue to experience PCS at six months postinjury
 - For a minority, PCS persists for more than one year
- PCS that continues for three months or longer can be considered “persistent”

Post-Concussion Syndrome

Factors associated with the development of PCS

- Past history of mild brain injury
- Neurological signs
- Female gender
- Older age
- Premorbid psychopathology
- Substance abuse

Concussion Evaluation

History

- Use a template/worksheet
- Physical Exam

Initial Evaluation Worksheet



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NEW PATIENT FORM

Patient Name: _____ Today's Date: _____ Date of Concussion: _____
 Date of Birth: _____ Age: _____ Gender: Male Female School: _____ Grade: _____
 Form Completed By: Patient Mother Father Grandparent Other: _____
 Who referred you here: Trainer/Coach Primary Care Physician ER Other: _____

Does patient believe he/she is completely back to normal now? No Yes
 Do others that know the patient believe he/she is completely back to normal now? All Some None Unsure

Details of Injury

Cause of concussion: Sport (specify) _____ Motor vehicle crash Hit by motor vehicle
 Fall Assault Other (specify) _____
 Location of impact: Head Neck Chest Abdomen Other: _____
 Direction of Impact: Front Back Left Side Right Side Unsure Other: _____
 Did the patient lose memory of any events BEFORE the injury? No Yes If Yes, how long? _____ Minutes _____ Hours
 Did the patient lose memory of any events AFTER the injury? No Yes If Yes, how long? _____ Minutes _____ Hours
 Did the patient lose consciousness (witnessed not moving or responding)? Unknown No Yes
 If Yes, how long? _____ Seconds _____ Minutes _____ Hours
 Did the patient appear dazed or stunned after the injury? Unknown No Yes
 Did the patient have a headache soon after the injury? Unknown No Yes
 Did the patient vomit after the injury? Unknown No Yes
 Has the patient seen a medical provider? No Yes If Yes, when? Same day 1-2 days later More than 3 days
 Was a head CT or brain MRI done? No Yes If Yes, were any problems identified? No Yes
 Did the patient miss any days of school or work? N/A No Yes If Yes, how many? _____

Symptom Checklist

Please rate the patient's symptoms for TODAY and for the FIRST FEW DAYS AFTER THE CONCUSSION.

	TODAY				FIRST FEW DAYS AFTER CONCUSSION			
	None	Mild	Moderate	Severe	None	Mild	Moderate	Severe
Headache	0	1	2	3	0	1	2	3
Nausea	0	1	2	3	0	1	2	3
Vomiting	0	1	2	3	0	1	2	3
Balance problem/dizziness	0	1	2	3	0	1	2	3
Fatigue/Drowsiness	0	1	2	3	0	1	2	3
Sleeping less than usual	0	1	2	3	0	1	2	3
Sleeping more than usual	0	1	2	3	0	1	2	3
Trouble falling asleep	0	1	2	3	0	1	2	3
Blurry or double vision	0	1	2	3	0	1	2	3
Sensitivity to light	0	1	2	3	0	1	2	3
Sensitivity to noise	0	1	2	3	0	1	2	3
Feeling "foggy"	0	1	2	3	0	1	2	3
Trouble concentrating	0	1	2	3	0	1	2	3
Trouble remembering	0	1	2	3	0	1	2	3
Feeling irritable	0	1	2	3	0	1	2	3
Feeling sad	0	1	2	3	0	1	2	3
Feeling nervous	0	1	2	3	0	1	2	3

Do any of the current symptoms worsen with physical activity? No Yes
 Do any of the current symptoms worsen with mental activity? No Yes

As of today, how different does the patient feel from normal? Normal A little different Somewhat A lot
 Has the patient now returned to sports or work? Completely Partially None N/A
 Has the patient now returned to school? Completely Partially None N/A
 Has the patient ever undergone computerized neuropsychological testing? No Yes Unsure
 Has the patient ever undergone formal neuropsychological testing? Unsure No Yes If Yes, where? _____

Medical History

Has the patient previously had any concussions? No Yes If Yes, how many? _____
 Please list the approximate dates of each concussion and how long it took for symptoms to go away after each concussion: _____

Please list any medications the patient is currently taking: _____

Before the concussion, had the patient ever had migraine headaches or frequent or severe headaches? No Yes
 Has anyone in the family ever been diagnosed with migraine headaches or any other headache disorder? No Yes
 If Yes, who? _____

Has the patient ever been diagnosed with any of the following?

- No Yes Attention-Deficit/Hyperactivity Disorder
- No Yes Learning Disability
- No Yes Anxiety
- No Yes Depression
- No Yes Bipolar Disorder
- No Yes Other Psychiatric Disorder: _____
- No Yes Sleep Problem
- No Yes Seizure Disorder
- No Yes Other Medical Problem: _____

Concussion Specific Physical Exam

- Cognition/Memory/Concentration testing
 - Delayed Recall (3 words)
 - Months of the Year backwards
 - Serial 7s or spelling the word "WORLD" Backwards
 - Repeating numbers backwards
- Balance Testing
 - Double Leg Stance, Tandem Stance
 - Tandem Gait

Concussion Specific Physical Exam

- Vision testing
- “H test” for smooth pursuit and blurry vision
- Convergence of 6cm
- Vestibular-Ocular testing
 - Looking for over shooting and increase in symptoms
- Coordination testing
 - Finger to nose
 - Rapid alternating

Concussion Follow Up



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RETURN PATIENT FORM

Patient Name: _____ Today's Date: _____ Date of Concussion: _____
Date of Birth: _____ Age: _____ Gender: Male Female School: _____ Grade: _____
Form Completed By: Patient Mother Father Grandparent Other: _____

Does patient believe he/she is completely back to normal now? No Yes
Do others that know the patient believe he/she is completely back to normal now? All Some None Unsure

Symptom Checklist

Please rate the patient's symptoms for TODAY and for the FIRST FEW DAYS AFTER THE CONCUSSION.

	TODAY			
	None	Mild	Moderate	Severe
Headache	0	1	2	3
Nausea	0	1	2	3
Vomiting	0	1	2	3
Balance problem/dizziness	0	1	2	3
Fatigue/Drowsiness	0	1	2	3
Sleeping less than usual	0	1	2	3
Sleeping more than usual	0	1	2	3
Trouble falling asleep	0	1	2	3
Blurry or double vision	0	1	2	3
Sensitivity to light	0	1	2	3
Sensitivity to noise	0	1	2	3
Feeling "foggy"	0	1	2	3
Trouble concentrating	0	1	2	3
Trouble remembering	0	1	2	3
Feeling irritable	0	1	2	3
Feeling sad	0	1	2	3
Feeling nervous	0	1	2	3

Do any of the current symptoms worsen with physical activity? No Yes
Do any of the current symptoms worsen with mental activity? No Yes

As of today, how different does the patient feel from normal? Normal A little different Somewhat A lot
If back to normal, when were the last symptoms?

Has the patient now returned to sports or work? Completely Partially None N/A

Has the patient now returned to school? Completely Partially None N/A

Any other details: _____

Concussion Testing/Evaluation

- Physical exam findings and worksheet scores are used as tracking tools
- Higher scores correlate to more severe concussion
- More severe concussions do not necessarily need advanced care

Concussion Recovery/Treatment

- Physical Rest
- Cognitive Rest
- Medication?

Concussion Recovery—Physical Rest

- Strict rest **not** recommended
 - No evidence for a more rapid improvement of symptoms
- Rest 'as needed'
- Moderate activity as soon as tolerated
 - If symptoms increase, decrease activity level
- Full activity to be avoided
 - Delays recovery

Concussion Recovery-Cognitive Rest

- **Not** recommended
- As with physical rest, no evidence it helps
- Avoid or decrease activities (screen time, reading) which make symptoms worse

Concussion Treatment-Medication?

- Symptomatic
 - NSAIDs for headache
 - Avoid alcohol and other drugs
- No other medications have been proven to improve or speed up recovery
- May use low dose amitriptyline to help with sleep and headaches
- DHEA/Omega-3

Concussion: Return to Play/Sports

- Steps are progressed through one at a time with typically 24hrs between steps
- If symptoms appear at any of the steps, activity is stopped. Once player is symptom free for 24hrs, resume at last step player was asymptomatic
- Steps should not be combined to decrease Return to Play time

Concussion: Return to Play/Sports



Concussion: Second Impact Syndrome

- Occurs when an athlete returns to play without resolution of symptoms and the player is injured a second time, even minor injury
- Leads to increased cerebral edema and is almost always fatal
- After injury, the brain is susceptible to extremes in blood pressure
- A second impact to the head or body can cause a surge of catecholamines causing vascular congestion, cerebral edema, increased cranial pressure, coma, or death
 - Possible parallel to Shaken Baby Syndrome

Concussion: Return to Work

- Dependent on job requirements
- Physical jobs may require step-wise return similar to sports
- An individual plan should be developed

Concussion: Return to School

- As symptoms improve
- Coordinate with counselor/teacher
- May limit hours at school
- See CDC handout

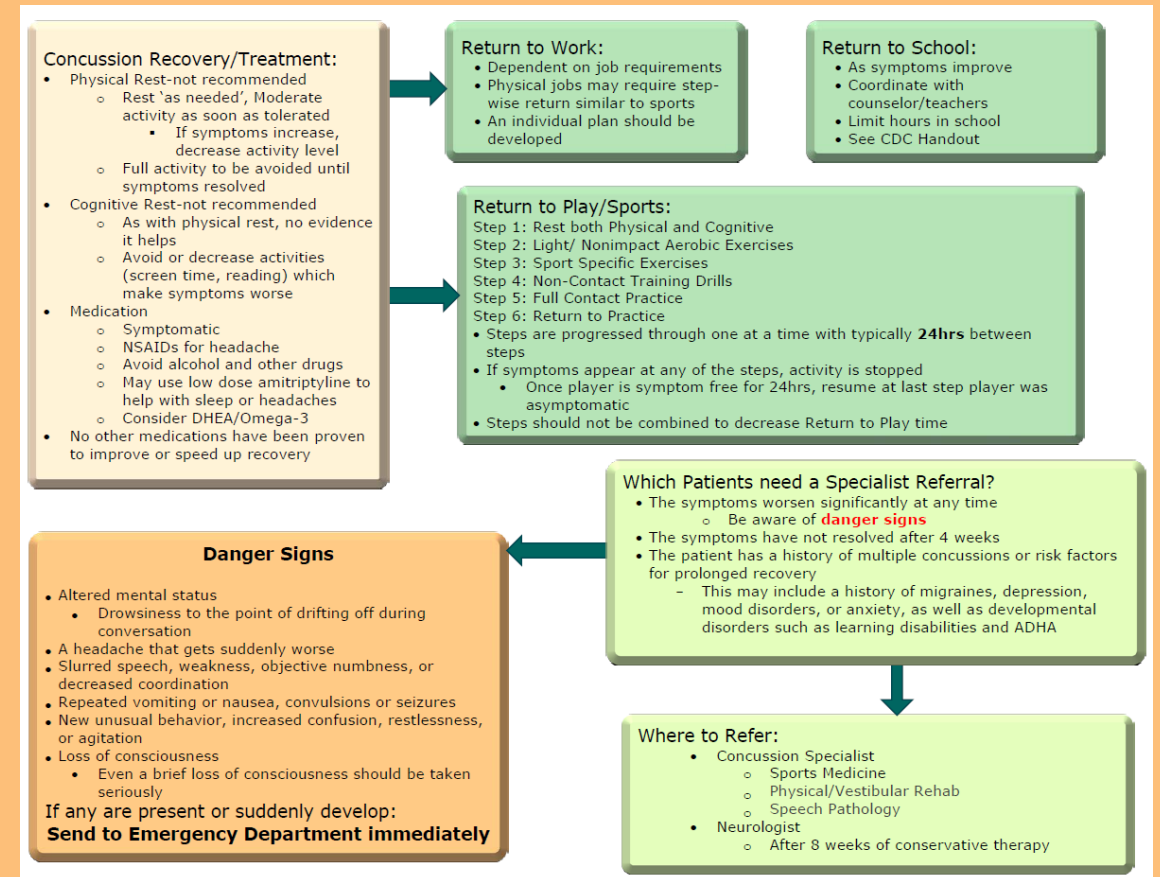
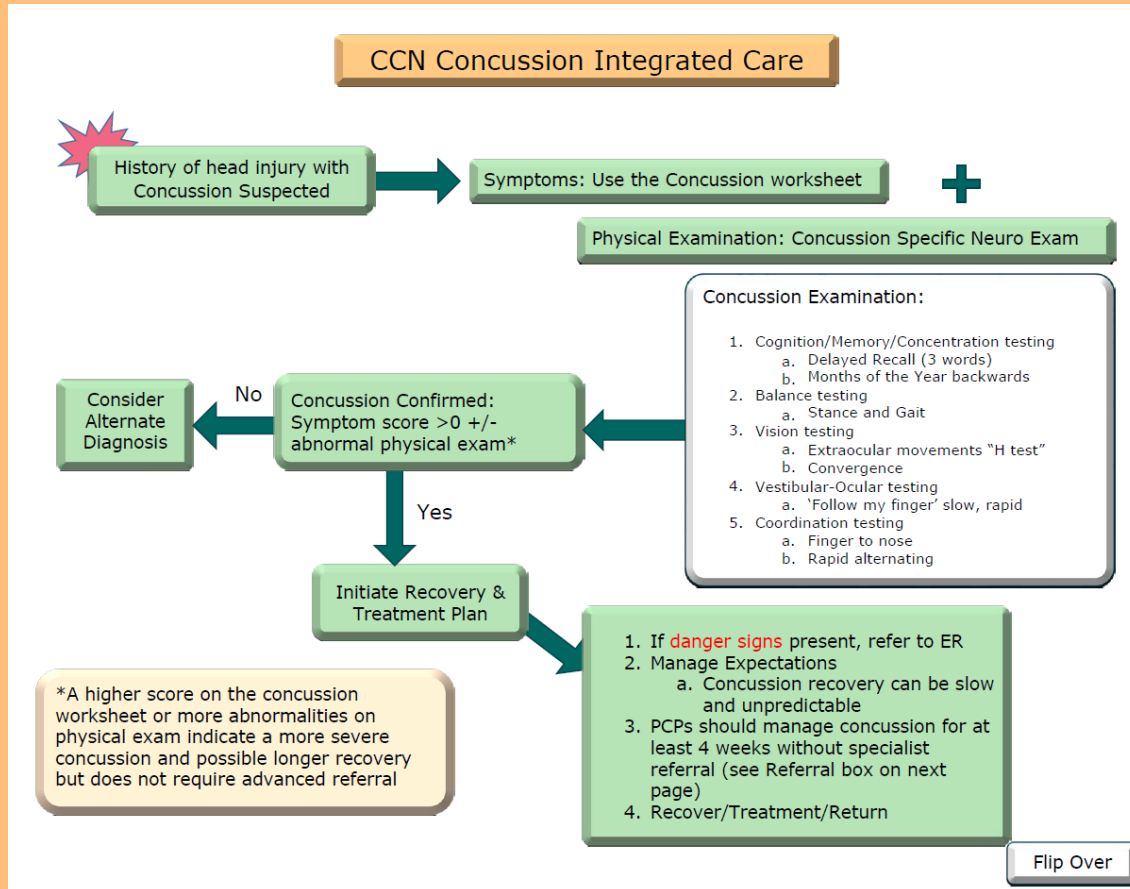
Concussion Referral: Who, When, and Why?

- The symptoms suddenly worsen at any time,
- The symptoms have not resolved after 4 weeks
- The patient has a history of multiple concussions or risk factors for prolonged recovery.
 - This may include a history of migraines, depression, mood disorders, or anxiety, as well as developmental disorders such as learning disabilities and ADHD.

Concussion: Where to Refer

- Concussion Specialist
 - Sports Medicine
 - Physical/Vestibular Rehab
 - Speech Pathology
- Neurologist
 - After 8 Weeks of Conservative Therapy

Concussion Flow Sheet



Scenario 1

- 38M hit in head by a steel beam through a helmet while on a construction site
- No loss of consciousness but complaining of headache, nausea, and dizziness
- Is imaging indicated?
- Does he need specialist referral?

Scenario 1

- No imaging or specialist referral indicated
- Patient can be evaluated and instructed to rest and limit activity until symptoms improve
- OTC analgesics

Scenario 2

- 15F lacrosse player knocked unconscious during game
- She had brief amnesia <10 minutes but feels fine now
- Can she return to the game?
- When to follow up?

Scenario 2

- No return to game
 - Risk of second impact syndrome is high
- Follow up within 3 days
- Limit physical and cognitive activity and return to school and sport in step-wise fashion

Scenario 3

- 55F with diabetes and HTN who slipped on the ice and hit the back of her head
- She was evaluated in the ER and had a negative CT
- Pt follows up in the office 5 days later and describes worsening headache with poor concentration

Scenario 3

- Pt has mild ataxia on exam and appears uncomfortable
- What is the next step?

Scenario 3

With worsening symptoms and an abnormal neuro exam pt should be sent back to the ED for urgent evaluation

Defining Impact of this Integrated Care Pathway

- Reduce the incidence of inappropriate specialist referral for patients with concussion
- Reduce time missed in school, work, or sports by following evidence-based guidelines

How Did We Do in Helping You Achieve These Learning Objectives?

This CME material will help you to:

- Streamline screening for and addressing behavioral health issues commonly encountered in ambulatory practice
- Engage CCN people, processes, and tools to enhance patient safety and health outcomes

Let us know by taking the post-test, which will allow you to receive free CME credit.

References

- Mullally, William J. (2017) Concussion *The American Journal of Medicine, Volume 130* (Issue 8) 885 – 892
- Evans, Randolph E. & Whitlow, Christopher T. (2019) Acute Mild Traumatic Brain Injury (Concussion) in Adults *UpToDate* (Topic 4828 v. 21)
- CDC NCIPC HeadsUP mTBI
- Consensus Statement on Concussion in Sport—the 4th International Conference on Concussion in Sport Held in Zurich, November 2012. Paul McCrory, MBBS, PhD; et al. *Clin J Sport Med* 2013;23:89–117.