CONCUSSION
Assessment and Management
Plan
UPDATED: April 22, 2019
Purpose:
In accordance to the standards of the National Collegiate Athletic Association (NCAA) and the University of Missouri Department of Intercollegiate Athletics, the Mizzou Sports Medicine team has set forth the following guidelines and protocols in an effort to prevent, educate, identify, evaluate, and manage traumatic brain injuries and concussions. These guidelines are set with the accordance and commitment to providing the highest level of health care for the student athlete, keeping their safety and well-being at the forefront of their experience at the University of Missouri.

Definition of Concussion:
In athletics, the most common form of traumatic brain injury (TBI) is a concussion. These injuries can be explained as a complex pathophysiological process affecting the brain, induced by traumatic biochemical forces. Characteristics of a concussion can include:

- A direct blow to the head or other body structures that results in a massive force transmitted to the head.
- A rapid onset of neurological impairments that are often short-termed and resolves within a quick manner of time.
- Acute symptoms largely reflect functional disturbances rather than structural brain injuries.
- Result in a graded set of clinical symptoms that may or may not involve loss of consciousness.
- Clinical and cognitive symptoms and functions resolve following a sequential progression, keeping in mind, that post-concussive symptoms may be prolonged.
- No evidence of abnormality is present on a standard neuroimaging studies.
Observable Potential Signs of Concussion:

The following list are symptoms or indications that a Student-Athlete has suffered a concussion. If any of these characteristics are noted, please make an Athletic Trainer or Team Physician aware of the situation.

- Any loss of consciousness
- Balance and motor coordination deficiencies
  - *Examples: Stumbles, trips/falls, slow/labored movement*
- Disorientation; blank/vacant stare
- Slurred/incoherent speech
- Delayed verbal/motor responses

Athlete Reported Potential Signs of Concussion:

The following list are “typical” symptoms related to a concussive injury. The Student-Athlete may describe one or more of the following:

- Headache,
- Dizziness,
- Balance and coordination struggles,
- Nausea,
- Retrograde/Anterograde Amnesia,
- Cognitive sluggishness,
- Light/Sound Sensitivities,
- Disorientation/confusion,
- Visual disturbance,
- Tinnitus (ringing in the ears),
- Inability to focus,
- Irritability,
- Emotional distress,
- Fatigue/Excessive drowsiness,
- Sleep disturbances
Mizzou Concussion Safety Protocol

Pre-Season Education

- Annually provide NCAA concussion fact sheets (provided by the NCAA) to the following entities: Student-Athletes, Coaches, Team Physicians, Athletic Trainers, and Directors of Athletics.

- Each party provides signed acknowledgment of having read and understand the concussion fact sheet.

Pre-Participation Assessment

- Every University of Missouri Student-Athlete will receive a baseline concussion assessment as part of their pre-participation physical examination, using the Sport Concussion Assessment Tool – Third Edition (SCAT-3). This will be documented and placed in each Student-Athlete’s medical file.

- The SCAT-3 baseline exam will cover:
  - Brain injury and concussion history
  - Symptom evaluation
  - Cognitive assessment
  - Balance evaluation

**SCAT-3**
- Standardized tool for evaluation of injured athletes for concussion
- Can be administered by ATC or Team Physician
- Quick and effective tool that can be used on sidelines, locker room, and athletic training facilities.

- Team Physician will provide clearance or determine the need for additional consultation or testing; consider a new baseline concussion assessment at six months post-injury for any student-athlete with a documented concussion. Especially those with complicated or multiple concussion history.
Recognition and Diagnosis of Concussion

**NCAA Competitions** for Contact/Collision Sports
1. Sports affected: basketball, football, pole vault, soccer, wrestling
2. Medical personnel with training in diagnosing, treatment, and initial management of acute concussion must be present.
3. Present is defined as on site at the campus or arena of competition
   - Medical personnel may be from either team
   - May be independently contracted for the event

**NCAA Varsity Practices** for Contact/Collision Sports
1. Sports affected: basketball, football, pole vault, soccer, wrestling
2. Medical personnel with training in diagnosing, treatment, and initial management of acute concussion must be available.
3. Available is defined as, at a minimum:
   - Medical personnel can be contacted at any time during the practice via telephone, messaging, email, beeper, or other immediate communication means.
   - The case can be discussed through such communication, and immediate arrangements can be made for the athlete to be evaluated.

**Any Student-Athlete** believed to have behaviors/symptoms/signs congruent with a concussion:
1. Removed immediately from practice/competition
2. Evaluation completed by ATC or Team Physician
   - Symptom Evaluation
   - Physical Evaluation
   - Neurological Evaluation
   - Cognitive Evaluation
   - Balance Evaluation
Referral to Emergency Action Plan (EAP)

1. Follow the University of Missouri Department of Athletics EAP
2. Correct and appropriate evaluation for injuries, such as:
   - Cervical Spine Trauma;
   - Skull Fracture;
   - Intracranial bleeding
3. Signs and Symptoms present to warrant EAP response:
   - Glasgow Coma Scale <13.
     - See Appendix
   - Prolonged loss of consciousness.
   - Focal Neurological deficit
     - problem with nerve, spinal cord, or brain function
     - loss of normal bodily functions
   - Repetitive emesis (vomiting.)
   - Diminished/worsening mental function or other neurological signs and symptoms
   - Spine Injury
Confirmation of Concussion

- Removal from practice/competition that calendar day
- During ALL competitions, the Student-Athlete will be moved to the locker room or Athletic Training Room
  1. SCAT-3 Assessment given at this time, as deemed necessary
  2. Eliminates distracting forces related to the field of competition
- Evaluation by team physician
- Student-athlete provided a Post-Concussive Care Document.
  1. Provided in Appendix
  2. Discussion with Student-Athlete and a responsible adult, parent/roommate/significant-other, who will accompany the concussed athlete for the evening and morning
- Admission into Post-Concussion Return to Play and Return to Learn
- Notification of the following individuals:
  1. Head Coach/Position Coach
  2. Academic Advisors
  3. Director of Sports Medicine
  4. Athletic Performance Staff
- In situations with prolonged recovery, ATCs and Team Physicians to consider additional diagnosis and best management plans. This could include, but not limited to:
  1. Post-concussion syndrome
  2. Sleep dysfunction
  3. Migraine or other headache disorders
  4. Mood disorders; such as anxiety and depression
  5. Ocular or vestibular dysfunction
Return to Play and Learn Activities

Return to Play (RTP)

Team Physician has FINAL ASSESSMENT and determination for RTP

Each Student-Athlete suffering a concussion will undergo:

- Supervised stepwise progression by the Athletic Trainer
- Student-Athlete will have limited physical and cognitive activity
  until baseline standards have been met.

At this point, the Student-Athlete can begin the RTP Progression

PROGRESSION MANAGEMENT PLAN FOR RETURN TO PLAY

This RTP is designed to progress as symptoms present themselves. The Student-Athlete must be symptom free for a minimum of 24 hours to progress to the next level. At any point, if concussive symptom are present, the Student-Athlete will return to the prior level and remain there until the concussive symptoms are no longer present. Further, the Student-Athlete will undergo continued post-concussion SCAT-3 testing.

1. Light aerobic exercise with resistance training:
   
   Example: Bike/Cardio

2. Sport-specific exercise and activity without head impact
   
   Example: Drill work, fundamental skill practice

3. Non-contact practice/progressive resistance training
   
   Example: Practice situations where no contact is possible
   Return to weight room activities

4. Unrestricted training
   
   Example: Complete return to practice

5. Return to competition pending Team Physician approval

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Return to Learn Management Team

- The designated sport Athletic Trainer will coordinate and navigate the RTL.
- In complex situations with a perceived prolonged RTL, a multidisciplinary team will be in place to assist the Student-Athlete’s reappearance in the traditional learning/classroom setting.
- The Post-Concussion RTL Team will consist of the following:
  - Athletic Trainer
  - Team Physician
  - Dr. Deborah Wright, Counseling Psychologist
  - Academic Counselor
  - Athletic Department Administrator
- Additional entities that could join RTL Team:
  - Office of Disability Services
  - Integrated Treatment Team
    - Dr. Aaron Gray, Team Physician
    - Dr. Deborah Wright, Clinical Psychologist
    - Rex L. Sharp, Sr. Associate Director; Sports Medicine
  - Dr. Pamela Hinton, Faculty Athletic Representative
  - University Administrators
  - College Directors. Ex.: Education, Business, CAFNR
  - Course instructors
  - Coaches/Support Staff
  - University of Missouri Health Center Specialists
    - Neuropsychologist consultant
    - Psychiatrist consultant

- Any action taken must remain in compliance with the Americans with Disabilities Act Amendments Act (ADAAA).
Return to Learn Protocols

- RTL should be managed much like the RTP progression
- Fits the individual and their concussive symptoms
- Quality RTL is based on cognitive rest immediately following a concussion
  - Avoidance of potential cognitive stressors
  - Examples include: School work; video games; reading; texting

Return to Cognitive Activity

- After concussion is diagnosed, the Student-Athlete must avoid the classroom, tutoring, mentoring for at least one day.
- Levels of RTL is based solely on the return of concussion symptoms

PROGRESSION MANAGEMENT PLAN FOR RETURN TO LEARN

1. If the Student-Athlete cannot tolerate 30 minutes of light cognitive activity, that person should contact the ATC and return home.
2. When Student-Athlete is able to reach 45 minutes of cognitive activity without a return of symptoms, they should return to a modified classroom schedule in a step-wise manner.
   a. Return of cognitive activity will be no longer than 45 minutes
   b. Followed by a minimum of 15 minutes of rest
3. Levels of adjustment should be decided by the Management Team
4. Amount of involvement will be made on a case-by-case basis
Return to Learn: Academic Terminology

 Majority of RTL cases do NOT need a detailed RTL Plan
  • Full recovery occurs within two weeks
  • Cognitive functions quickly return

 Complex RTL management
  • Great involvement from the RTL Management Team
  • General understanding of concepts BEFORE injury occurs

 Academic Adjustment:
  • Academic schedule requires some modifications the first 2 weeks following a concussive episode.
  • Full recovery is anticipated
    ▪ No meaningful curriculum or testing alterations
    ▪ Instructor awareness of the situation

 Academic Accommodation:
  • For the athlete that has on-going signs and symptoms for more than 2 weeks post-concussion.
  • Alterations may be needed in class schedules and special arrangements may be needed for tests, projects, and assignments.
  • Diagnosis of concussion vs. Post-Concussion Syndrome
  • Post-Concussion Syndrome
    ▪ Neuro-psychiatric best managed by a multi-disciplinary manner with active interventions.
    ▪ Prolonged cognitive/physical rest is actually counterproductive in a post-concussive syndrome Student-Athlete

 Academic Modification:
  • For a Student-Athlete who is suffering from prolonged difficulties, requiring an Individualized Education Plan (IEP).
  • IEP: A prescriptive, formal education for that individual, protected by the Individuals with Disabilities Education Act.

 Team Physician will reevaluate if Concussion Symptoms reappear or worsen during the RTL process.
Reducing Exposure to Head Trauma

- Reducing head trauma exposures will be difficult to acknowledge and quantify.
- Critical to educate both athletes and coaches regarding the importance of minimizing head trauma exposures.
- Examples to minimize head trauma injuries:
  - Adherence to the NCAA consensus for Year-Round Football Practice Guidelines.
  - Adherence to NCAA consensus for Independent Medical Care Guidelines.
  - Reducing unneeded contact during practice.
  - Take a “safety-first” thought and approach to the sport.
  - Education and direction of taking the head out of the point of impact and contact.
  - Education of athletes and coaches regarding safe play and the use of proper technique.
- Consistent and on-going evaluation of practice procedures and protocols
APPENDIX

A. NCAA Concussion Fact Sheet
B. Concussion Acknowledgement Form
C. SCAT-3 Testing Form
D. Glasgow Coma Scale
E. Post-Concussive Care Document
F. Concussion Flow Sheet
G. Campus Resources
Appendix A: NCAA CONCUSSION HANDOUT and

CONCUSSION
A FACT SHEET FOR STUDENT-ATHLETES

WHAT IS A CONCUSSION?
- A concussion is a brain injury that:
  - Is caused by a blow to the head or body.
  - Results from contact with another player hitting a hard surface such as the ground, ice or floor, or being hit by a piece of equipment such as a bat, lacrosse stick or field hockey ball.
  - Can change the way your brain normally works.
  - Can range from mild to severe.
  - Presents itself differently for each athlete.
  - Can occur during practice or competition in ANY sport.
  - Can happen even if you do not lose consciousness.

WHAT ARE THE SYMPTOMS OF A CONCUSSION?
- You will not see a concussion, but you might notice some of the symptoms right away. Other symptoms can show up hours or days after the injury.
- Concussion symptoms include:
  - Amnesia.
  - Confusion.
  - Headache.
  - Loss of consciousness.
  - Balance problems or dizziness.
  - Double or blurry vision.
  - Sensitivity to light or noise.
  - Nausea (feeling that you might vomit).
  - Feeling sluggish, foggy or groggy.
  - Feeling unusually irritable.
  - Concentration or memory problems (forgetting game plays, facts, meeting times).
  - Slowed reaction time.
- Exercise or activities that involve a lot of concentration, such as studying, working on the computer, or playing video games may cause concussion symptoms (such as headache or tiredness) to resurface or get worse.

HOW CAN I PREVENT A CONCUSSION?
- Basic steps you can take to protect yourself from concussion:
  - Do not initiate contact with your head or helmet. You can still get a concussion if you are wearing a helmet.
  - Avoid striking an opponent in the head. Undercutting, flying elbows, stepping on a head, checking an unprotected opponent, and sticks to the head all cause concussions.
  - Follow your athletic department’s rules for safety and the rules of the sport.
  - Practice good sportsmanship at all times.
  - Practice and perfect the skills of the sport.

WHAT SHOULD I DO IF I THINK I HAVE A CONCUSSION?
- Don’t hide it. Tell your athletic trainer and coach. Never ignore a blow to the head. Also, tell your athletic trainer and coach if one of your teammates might have a concussion.
- Sports have injury timeouts and player substitutions so that you can get checked out.
- Report it. Do not return to participation in a game, practice or other activity with symptoms. The sooner you get checked out, the sooner you may be able to return to play.
- Get checked out. Your team physician, athletic trainer, or health care professional can tell you if you have had a concussion and when you are cleared to return to play.
- A concussion can affect your ability to perform everyday activities, your reaction time, balance, sleep and classroom performance.
- Take time to recover. If you have had a concussion, your brain needs time to heal. While your brain is still healing, you are much more likely to have a repeat concussion. In rare cases, repeat concussions can cause permanent brain damage and even death. Severe brain injury can change your whole life.

IT’S BETTER TO MISS ONE GAME THAN THE WHOLE SEASON.
WHEN IN DOUBT, GET CHECKED OUT.

For more information and resources, visit www.NCAA.org/HealthSafety and www.CDC.gov/Concussion.
Appendix B: Concussion Acknowledgment Form

University of Missouri Sports Medicine
Dr. Glenn L. McElroy Sports Medicine Center
100 MATC
Columbia, MO 65211
Phone (573) 882-2375
Fax (573) 884-0052

Acknowledgement form for having read and understand the NCAA Concussion Fact Sheet

I acknowledge that I have received, reviewed, and understand the NCAA Concussion Fact Sheet. As such, I have the direct responsibility of reporting any concussion for myself or of any other Mizzou Student-Athletes to the Mizzou Sports Medicine Staff.

Furthermore, I understand that there is a possibility that participation in my sport may result in a head injury and/or concussion.

By signing below, I acknowledge that the University of Missouri has provided me with specific educational materials on what a concussion is and given me an opportunity to ask questions and areas and issues that are not clear to me regarding concussions.

______________________________ Signature

______________________________ Printed Name

______________________________ Sport

______________________________ Date
Appendix C: SCAT-3 INSTRUCTIONS

Words in ITALICS are the instructions to be given to the athlete for each section.

SYMPTOM SCALE

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should be done at least 10 minutes post-exercise.

"You should score yourself on the following symptoms, based on how you feel now."

SAC

Immediate Memory: "I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."

Trials 1 & 2: "I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before"

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. SCORE 1 POINT for each correct response. Total score equals sum across all 3 trials.

Do NOT inform the athlete that a DELAYED RECALL will be asked.

CONCENTRATION:

Digit Recall: I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say: 7-1-9, you would say: 9-1-7.

If correct, go to next string length. If incorrect, read trial 2. One point possible for each string length. Stop after incorrect on third trials. Digits should be read at the rate of one per second.

Months in Reverse Order: "Now tell me the months of the year in reverse order. Start with the last month and go backwards. So, you will say: December, November, ___, Go Ahead.

SCORE 1 POINT if entire sequence is correct.

DELAYED RECALL:
The delayed recall should be performed after completion of the Balance and Coordination Exams. SCORE 1 POINT for each correct response.

Do you remember that list of words? Read it five times earlier? Tell me as many words from the list as you can remember in any order.

BALANCE EXAMINATION

Modified BESS testing: This balance testing is based on a modified version of the BESS. A metronome is required for this testing.

"I am now going to test your balance. Please take your shoes off and roll up your pant legs above ankle. Remove any undergarments. Test will consist of different tasks with different scores."  

(4) Double Leg Stance: The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in this position for 20 seconds. If you lose balance, you will be counted the number of times you move out of this position. If you fall, I will start timing when you are set and have closed your eyes.

(6) Single Leg Stance: If you lose your balance, you will be counted the number of times you move out of this position. If you fall, I will start timing when you are set and have closed your eyes.

(2) Tandem Stance: If you lose your balance, you will be counted the number of times you move out of this position. If you fall, I will start timing when you are set and have closed your eyes.

Balance testing—Types of errors: 1. Headliftoff 2. Distract 3. Fall to the side 4. Fall to the front 5. Fall to the back 6. Drop of position 7. Fall to the right 8. Fall to the left 9. Fall to the middle 10. Fall to the floor 11. Fall to the ground 12. Fall to the ground. Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. The modified BESS is calculated by adding one error point for each error during the 20-second trial. The maximum total number of errors for any single condition is 10. If athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once error is set. Scorer should note that errors occur in pairs at the level of the knee, hip, lumbar spine, and head. Each error point is scored once and only once.

Tandem Stance: Remove any footwear. Instruct athlete to stand with their feet together behind a starting line. Have the athlete walk in a forward direction as quickly and accurately as possible along a 10-foot length of tape. The athlete must use one alternating foot and keep both feet in contact with the ground at all times. Scorer should count the number of times the athlete steps outside the boundary of the starting line.

COORDINATION EXAMINATION

Upper limit coordination: Finger-to-nose (FTN) task: "I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm either right or left extended (shoulder flexed to 90 degrees and elbow and fingers extended), pointing in front of you. When I give you a start signal, I would like you to perform 5 consecutive finger to nose repetitions using your index finger to touch the tip of the nose, and then return to the starting position, as quickly and as accurately as possible.

Score: 5 correct repetitions in <4 seconds = 1. Note for testers: athletes fail the test if they do not touch their nose, do not fully extend their elbow, or do not perform five repetitions. Failure should be scored as a 0."
Appendix D: Glasgow Coma Scale

<table>
<thead>
<tr>
<th>BEST EYE RESPONSE E</th>
<th>Spontaneous—open with blinking at baseline</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Opens to verbal command or speech</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Opens to pain, not applied to face</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>BEST VERBAL RESPONSE V</td>
<td>Oriented</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Confused conversation, able to answer questions</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Inappropriate responses, words understandable</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Unable to understand speech</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
<tr>
<td>BEST MOTOR RESPONSE M</td>
<td>Obeys direction for movement</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Intentional movement to painful stimulus</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdraws from pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Abnormal (spastic) flexion, decorticate posture</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Extensor (rigid) response, decerebrate posture</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**Medical emergency if an individual grades out with less than 13 points.**
Appendix E: Post-Concussive Care Document

POST-CONCUSSION INFORMATION SHEET

Definition: A concussion is a form of traumatic brain injury, generally caused by a force to the head or body that causes your brain to move quickly within the skull. Generally, most people recover quickly from a concussive injury. It is important during this time to allow your brain to recover.

SYMPTOMS TO BE AWARE OF: Please contact your athletic trainer if you have any of the following:

1. Repeated vomiting
2. Headache intensifies
3. Increased confusion, agitation
4. Difficulty with balance
5. Weakness/numbness
6. Vision difficulties

THINGS YOU CAN DO TO FEEL BETTER:

- Get plenty of rest and sleep.
- Drink plenty of fluids
- Eat normally
- STAY away from computers, phones, video games, movies, and TV

ATHLETIC TRAINER

NAME: _______________________
PHONE: ______________________

ADDITIONAL INSTRUCTIONS:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

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Appendix F: CONCUSSION FLOW SHEET

PRE-SEASON CONCUSSION EDUCATION/ASSESSMENT

NCAA Fact Sheet (signed and kept in file)

SCAT-3 Baseline during yearly physical.
*Team Physician clears for play or refer to further testing*

- **Symptoms of Concussion**
- **Concussive Force.Hit**
- **No symptoms of concussion**
  - **REMOVAL by ATC/Team Physician**
    - During competition, Athlete moved to Locker Room/Athletic Training Room for evaluation
  - **Recheck in ~15 minutes**
  - No sign of Concussion
  - No further care needed

- **Examination**
  - SCAT-3 Testing → compare to previous testing
  - Notification of Coaches/Academic Advisors, Athletic Performance, Director of Sports Medicine
  - Discussion with Athlete and Responsible Adult → Given Concussion Care Document

- **Return to Play:** 5 step protocol. Must complete all steps with no symptoms of concussion.
  1. Light Cardio
  2. Fundamental/Skills during practice
  3. Non-Contact Practice/Progression into Weight Room Activities
  4. Unrestricted Training
  5. Team Physician gives final clearance for full participation

- **Return to Learn:** RTL through Cognitive step-wise protocol
  - Athletic Department Management Team
  - NO CLASSWORK for 24 hours post-injury
  - Less than 2 week injury: Work with academics staff to make slight modifications
  - More than 2 week return: Campus/Athletics Management Team; Campus Disabilities
Appendix G: CAMPUS RESOURCES

University of Missouri:

Campus Disability Center: disabilitycenter.missouri.edu

Address: S5 Memorial Union, Columbia, MO 65211

Voice: 573-882-4696 | VP: 573-234-6662 | Fax: 573-884-5002

E-mail: disabilitycenter@missouri.edu

Office Hours: Monday-Friday, 8:00 a.m.–5:00 p.m.

Director: Barbara Hammer, M.Ed.

University of Missouri Health Care

Carmen Abbott, Physical Therapist

Specializing in Vestibular Rehabilitation

Lisa Smith, Occupational Therapist at the Neurology Clinic

Specializing in cognitive deficits and neurological vision

Justin Midyett, Physical Therapist at the Neurology Clinic

Specialist in Traumatic Brain Injuries

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