

# MANAGEMENT OF SPORT CONCUSSIONS

## NC STATE SPORTS MEDICINE

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1. Sports Medicine Staff
2. Definitions
3. Policy & Procedures
4. Recovery
5. Other Issues

# SPORTS MEDICINE STAFF

- Licensed Healthcare Providers
- Primary role to protect the health of the student athlete
- Skilled in Injury Evaluation, Management, & Rehabilitation
- 18 Certified Athletic Trainers
  - 11 Full-Time and 7 Graduate Assistants
  - 2014 Transitioning to 13 FT and 5 GA's
  - Emphasis placed on high risk sports & BIG 4
  - Football, Wrestling, Gymnastics, Volleyball, Men's & Women's Basketball, Men's & Women's Soccer, Track & Field (Pole Vault), Baseball

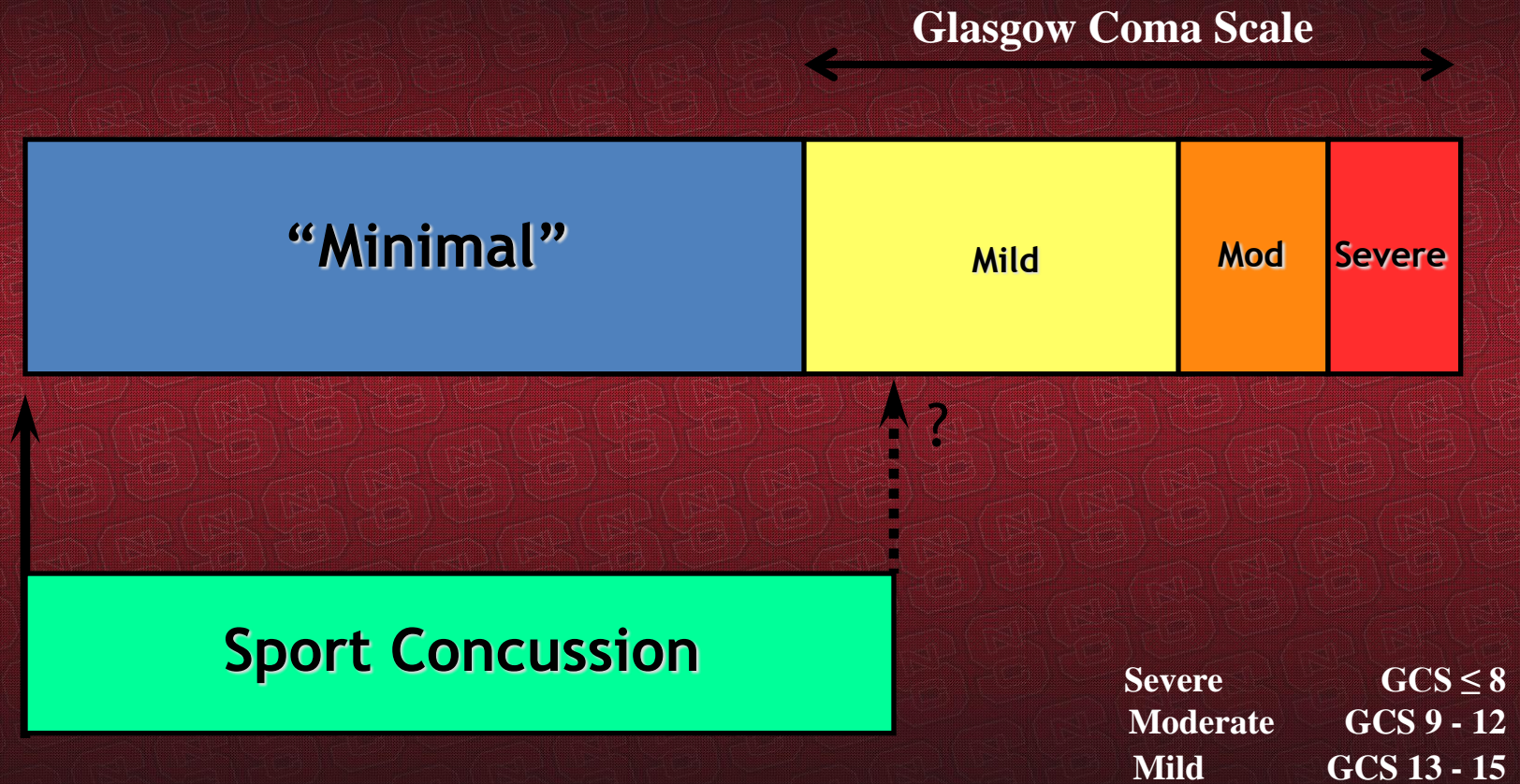


# SPORTS MEDICINE STAFF

- 5 Internal Medicine Physicians (Raleigh Medical)
- 1 Emergency Medicine Physician (REX)
- 1 Student Health Physician
- 1 Neurosurgeon
- 6 Orthopaedic Physicians (Raleigh Ortho)
- 1 Psychiatrist
- 1 Sport Psychologist (3/4 time employee)

# 2. DEFINITIONS

# TRAUMATIC BRAIN INJURY





# DEFINITION: SPORT CONCUSSION

*“Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by biomechanical forces. Several common features that incorporate clinical, pathologic and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include...”*

# DEFINITION: SPORT CONCUSSION

1. Concussion 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.
2. Concussion typically results in the rapid onset of short- lived impairment of neurologic function that resolves spontaneously. However in some cases symptoms and signs may evolve over a number of minutes to hours.
3. Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury and as such, no abnormality is seen on standard structural neuroimaging studies.
4. Concussion results in a graded set of clinical symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course. However it is important to note that in some cases, post-concussive symptoms may be prolonged.



# 3. POLICY & PROCEDURES

# CONSENSUS POSITION STATEMENTS

- International Conference on Concussion in Sport
  - 1<sup>st</sup> Vienna 2001
  - 2<sup>nd</sup> Prague 2004
  - 3<sup>rd</sup> Zurich 2008
  - 4<sup>th</sup> Zurich 2012
- National Athletic Trainers' Association Position Statement: Management of the Sport Related Concussion 2004
- The Team Physician Consensus Statement: Concussion and the Team Physician 2005  
(AAFP, AMSSM, AAOS, AOSSM, ACSM, AOASM)

# CONCUSSION POLICY

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# PRE-SEASON EVALUATION

- Medical History
- Pre-Participation Physical
- Risk Acknowledgment Specific to Concussions
- “Heads-Up” Video (mandatory for Football)
- Website Videos [www.gopack.com](http://www.gopack.com) (NCAA “Don’t Hide It”)
- Review of Concussion Management with Coaches
- Review of Concussion Symptoms @ Team Meeting
- Baseline Testing
  - Neuropsychological – ImPACT
  - Symptom, Balance, & Cognitive Assessment – SCAT/BESS
- Proper Equipment Fitting

# ON THE FIELD EVALUATION

- A Certified Athletic Trainer (ATC) is on site for all scheduled high risk countable activities.
- If an athlete is suspected of sustaining a head injury the student is removed from participation and evaluated.
- If an ATC is not on site, the coach and/or teammates have been instructed to remove the individual from activity and contact a designated Sports Medicine staff member or 911.
- Evaluation of a suspected head injury is initiated with a quick scan of ABCs and responsiveness (Glasgow coma scale) Eyes - Verbal - Motor
- SCAT or other sideline assessment tools can be utilized.
- NCAA Mandate: A player that is diagnosed concussion will not be allowed to return to play on the day of injury.



1

## Glasgow coma scale (GCS)

### Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

### Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

### Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

**Glasgow Coma score (E + V + M)** of 15

GCS should be recorded for all athletes in case of subsequent deterioration.



# SIGNS AND SYMPTOMS

- Symptoms – headache, nausea, dizziness, blurred vision, sensitivity to light or sound, ringing in the ears, pressure in the head, balance and coordination problems
- Physical signs – loss of consciousness, elevated blood pressure, nystagmus, pupil size and reactivity to light
- Behavioral changes – irritability, emotional
- Cognitive impairment – slowed reaction times, confusion, lack of concentration, amnesia
- Sleep disturbance – drowsiness, insomnia

## 3

## How do you feel?

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

**Total number of symptoms** (Maximum possible 22)

**Symptom severity score** (Maximum possible 132)



## Cognitive assessment

### Standardized Assessment of Concussion (SAC)<sup>4</sup>

**Orientation** (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1
<b>Orientation score</b>	of 5	

### Immediate memory

List	Trial 1		Trial 2		Trial 3		Alternative word list		
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect
<b>Total</b>									

**Immediate memory score total** of 15

### Concentration: Digits Backward

List	Trial 1		Alternative digit list		
4-9-3	0	1	6-2-9	5-2-6	4-1-5
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6
<b>Total of 4</b>					

**Concentration: Month in Reverse Order** (1 pt. for entire sequence correct)

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan	0	1
<b>Concentration score</b>	of 5	



5

### Neck Examination:

Range of motion      Tenderness      Upper and lower limb sensation & strength

Findings: \_\_\_\_\_

6

### Balance examination

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.) \_\_\_\_\_

#### Modified Balance Error Scoring System (BESS) testing<sup>5</sup>

Which foot was tested (i.e. which is the **non-dominant** foot)       Left       Right

Testing surface (hard floor, field, etc.) \_\_\_\_\_

#### Condition

Double leg stance: \_\_\_\_\_ Errors

Single leg stance (non-dominant foot): \_\_\_\_\_ Errors

Tandem stance (non-dominant foot at back): \_\_\_\_\_ Errors

#### And/Or

#### Tandem gait<sup>6,7</sup>

Time (best of 4 trials): \_\_\_\_\_ seconds

7

### Coordination examination

#### Upper limb coordination

Which arm was tested:       Left       Right

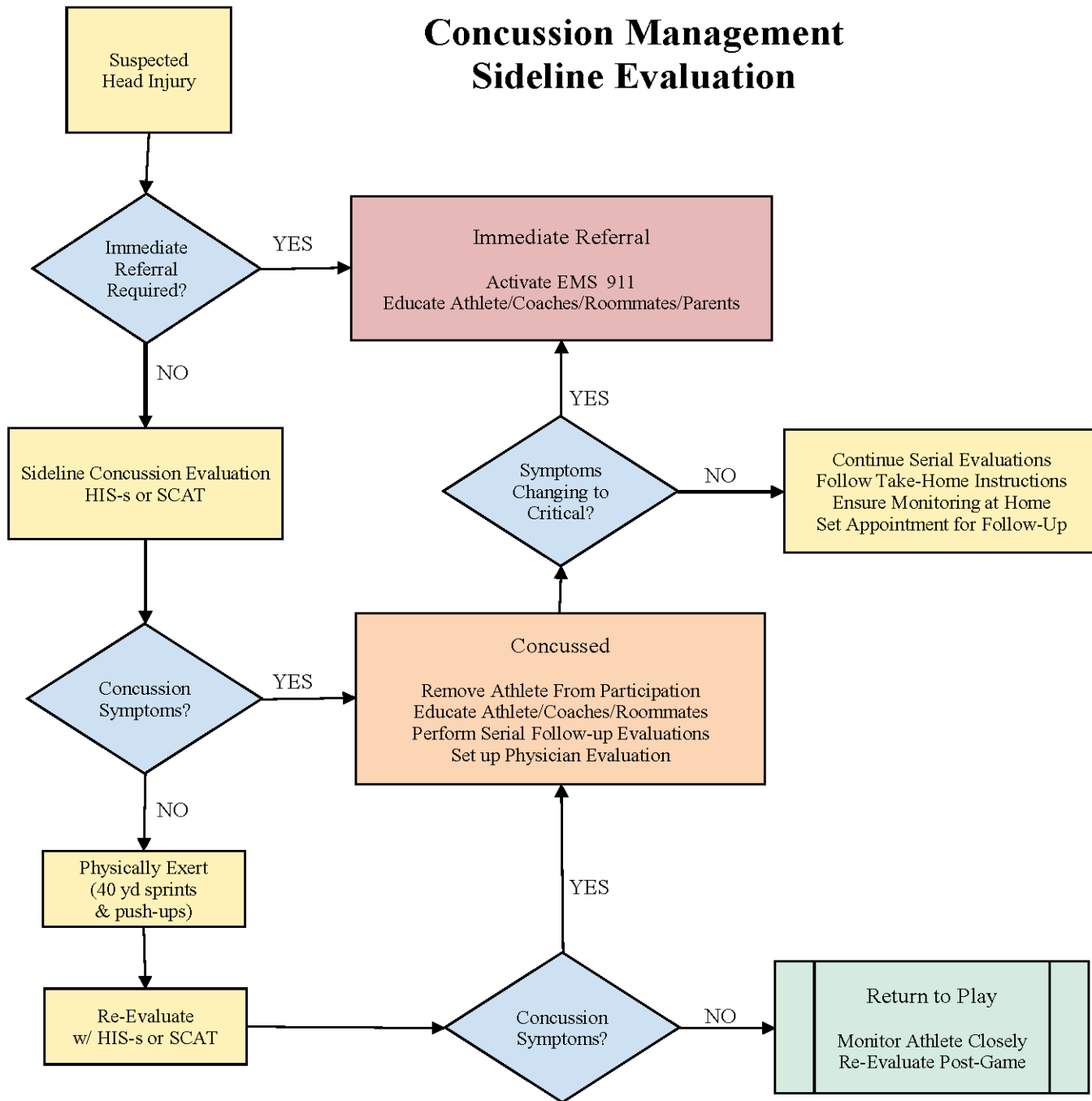
Coordination score \_\_\_\_\_ of 1

8

### SAC Delayed Recall<sup>4</sup>

Delayed recall score \_\_\_\_\_ of 5

# Concussion Management Sideline Evaluation

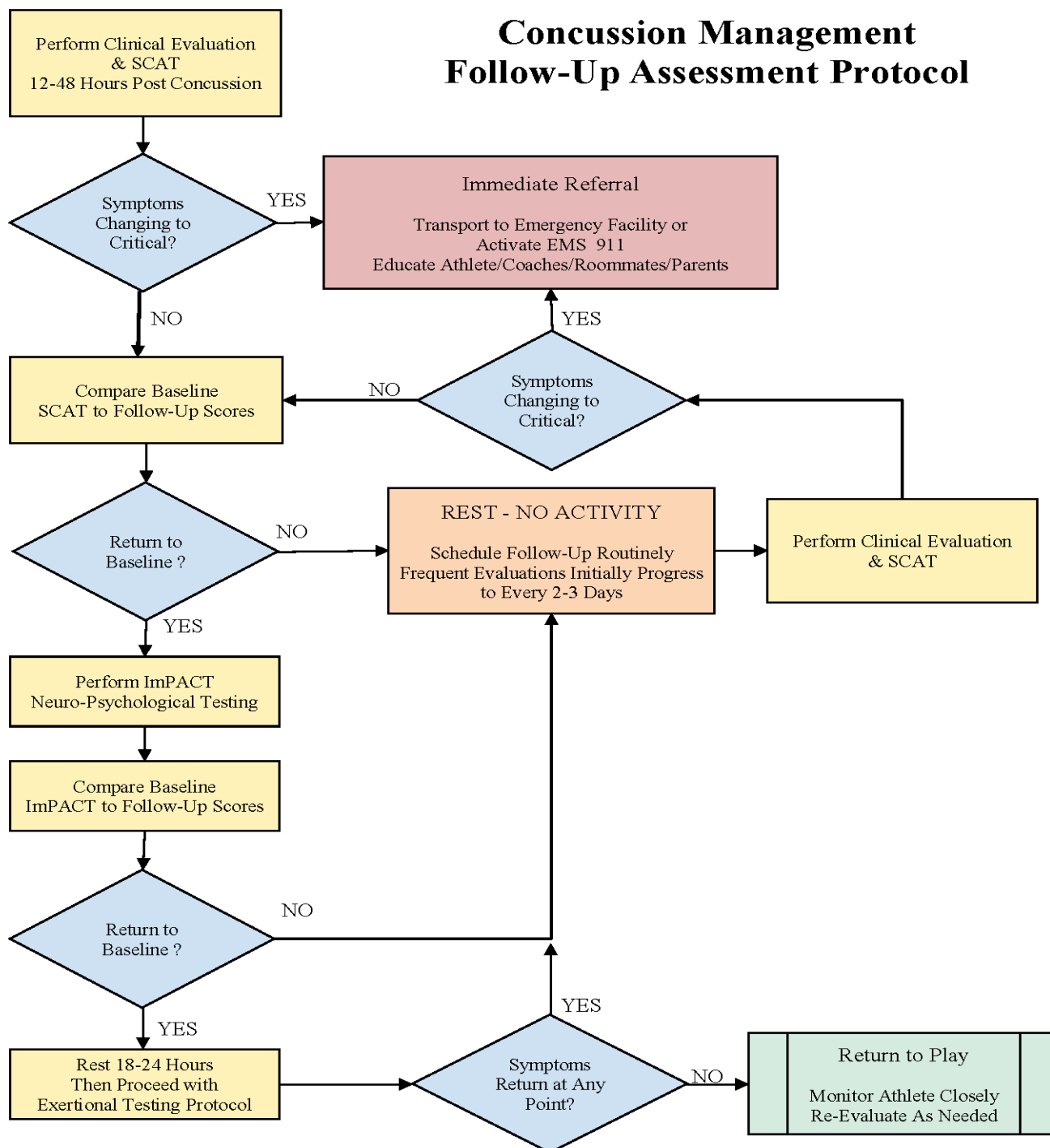


# REFERRAL TO A PHYSICIAN

- Every concussion must be referred to a physician
- Referrals do **NOT** need to be executed immediately
- Individual clinical decision
- “Physician Referral Checklist”
- Serial evaluations are performed to monitor changes
- If deterioration is suspected the student should be referred immediately
- If referral is delayed, the student is monitored for the next several hours
- “Take Home Instructions”
- Initiate academic accommodations with DSO



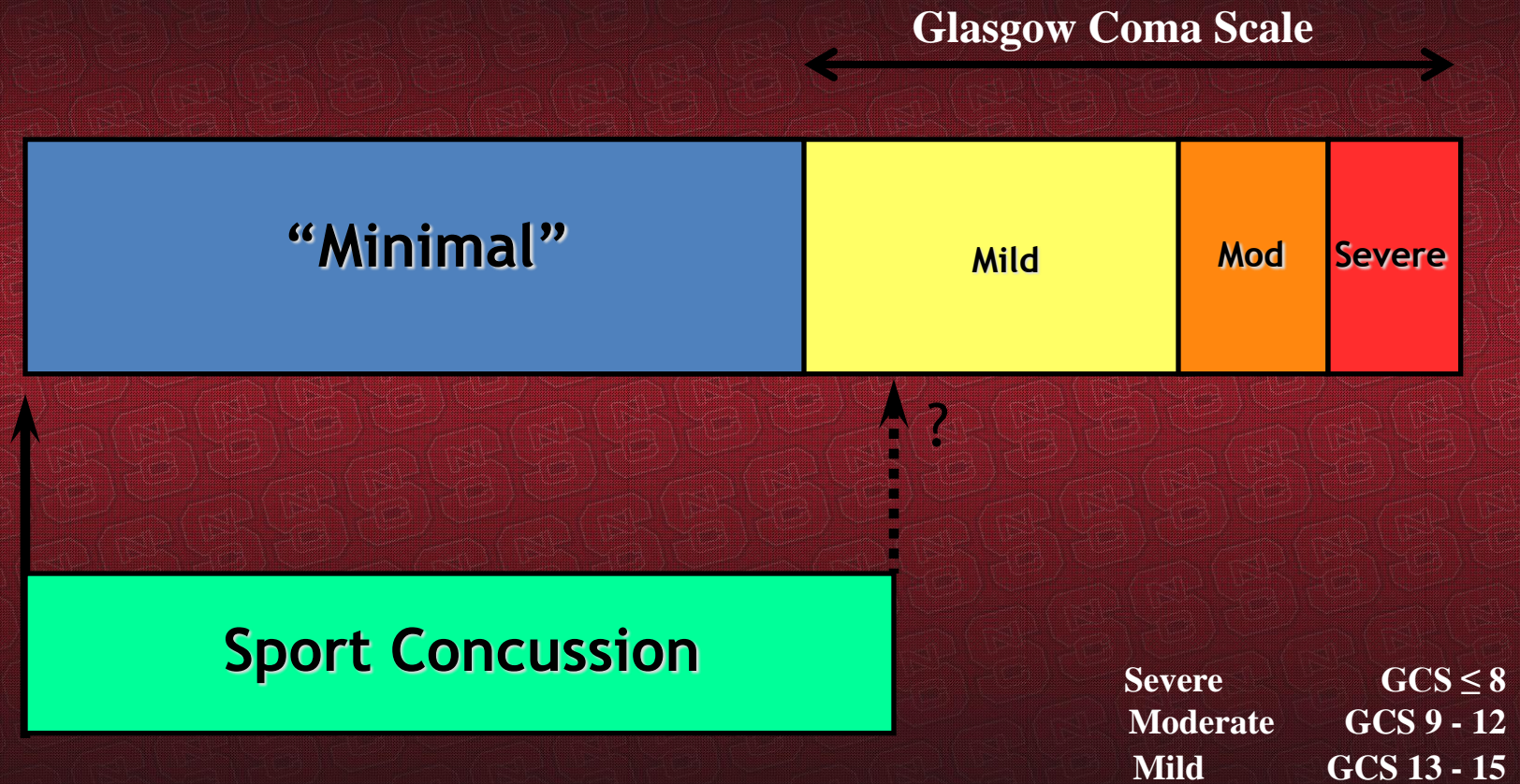
# Concussion Management Follow-Up Assessment Protocol



# DIAGNOSTIC TESTING

- Neuroimaging (CT, MRI)
  - Contributes little to concussion evaluation
  - Use when suspicion of intracerebral or structural lesion exists:
    - focal neurologic deficit
    - worsening symptoms
    - Prolonged disturbance of conscious state
- Positive CT/MRI = more severe traumatic brain injury
- Likely medical disqualification

# TRAUMATIC BRAIN INJURY





# 4. RECOVERY

# RECOVERY

- Majority (80-90%) resolve in 7-10 day
- May take longer in children and adolescents
- Recent studies suggest women may have delayed recovery

# RECOVERY MANAGEMENT

Initial Rest is Critical “Act like mold.”

- Physical Rest
  - No training, playing, exercise, weights
  - Minimize activities of daily living (stairs)
  - Minimize fluctuations in blood pressure
  - Maintain posture (head above the heart)
- Cognitive Rest
  - No television, video games, or computers (eye strain)
  - No extensive reading
  - No conceptual thinking



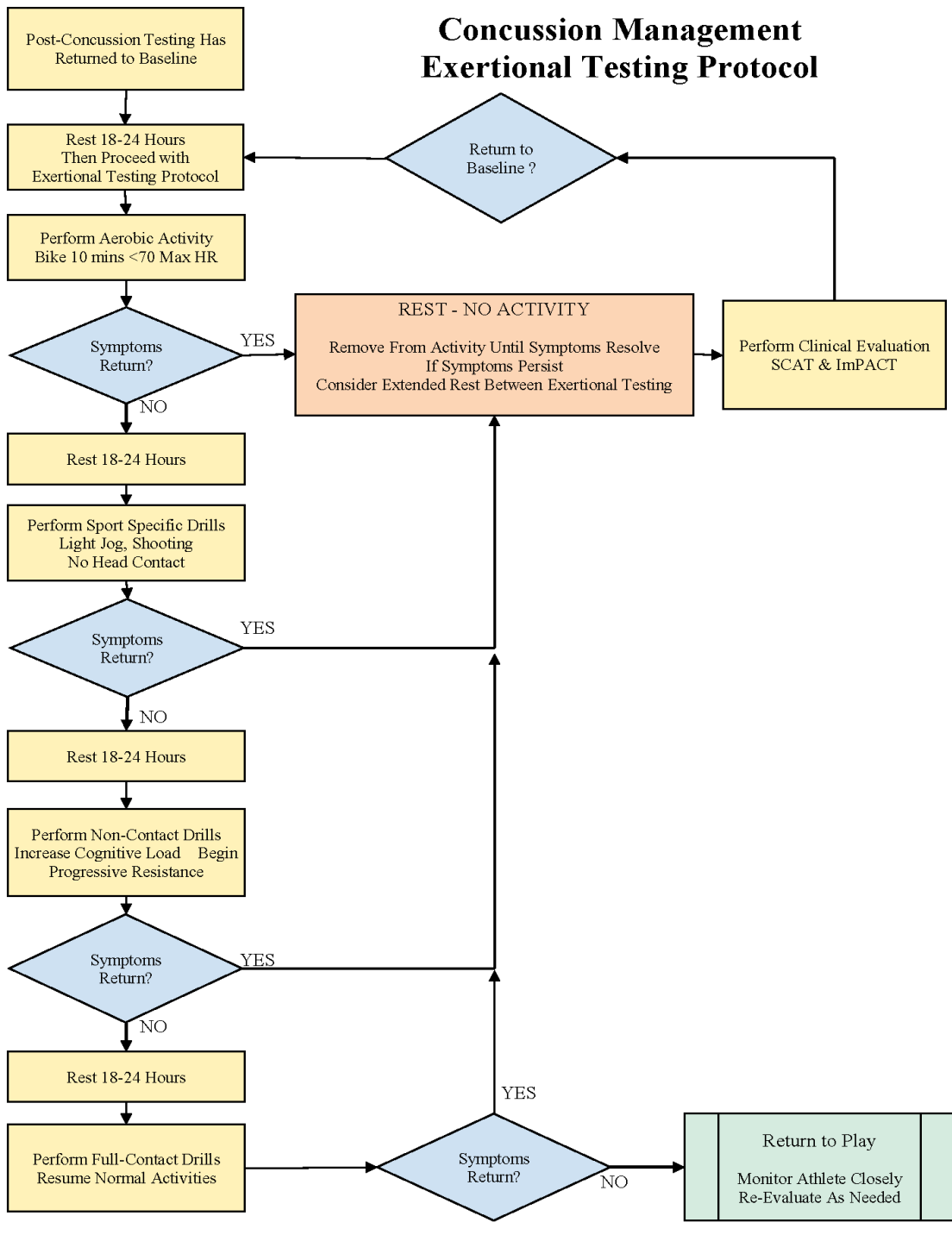
# RECOVERY MANAGEMENT

- When symptoms begin to resolve a gradual return to school and social activities should be executed that does not exacerbate symptoms
  - Walk for 10 mins
  - Read for 10 mins and work up to reading at intervals every hour
- Once symptoms have fully resolved the student is evaluated to determine their readiness to begin a gradual exercise protocol.
- Physician determines the student's readiness to proceed and the rate at which to proceed.

# GRADUATED EXERTIONAL PROTOCOL

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Symptom limited physical and cognitive rest.	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity < 70% MPHR No resistance training.	Increase HR & BP
3. Sport-specific exercise	Jogging, shooting drills in basketball, running drills in soccer. No head impact activities.	Added movement with shock absorbing forces
4. Non-contact training drills	Progression to more complex training drills e.g. passing drills in football and soccer. May start progressive resistance training No head impact activities	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

# Concussion Management Exertional Testing Protocol





# THE PERSISTENT CONCUSSION

- Symptoms (>10 days) in about 10-15%
- Managed in multidisciplinary manner
  - Internal Medicine
  - Sport Psychologist
  - Psychiatrist
  - Neurologist
  - Neurosurgeon

# MODIFYING FACTORS

FACTORS	MODIFIER
Symptoms	Number Duration (>10 days) Severity
Signs	Prolonged LOC (>1min) Amnesia
Sequelae	Concussive convulsions
Temporal	Frequency – repeated concussion over time Timing – Recent concussion or TBI
Threshold	Repeated concussions occurring with progressively less impact force or slower recovery after each successive concussion
Age	Child and adolescent (< 18 years old)
Co and Pre-morbidities	Migraine, depression or other mental health disorders, attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), sleep disorders
Medication	Psychoactive drugs Anticoagulants
Behaviour	Dangerous style of play
Sport	High risk activity Contact and collision sport High sporting level

# 5. OTHER ISSUES



# CONCERNS

- Diagnosis is largely based on the report of symptoms which is very subjective
- Athletes/Coaches tend to have a “suck it up” attitude
- Sub-Concussive Accumulation – Limited Contact
- Sporting Rules – Wrestling & Soccer
- Growing concern for the long-term health of athletes (loss of motor function, mental health issues)
- Chronic Traumatic Encephalopathy (CTE)
  - Cause/effect not yet demonstrated

# LEGAL ISSUES

- NCAA is currently being sued by at least two groups
- Growing NCAA trend: ATC is beholden to the coach
- Conflict of Interest
- NFL settled for \$765 million

# PREVENTION

- Protective equipment
  - Mouthguards prevent oral injury, there is no evidence that they play any role in reducing concussions
  - Head gear and helmets have not been shown to reduce the incident of concussions.
  - The intent of the helmet and head gear was/is to reduce skull fractures and facial injuries.
  - Use of football helmet caps/add-ons or head gear in soccer gives a false sense of security.



Go Pack!