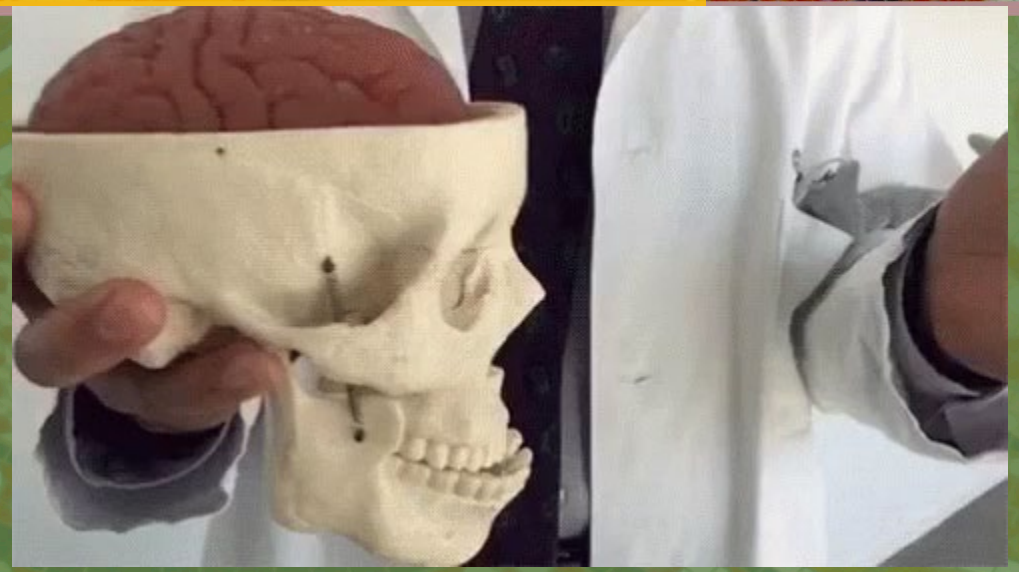
Curtin University

# Concussion Update

Dr Gill Cowen



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CRICOS Provider Code: 00301J

# ACKNOWLEDGEMENT OF COUNTRY (BOODJA)

I would like to acknowledge the Whadjuk Noongar people whose land we are standing on and recognise the strength, resilience and capacity of the Noongar people.

I pay my respect to their vibrant and endless culture and the leadership of the Elders past, present and emerging. I extend my respect to Aboriginal and Torres Strait Islander peoples here today.

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# Learning Objectives

- Definition of Concussion/mTBI
- Epidemiology
- Assessment – tips and tools
- Management update
- Support and Resources

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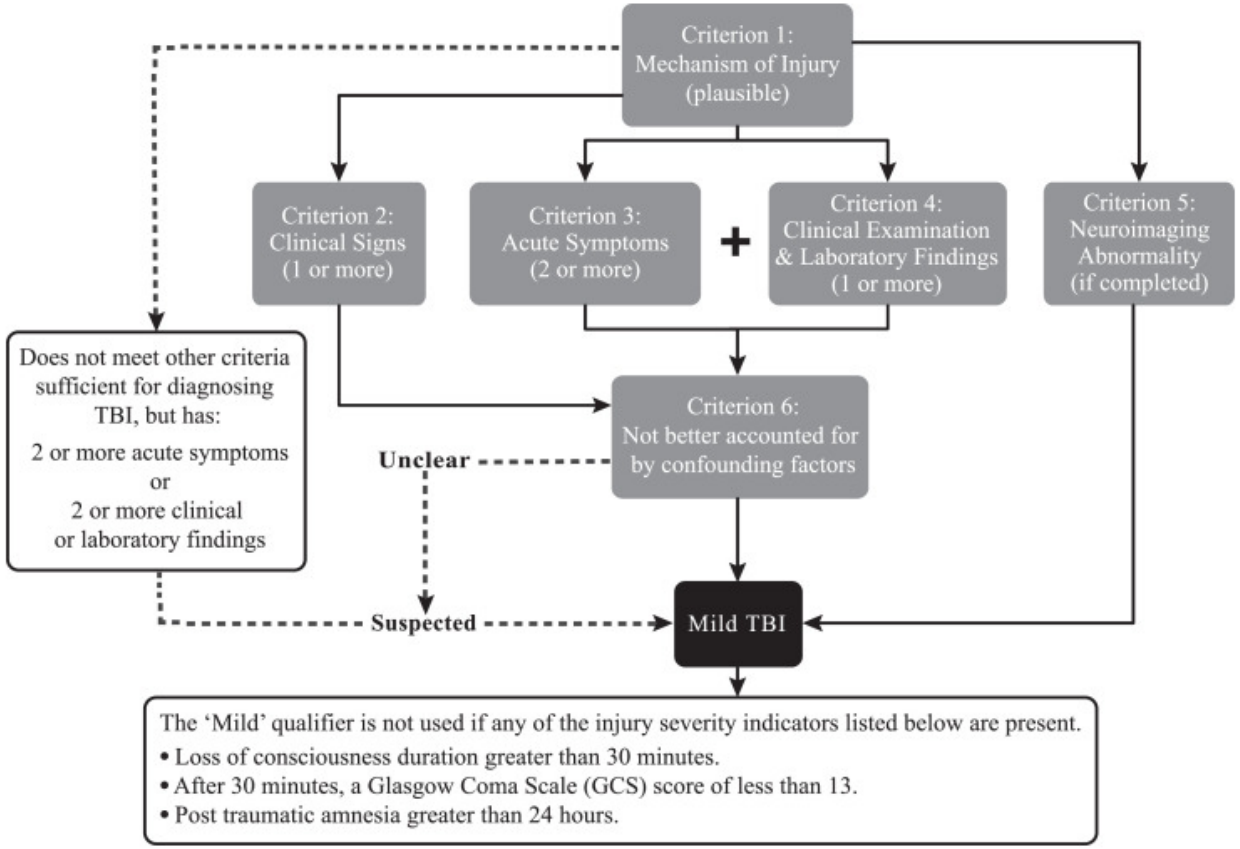
# Concussion/mTBI

**American Congress of Rehabilitation Medicine Diagnostic Criteria for Mild Traumatic Brain Injury.**




Silverberg et al 2023 Archives of Physical Medicine and Rehabilitation

**Concussion:** The diagnostic label 'concussion' may be used interchangeably with 'mild TBI' when neuroimaging is normal or not clinically indicated

**Neuroimaging Qualifier:** If neuroimaging is abnormal (Criterion 5), the qualifier mild TBI 'with neuroimaging evidence of structural intracranial injury' may be used. When neuroimaging is completed and found to be normal, the qualifier mild TBI 'without neuroimaging evidence of structural intracranial injury' may be used. If neuroimaging is not completed, no qualifier is used

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# Concussion in Primary Care

- Acute presentations:
  - GP-led EDs
  - GP practices
  - Aboriginal Health Services
  - Nursing posts
- ‘Clearance’ requests:
  - Return to school/work
  - Return to (contact) sport/high risk activities
  - Return to other activities (driving)
- Prolonged or persisting symptoms

But also:
In the community

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https://www.istockphoto.com/photos

# Mechanism

- Traumatic brain injury
- Induced by direct/indirect impulsive biomechanical force (blow to head/neck/body)
- Symptoms may present acutely OR evolve over minutes to hours
- Loss of consciousness in NOT required to make the diagnosis
- Symptoms and signs of concussion cannot be explained solely drug, alcohol, or medication use, other injuries or other comorbidities

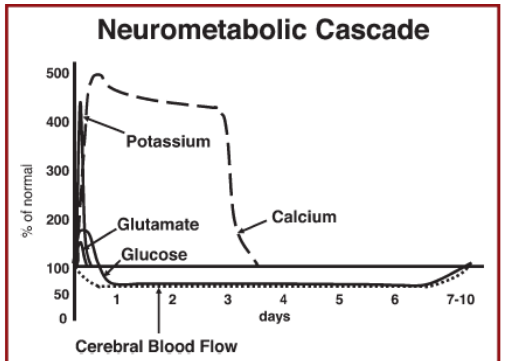

FIGURE 1. *Time course of the neurometabolic cascade of concussion.*

Giza & Hovda, 2014

Neuroinflammation

Herring S, et al. Br J Sports Med 2021;0:1–11. doi:10.1136/bjsports-2021-104235
Patricios JS, Schneider KJ, Dvorak J, et al. Br J Sports Med 2023;57:695–711.

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# Demographics

- >90% of all TBIs
- Only 16-20% sports-related (SRC)
- Major causes:

https://www.istockphoto.com/photos

Falls

Road traffic crashes

Traumatic assaults (in IPV)

Lancet Neurol 2022; 21: 1004–60

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# Assessment Tips

- The trend is your friend
- Greater severity of acute symptoms predicts slower recovery
- Greater severity of subacute symptoms predicts prolonged recovery
- Pre-morbid impaired mental wellbeing

| Symptom | Rating |
|---|---|
| Headaches | 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 |
| 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 |
| Trouble falling asleep (if applicable) | 0 1 2 3 4 5 6 |

| | | |
|---|---|---|
| Do your symptoms get worse with physical activity? | Y | N |
| Do your symptoms get worse with mental activity? | Y | N |

**If 100% is feeling perfectly normal, what percent of normal do you feel?**

**If not 100%, why?**

Echemendia RJ, et al. Br J Sports Med June 2023 Vol 57 No 11

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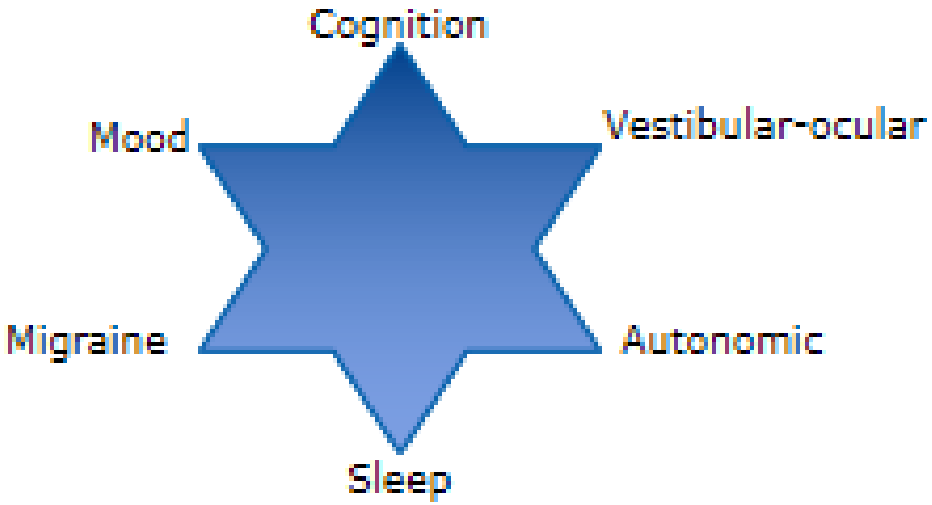
# Symptom Constellation

Think of it as a constellation of symptoms

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# Tools to assist assessment

- BIST

https://tbin.aut.ac.nz/__data/assets/pdf_file/0006/448593/37827_AUT-TBI-Network-BIST-Tool_v2.pdf

- SCAT6 (>12y: up to 3/7 post-injury) /child SCAT6 (8-12y: up to 7/7 post-injury)

https://www.connectivity.org.au/wp-content/uploads/2023/06/SCAT-6.pdf

https://www.connectivity.org.au/wp-content/uploads/2023/06/Child-SCAT-6.pdf

- SCOAT6/child SCOAT6

https://www.connectivity.org.au/wp-content/uploads/2023/06/SCOAT-6.pdf

https://www.connectivity.org.au/wp-content/uploads/2023/06/Child-SCOAT-6.pdf

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# Autonomic Dysfunction

ANS dysfunction is thought to be a major factor in mTBI symptoms

- Does physical activity exacerbate their symptoms?
- Do they have orthostatic changes in HR and BP, + worsening of symptoms?
- Has their heart rate variability diminished?
  - HRV: non-invasive measure of autonomic status
  - Some smart watches have HRV monitoring capabilities
  - Greater variability suggests an appropriate ANS response to the environment
- Graded aerobic exercise testing (>72h post injury)

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# Brief vestibular-ocular motor screening (VOMS)

Duke Neurology: VOMS https://www.youtube.com/watch?v=CJF6kJcFGqE

- Smooth pursuit (H) – pressure, pain, other at end ROM


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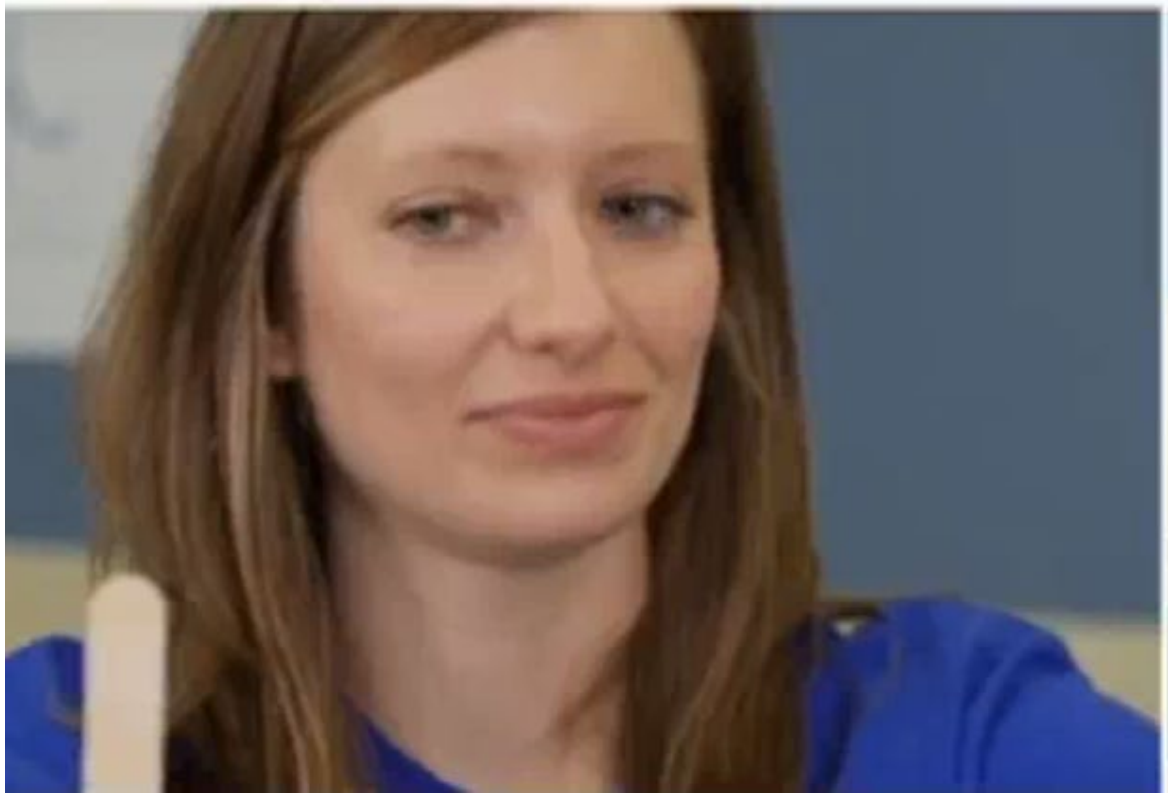
- Horizontal and vertical saccades



https://www.youtube.com/watch?v=CJF6kJcFGqE

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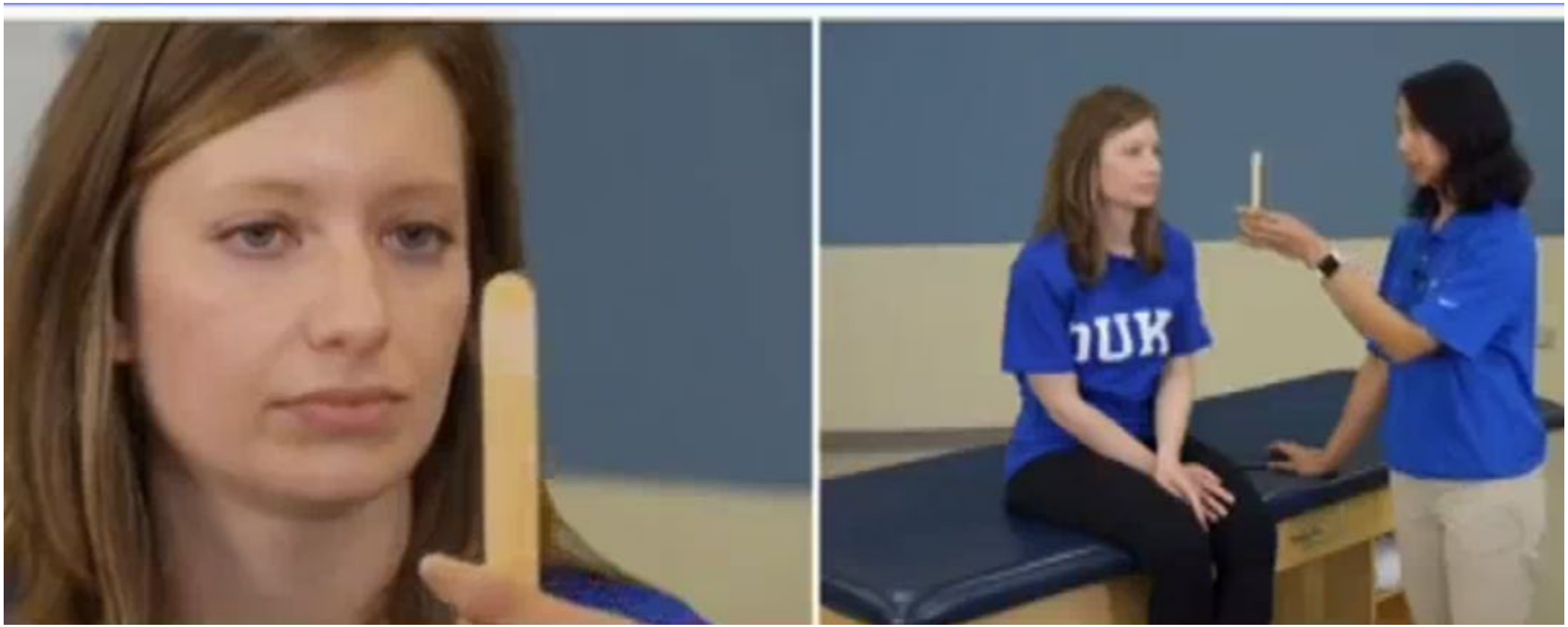
- Convergence



https://www.youtube.com/watch?v=CJF6kJcFGqE

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- Horizontal and vertical VOR

https://www.youtube.com/watch?v=CJF6kJcFGqE

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- Visual motion sensitivity testing

https://www.youtube.com/watch?v=CJF6kJcFGqE

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# Confounding Factors

- Previous concussion(s)
- Female sex (esp 15-18y)
- Post concussive seizures
- Migraine
- Mental health problems (pre-injury or current)
- Co-morbid ADHD
- Learning disabilities
- Sleep disturbance
- Psychoactive drug use
- Personality traits (high achievers, rigidity or thought)

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# Management

Research has identified a discrepancy between confidence in making a diagnosis of concussion and confidence in managing concussion in General practitioners in Western Australia

Thomas et al. BMC Fam Pract (2021) 22:46
https://doi.org/10.1186/s12875-021-01384-1

BMC Family Practice

RESEARCH ARTICLE Open Access

## A cross-sectional study reporting concussion exposure, assessment and management in Western Australian general practice

Elizabeth Thomas[1,2], HuiJun Chih[1,3], Belinda Gabbe[4,5], Melinda Fitzgerald[6,7] and Gill Cowen[8*]

**Abstract**

**Background:** General Practitioners (GPs) may be called upon to assess patients who have sustained a concussion despite limited information being available at this assessment. Information relating to how concussion is actually being assessed and managed in General Practice is scarce. This study aimed to identify characteristics of current Western Australian (WA) GP exposure to patients with concussion, factors associated with GPs' knowledge of concussion, confidence of GPs in diagnosing and managing patients with concussion, typical referral practices and familiarity of GPs with guidelines.

**Methods:** In this cross-sectional study, GPs in WA were recruited via the RACGP WA newsletter and shareGP and the consented GPs completed an electronic survey. Associations were performed using Chi-squared tests or Fisher's Exact test.

**Results:** Sixty-six GPs in WA responded to the survey (response rate = 1.7%). Demographics, usual practice, knowledge, confidence, identification of prolonged recovery as well as guideline and resource awareness of GPs who practised in regional and metropolitan areas were comparable ($p > 0.05$). Characteristics of GPs were similar between those who identified all symptoms of concussion and distractors correctly and those who did not ($p > 0.05$). However, 84% of the respondents who had never heard of concussion guidelines were less likely to answer all symptoms and distractors correctly ($p = 0.039$). Whilst 78% of the GPs who were confident in their diagnoses had heard of guidelines ($p = 0.029$), confidence in managing concussion was not significantly associated with GPs exposure to guidelines. It should be noted that none of the respondents correctly identified signs of concussion and excluded the distractors.

**Conclusions:** Knowledge surrounding concussion guidelines, diagnosis and management varied across GPs in WA. Promotion of available concussion guidelines may assist GPs who lack confidence in making a diagnosis. The lack of association between GPs exposure to guidelines and confidence managing concussion highlights that concussion management may be an area where GPs could benefit from additional education and support.

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# Initial Management

First 24-48h

Limit cognitive activity to only mild symptom exacerbation

Limit physical activity to only mild symptom exacerbation

Avoid use of screens (0-48h)

Avoid air travel

Avoid driving

Avoid alcohol

Simple analgesia (paracetamol) for headaches if required

Consider ice packs to head/neck (72h)

Aim for good sleep patterns

- Manage red flags
- Exclude focal neurology
- Early education and reassurance is paramount
  - Normalise symptoms
  - Discuss expectations of outcome

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# After 24-48h

- Gently challenge sensitivities to eg movement, light, noise
- Start a graduated return to normal activities
  - Increase periods of cognitive activity
  - Pacing activities and including regular breaks
  - Light physical exercise with the aim of increasing heart rate but no more than mild symptom exacerbation
- Stress minimisation and management
- Reassure – recovery is usual within 4 weeks

ABSOLUTE REST is associated with SLOWER RECOVERY

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# Symptom Monitoring

- Exacerbation of symptoms >2/10 during activity
- Failure of 0-2/10 symptom exacerbation to settle w/I 1h
- Worsening of symptoms without return to pre activity levels
- Domain identification and targeted symptom management

- If recovery is not within anticipated timeframes
  - Optimise management of confounding conditions
  - Individualise management
  - Reassure (typically prolonged symptoms will settle by 3/12)

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# Return to Learn/Work

| Step | Mental Activity | Activity at Each Step | Goal |
|---|---|---|---|
| 1 | Daily activities that do not result in more than a mild exacerbation* of symptoms related to the current concussion. | Typical activities during the day (e.g., reading) while minimizing screen time. Start with 5–15 min at a time and increase gradually. | Gradual return to typical activities. |
| 2 | School activities. | Homework, reading, or other cognitive activities outside of the classroom. | Increase tolerance to cognitive work. |
| 3 | Return to school part time. | Gradual introduction of schoolwork. May need to start with a partial school day or with greater access to rest breaks during the day. | Increase academic activities. |
| 4 | Return to school full time. | Gradually progress school activities until a full day can be tolerated without more than mild* symptom exacerbation. | Return to full academic activities and catch up on missed work. |

**NOTE:** Following an initial period of relative rest (24-48 hours following injury at Step 1), athletes can begin a gradual and incremental increase in their cognitive load. Progression through the strategy for students should be slowed when there is more than a mild and brief symptom exacerbation.

*Mild and brief exacerbation of symptoms is defined as an increase of no more than 2 points on a 0-10 point scale (with 0 representing no symptoms and 10 the worst symptoms imaginable) for less than an hour when compared with the baseline value reported prior to cognitive activity.

For use by Health Care Professionals only

British Journal of Sports Medicine

# Sport-Related Concussion

- Recent changes to Australian Institute of Sport recommendations:
  - In line with NZ and UK guidelines
  - Recommend 14-day symptom free at rest before return to contact training

  PLUS, minimum of 21 days before returning to contact sport from injury (D0)

- Recommends Healthcare practitioner review:
  - D0
  - D3-4
  - After 14 days symptom free at rest

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# Clinician Support

- WAPHA mTBI healthpathway: https://wa.communityhealthpathways.org/246668.htm
- SHIU: https://www.nmhs.health.wa.gov.au/Hospitals-and-Services/Public-Health/Head-Injury/Concussion/HP
- Connectivity: https://www.connectivity.org.au/guidance-for-clinicians/
- PREDICT: https://www.predict.org.au/head-injury-guideline/

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# Patient Resources

- SHIU

https://www.nmhs.health.wa.gov.au/Hospitals-and-Services/Public-Health/Head-Injury/Concussion

- Connectivity

https://www.connectivity.org.au/symptoms-and-care/what-is-mild-tbi-or-concussion/

- Headcheck

https://www.headcheck.com.au/

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# Sport Related Resources

**‘If in doubt, sit them out’**

- AIS: https://www.concussioninsport.gov.au/__data/assets/pdf_file/0004/1133545/37382_Concussion-and-Brain-Health-Position-Statement-2024-FA.pdf
- Consensus Statement on Concussion in Sport:

https://bjsm.bmj.com/content/bjsports/57/11/695.full.pdf

- Sporting codes
- https://sma.org.au/resources-advice/concussion/

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# Repetitive Head Trauma

- There is concern about potential consequences of RHT (which may or may not cause symptoms)  for long term brain health
- The strength of the association is unclear, but it appears related to length of time ‘in the game’ in sport
- This raises questions regarding other cohorts who experience RHT such as those suffering family violence

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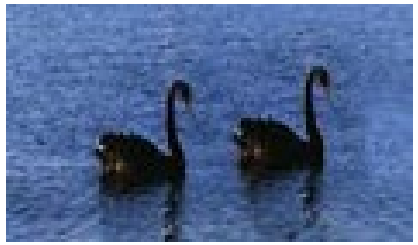

# Questions

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