Persistent symptoms after TBI

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Speaker disclosures

- ✓ Kayli Gimarc, Natasha Mehta, and Cherry Junn have no conflicts of interest to declare

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Objectives

1. Discuss etiology and risk factors for persistent symptoms
2. Learn about most common persistent symptoms
3. Discuss management of persistent symptoms

Lecture outline

This lecture will focus on mild TBI.

1. Initial management of TBI
2. Risk factors for persistent symptoms
3. Etiology of persistent symptoms
4. Diagnosis/assessment of persistent symptoms
5. Persistent symptoms
    - A. Cognitive symptoms
    - B. Affective symptoms
        - -Depression
        - -Emotional dysregulation
    - C. Somatic symptoms
        - -Headache
        - -Sleep disturbance
        - -Fatigue
        - -Dizziness / vestibular dysfunction
        - -Visual dysfunction
6. Management of persistent symptoms

Terminology note:

In this lecture we will use “concussion” and “mild TBI” interchangeably.

mTBI = mild traumatic brain injury
CBT = cognitive behavioral therapy
DoD = Department of Defense

Initial management of TBI:

- Brief period of relative rest during acute phase (24-48 hours)
- Evaluation of signs/symptoms
- Education/counseling
  - Anticipated positive trajectory of recovery
  - Normalization of symptoms
  - Education about symptoms and recommended treatment
  - Avoidance of further head injury during initial recovery
- Screen for depression/anxiety
- Gradual and progressive resumption of physical and cognitive activity
  - "Sub-symptom threshold"

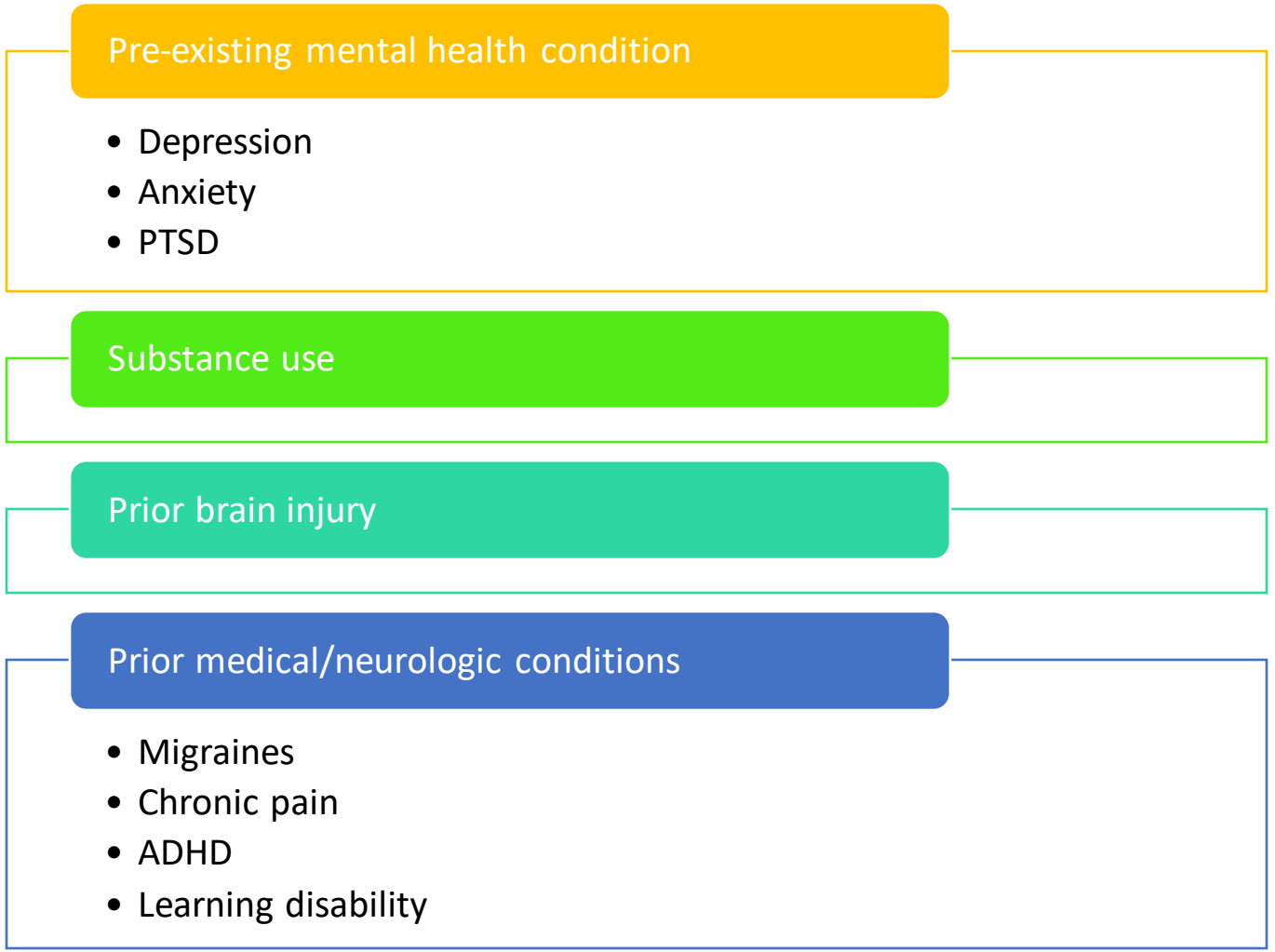
Persistent symptoms:

- Some individuals report persistent symptoms for months or years
- Several prospective studies have noted that symptom reporting after mTBI is relatively stable from 3 mo-1 year
- Symptoms may be waxing/waning over time
- Persistent symptoms associated with high levels of healthcare utilization
- Patients with persistent symptoms 3 months post injury should be referred for specialist management if available

Source: Zasler et al. "Chapter 28: Mild Traumatic Brain Injury". *Brain Injury Medicine.* Springer Publishing, 2021.

Risk factors for persistent symptoms:

- Pre-injury factors



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Source: Zasler et al. "Chapter 28: Mild Traumatic Brain Injury". *Brain Injury Medicine.* Springer Publishing, 2021.

Risk factors for persistent symptoms:

- Post-injury factors

Psychological and social factors

- "Good old days" bias
- Lack of social supports
- Misattribution
- Negative expectations for recovery

Contextual factors

- Litigation
- Lifestyle and family dynamics change
- Trauma/distress of event
- Loss of vocation/avocation

Source: Zasler et al. "Chapter 28: Mild Traumatic Brain Injury". *Brain Injury Medicine.* Springer Publishing, 2021.

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Etiology of persistent symptoms

- When are symptoms “persistent”?
- What about post-concussive syndrome?
- It is likely that no single underlying disease mechanism for post-concussion syndrome exists
  - This terminology attributes persistent symptoms directly to injury itself (single underlying cause), when multiple factors likely at play for most individuals
  - Thus, this phrase is being phased out of use
  - Suggested terminology: persistent or prolonged symptoms after TBI
    - → acknowledges that while the TBI can be the inciting event, multiple factors are likely at play

Source: Zasler et al. “Chapter 28: Mild Traumatic Brain Injury”. *Brain Injury Medicine.* Springer Publishing, 2021.

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Etiology of persistent symptoms

- Disentangling symptom etiology is challenging
  - Post-concussion symptoms are non-specific
  - Similar symptoms are common to chronic pain, depression, sleep disorders, trouble concentrating, irritability
  - These symptoms are also common in the general population
- Multidimensional cumulative stressor model
- Consider the timeline
  - Temporal relationship between injury and symptom onset
  - For new symptoms that develop >30 days after mTBI, DoD suggests symptom specific evaluation for non-mTBI etiologies

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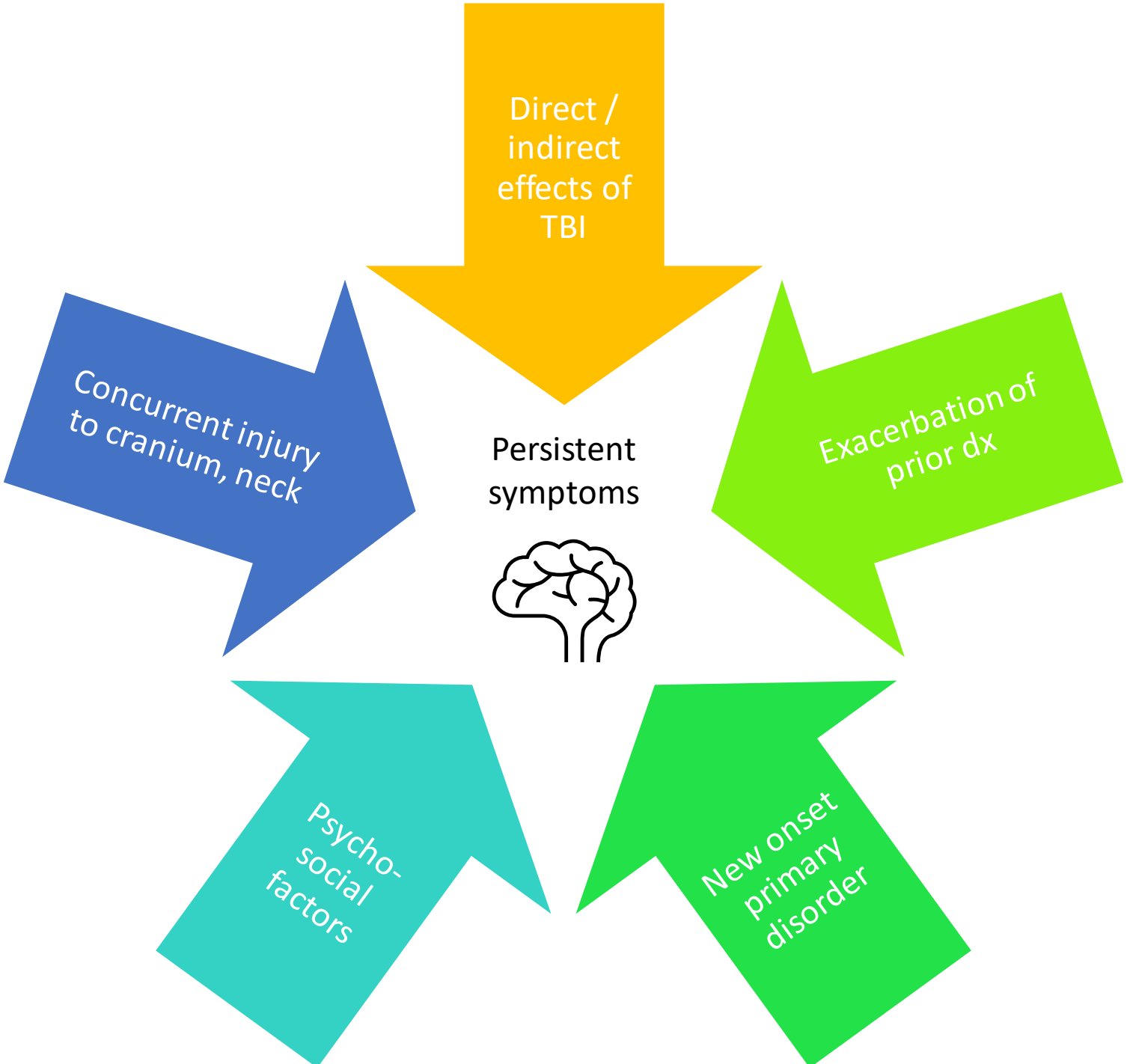
VA/DoD Clinical Practice Guidelines for The Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury. 2021.


Direct / indirect effects of TBI
Concurrent injury to cranium, neck
Persistent symptoms
Exacerbation of prior dx
Psycho-social factors
New onset primary disorder

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Assessment of persistent symptoms:

- Provider role: comprehensive assessment
  - Reassess symptom severity and impact on function
  - Directed physical exam
  - Evaluate for complicating health-related and contextual factors
    - Support system
    - Mental health history
    - Co-occurring conditions
      - Chronic pain
      - Mood disorders
      - Stress disorder
      - Sleep disorders
    - Substance use
    - Unemployment or change in job status
    - Suicide risk
  - Education and reassurance
  - Initiate targeted treatment of specific symptoms

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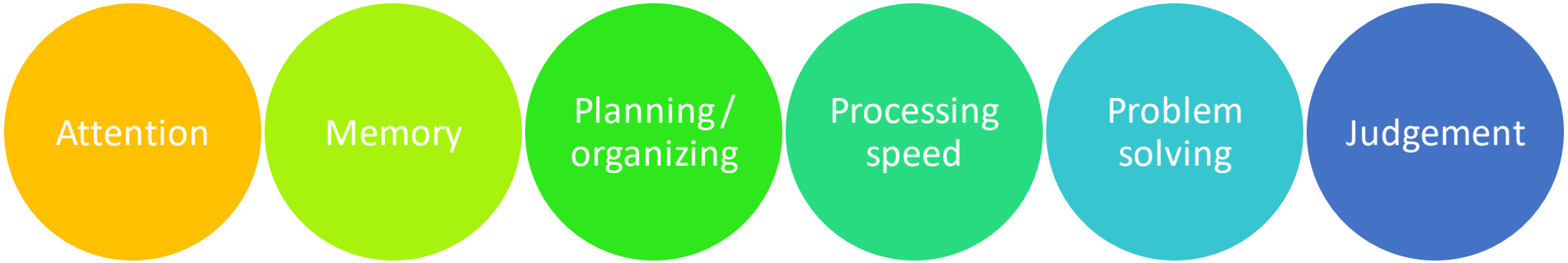
Types of persistent symptoms:

Cognitive	Affective	Somatic
• Memory • Attention • Processing speed • Judgment • Speech and language	• Depression • Anxiety • PTSD • Irritability • Aggression	• Headache • Dizziness • Fatigue • Sleep disturbance • Visual disturbance

Cognitive

- mTBI can be associated with difficulties in multiple cognitive domains
- Expected recovery ranges from 1 week to 6 mo in general
  - 15-33% of people experience persistent cognitive symptoms
- Significant influence from other factors: pain, meds, sleep disturbance, mood disorder, cognitive reserve
- Symptoms do not typically worsen over time as direct result of traumatic injury



Post-Traumatic Headache. Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms. Ontario Neurotrauma Foundation. 2022.
TBI Factsheets: Cognitive Problems after Traumatic Brain Injury. Models Systems Knowledge Translation Center (MSKTC). 2020.

Cognitive

- Evaluation
  - Clinical screening (MoCA, SCAT5)
  - Neuropsychological testing (>3 mo)
  - Speech therapy
- Treatment
  - Early education associated with reduction in persistence and misattribution of symptoms
  - Speech therapy
    - Encourage support system to attend therapy sessions
  - Pacing strategies
    - Single task focus
    - Limit over-stimulation
    - Increase time for new learning
  - Compensatory strategies
    - Create daily structure
    - Memory aids (calendar reminders, pillbox, written instructions)
    - Engage trusted family/friends when solving problems

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Affective: Depression

- Large effect on post-concussion symptom reporting – significant overlap in symptoms common to both diagnoses
- ~1/2 of people with TBI are affected with depression the first year after injury; ~2/3 within 7 years of injury
- Frequently co-occurs with anxiety or PTSD
- Evaluation
  - Screen for suicide risk
  - Symptom evaluation
    - PHQ-9 (depression), GAD-7 (anxiety)
- Treatment
  - Pharmacologic: SSRI or SNRI is generally first line
    - Maintenance at least 6-9mo recommended
  - Psychotherapy (CBT, behavioral activation therapy)

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Affective: Emotional dysregulation

- Emotional lability and mood swings
- Can be exacerbated by lowered frustration tolerance, chronic pain, difficulty self-monitoring
- Typically improves in first few months
- Treatment
  - Family counseling: reduce stress and irritability triggers; set some rules for communication; develop behavioral outlets
  - Consider support groups and peer mentoring
  - Psychotherapy
  - Pharmacologic treatment: mood stabilizers

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Source: Zasler et al. "Chapter 28: Mild Traumatic Brain Injury". *Brain Injury Medicine.* Springer Publishing, 2021.
TBI Factsheets: Models Systems Knowledge Translation Center (MSKTC). 2020.

Somatic: Headache

- Among the most common symptoms after TBI of any severity
- Several studies report more common after mild TBI > moderate/severe TBI
- Diagnosis
  - Determine clinical characteristics of primary headache type
    - Migraine
    - Tension-type
    - Cervicogenic
    - Medication overuse (rebound)
  - Evaluate current medications (including PRNs)
  - Neurologic and musculoskeletal exam
    - Include neck, shoulders, scalp, TMJ, vestibular
  - Co-occurring conditions (sleep disturbance, mood disorder) may contribute
  - Consider Headache Diary

TBI Factsheets: Headaches after TBI. Models Systems Knowledge Translation Center (MSKTC). 2021.
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Somatic: headache

- Treatment – to be covered in depth in later lectures
  - Lifestyle strategies
    - Stretching, self-massage
    - Sleep hygiene
    - Stress management
    - Exercise
    - Habits/Substance use
  - Consider intermittent passive therapies (biofeedback, massage)
  - Targeted treatment of mood and sleep disorders
  - Medications
    - Guidelines based on primary headache type
    - Prophylactic: >15 headache days/month
    - Sparing use of Tylenol, ibuprofen

TBI Factsheets: Headaches after TBI. Models Systems Knowledge Translation Center (MSKTC). 2021.
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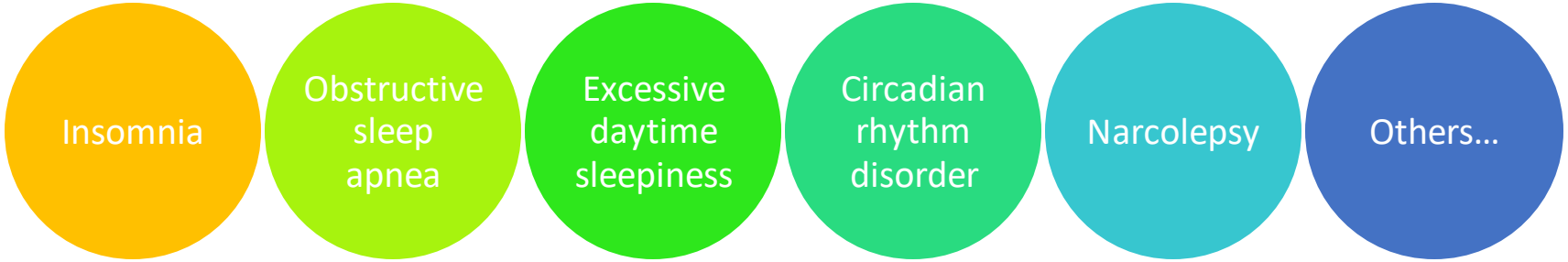
Somatic: sleep disorders

- 3x more common in individuals with TBI
- Sleep disturbance is a prognostic factor for functional and social outcomes at one year
- Poor sleep can worsen cognition (memory/attention), processing speed, mood, fatigue, pain
- Can be secondary to other conditions (depression, anxiety, pain)
- Common sleep disorders after TBI



- Diagnosis
  - Screening history
  - PSG if suspicion for sleep-related breathing disorder, nocturnal seizures, narcolepsy

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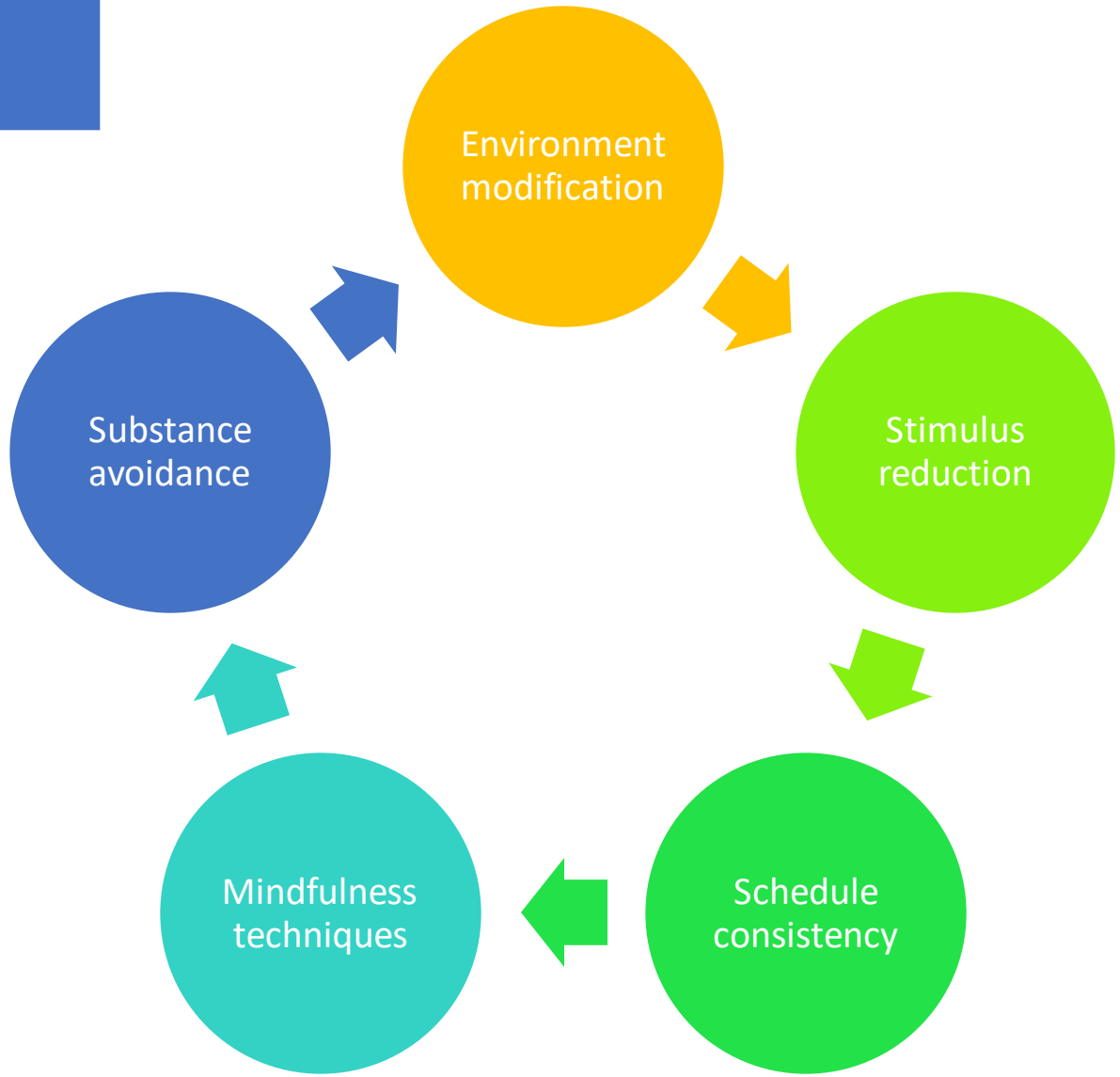
TBI Factsheets: Sleep and TBI. Models Systems Knowledge Translation Center (MSKTC).

Somatic: sleep disorders

- Treatment can help with mood, pain, fatigue, cognitive problems
- Behavioral interventions (sleep hygiene) → first line
- CBT is treatment of choice for insomnia
- Medications
  - Consider melatonin
  - Antidepressants with sedating properties for co-occurring mood disorder (trazodone, nortriptyline, mirtazapine)
  - Avoid benzodiazepines
- Caution with over-the-counter sleep aids
  - Most contain antihistamine (diphenhydramine) – tend to avoid after TBI (cognitive disturbance, dizziness, increased risk of falls)



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Somatic: fatigue

- ~1/3 of individuals with persistent fatigue at 3 months after mTBI
- Conditions known to cause or increase fatigue:
  - Depression
  - Sleep problems
  - Headaches
- Diagnosis
  - Self assessment scales: Multi-dimensional Assessment of Fatigue (MAF), Fatigue Impact Scale (FIS), Fatigue Assessment Instrument (FAI)
  - Lab workup for other conditions (hypothyroidism, anemia, low vitamin D)
  - Review medications and timing
- Treatment
  - More research is needed
  - Treat co-occurring conditions
  - Track activities to determine triggers
  - Pacing strategies (cognitive and physical)
  - Non pharmacologic strategies: exercise, mindfulness techniques, CBT

Post-Traumatic Headache. Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms. Ontario Neurotrauma Foundation. 2022.
TBI factsheets: Fatigue and TBI. Model Systems Knowledge Translation Center.

Somatic: vestibular dysfunction

- Vestibular system detects and interprets movement of the head, assisting with eye movements and postural control
  - Disruption in vestibular pathway = conflicting sensory inputs
- Peripheral and central vestibular disorders
  - Benign paroxysmal positional vertigo (most common)
- Other causes of dizziness: migraines, autonomic dysfunction, medications, depression, cervical
- Assessment
  - Characterization is important: vertigo, lightheadedness, syncope, disequilibrium
  - History: provoking activities, timing, medication review
  - Dix-Hallpike and supine role tests to assess for BPPV
  - Balance testing (Balance Error Scoring System)
  - Vestibulo-ocular reflex (VOR)

Post-Traumatic Headache. Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms. Ontario Neurotrauma Foundation. 2022.

VA/DoD Clinical Practice Guidelines for Persistent Symptoms after mTBI
Silver et al. Chapter 26 - Textbook of Traumatic Brain Injury. 2019

Somatic: vestibular dysfunction

- Treatment
  - BPPV: canalith repositioning maneuvers (Epley)
  - Vestibular suppressants can delay central compensation; current evidence does not support use
    - If symptoms significantly limit functional activities, can consider short trial
      - Meclizine > scopolamine
  - Vestibular rehabilitation
    - Promotes central compensation, improves functional balance and mobility
    - Strong emphasis on education
    - Habituation exercises: desensitize symptoms of motion provoked dizziness
    - Efficacy has been shown in non-TBI populations
    - Effective for unilateral peripheral vestibular dysfunction
    - Some evidence suggests may be helpful in central vestibular dysfunction

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Somatic: visual dysfunction

- mTBI can result in impairment of visual acuity, accommodation, vergence, visual field integrity
- Symptoms: Light sensitivity, eye fatigue, difficulty focusing, blurry vision, double vision
- Diagnosis
  - Detailed medication review (antihistamines, anticholinergics, digitalis derivatives)
  - Contributing factors: migraines, sleep disturbance, mood disorder
  - Referral to neuro-ophthalmology
- Treatment
  - Vision therapy – mixed results but can be beneficial in some patients (typically not covered by insurance)
  - Prism glasses – double vision
  - Tinted lenses – photosensitivity (blue light blocking; FL-41 rose tinted block both blue and green light)

Silver et al. Chapter 27 - Textbook of Traumatic Brain Injury. 2019.
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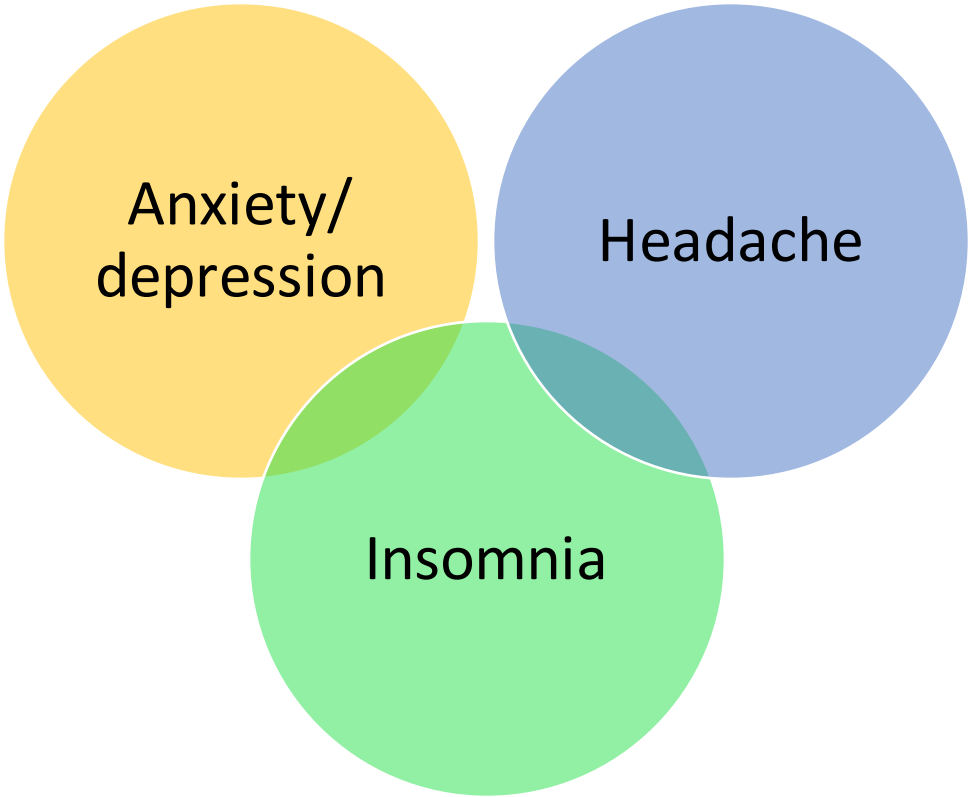
VA/DoD Clinical Practice Guidelines for Persistent Symptoms after mTBI

Management of persistent symptoms:

- Multimodal and multidisciplinary, depending on symptoms
- Early education
  - Normalization of symptoms
  - Expectation of further recovery
  - Guidance on return to activity
- Return to activity
  - Prolonged rest (>48 hours) is not shown to be helpful and is potentially harmful
- Symptom based management
  - Relies on extrapolated evidence involving other clinical populations
  - Where to begin, when many symptoms are present?

- Ontario Neurotrauma Foundation (ONF) recommends prioritizing:
  - If these are treated, can bring about improvement in other symptoms (fatigue, difficulty concentrating, irritability)



Management of persistent symptoms:

- Aerobic exercise
  - Generally safe post-concussion, "sub-symptom threshold"
  - Associated with faster symptom resolution
  - May reduce post-concussion symptom severity
- Psychological intervention
  - Cognitive behavioral therapy
  - Acceptance/commitment therapy
  - May have significant effect on functional outcomes
- Pharmaceuticals
  - Few pharmaceutical trials for mTBI
  - Studies have looked at guanfacine, bromocriptine
  - Symptom-based targeted pharmaceutical treatment

Management of persistent symptoms:

- Interventions with insufficient evidence (VA/DoD)
  - Acupuncture
  - Tai chi
  - Meditation
  - Yoga
  - Massage
  - Chiropractic therapy
- Interventions not recommended (VA/DoD)
  - Absolute rest >48 hours
  - Hyperbaric oxygen
    - Literature does not support efficacy
  - Repetitive transcranial magnetic stimulation (rTMS)

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VA/DoD Clinical Practice Guidelines for The Management and Rehabilitation of Post-Acute Mild Traumatic Brain Injury. 2021

Summary:

Initial management	Risk factors for persistent symptoms	Evaluation of persistent symptoms	Most common persistent symptoms	Management of persistent symptoms
• Education, counseling is key • Complete rest >48 hours is not recommended • Gradual resumption of cognitive and physical activity is recommended	• Pre-injury factors • Post-injury factors	• Etiology is generally multifactorial • Co-occurring conditions are common	• Cognitive symptoms • Affective symptoms • Somatic symptoms	• Targeted, symptom based treatment • Prioritize mood disorder, headache, sleep • Aerobic exercise is recommended • Psychological intervention can be helpful • Continued counseling and education

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Questions?

References

Guideline for Concussion/Mild Traumatic Brain Injury & Prolonged Symptoms. 3rd Edition. Ontario Neurotrauma Foundation. Published 2018. https://braininjury guidelines.org

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