The Neurosciences Clinical Program will measure the number of:
- Initial concussion evaluations
- Referrals to the ED
- Concussion diagnoses
- Patients for which targeted symptom-based management is initiated

The Neurosciences Clinical Program developed this care process model (CPM) with multidisciplinary representation from primary care, sports medicine, neurology, emergency medicine, neuropsychology, physical therapy, athletic training, pharmacy, radiology, and healthcare administration. This CPM provides expert advice for the primary care evaluation, diagnosis, and management of acute concussion (or “mild traumatic brain injury” [mTBI]) and summarizes current medical literature and national practice guidelines. (See guideline references on page 12.) This CPM is not intended to be utilized for moderate-to-severe TBI.

WHAT’S INSIDE?
ALGORITHMS
- Algorithm 1: Diagnosis of Concussion
- Algorithm 2: Initial Management of Concussion
- Algorithm 3: Follow-up Management of Concussion

POST-CONCUSSION SYMPTOM SCALE

MEDICATION TABLES
- Treatment of Pediatric Patients
- Treatment of Adult Patients

RETURN-TO-ACTIVITY RECOMMENDATIONS

RESOURCES
- Patient Education
- Provider Resources
- Concussion specialty clinics

REFERENCES

WHY FOCUS ON CONCUSSION?

- **Incidence.** The Centers for Disease Control and Prevention (CDC) estimates that 1.7 to 3.8 million people in the U.S. suffer a traumatic brain injury (TBI) each year with approximately 75% graded as a mild TBI (mTBI). Concussion is considered a subset of TBI, and the terms “mild TBI” and “concussion” are often used interchangeably. The true incidence of mTBI/concussion is likely underestimated for two reasons:
  1. No standard for diagnosis exists
  2. Surveillance systems rely on hospitalization data to determine incidence. As a result, underreporting is likely considering the proportion of those who sustain TBI and do not seek health care.

- **Cost.** The CDC estimates that TBI results in direct and indirect costs totalling $60 billion or more annually. However, given the limits of TBI surveillance, true costs are likely higher.

- **Health consequences.** While mTBI-related injuries are usually not life-threatening, the term “mild TBI” might be misleading. The effects of mTBI can be potentially severe and debilitating. More than 5 million U.S. adults live with TBI-related disability at an estimated economic impact of more than $83 billion annually.

- **Risk Factors.** Certain risk factors shown to correlate with a protracted recovery from concussion include history of prior concussion, symptom severity and duration, signs and sequelae, demographic factors, genetics, comorbidities/premorbidities, medications, participation in high-risk sports, and aggressive behavior.

MEASUREMENTS

Throughout this CPM, this icon indicates an Intermountain measure.

PROGRAM GOALS

- Standardize the management of concussion across the Intermountain Healthcare system
- Increase engagement of primary care providers in the management of routine concussions
- Improve training/knowledge base of primary care providers in the management of concussion
- Improve evaluation and management of concussion within Intermountain Healthcare
- Identify appropriate thresholds for referral of concussion to emergency and/or specialty care
- Evaluate effectiveness of standardized management documented in this CPM
ALGORITHM 1: DIAGNOSIS OF CONCUSSION

Patient with direct / indirect head trauma

DETERMINE if head trauma is consistent with concussion definition
- The head being struck
- The head striking an object
- The brain undergoing an acceleration/deceleration movement (i.e., whiplash) without direct external trauma to the head

CONDUCT initial evaluation
- ADMINISTER Post-Concussion Symptom Scale (see page 7)
- GATHER appropriate concussion history (a)
- PERFORM concussion-specific physical exam (b)

ASSESS if patient meets concussion diagnostic criteria (IF ANY)
- Loss of consciousness
- Pre- and / or post-traumatic amnesia
- Alteration in mental state
- Transient focal neurologic deficit(s)
- At least 2 acute symptoms (d)

Criteria met?
- yes
- no

DIAGNOSE concussion
USE one of the following ICD-10 diagnostic codes for the initial encounter:
- S06.0X0A Concussion without loss of consciousness
- S06.0X1A Concussion with loss of consciousness ≤ 30 minutes
- S06.0X9A Concussion with loss of consciousness of unspecified duration

MANAGE as concussion per algorithm 2 on page 4

CONSIDER referral for immediate evaluation at an emergency department

Are there any red flags? (c)
- yes
- no

Suspected concussion?
- yes
- no

CONSIDER other diagnoses, and MANAGE according to clinical judgement
### (a) History
- Mechanism of injury
- Associated symptoms at time of injury
- Current concussion-like symptoms (see Post-Concussion Symptom Scale on page 7) and physical/cognitive activity tolerances
- Concussion/head trauma history, including time course for recovery from any prior injuries
- Comorbidities, especially attention deficit hyperactivity disorder (ADHD), learning disabilities, mental health diagnoses (i.e., anxiety, depression), and history of migraine or other headache
- Current medications

### (b) Physical exam
- **Behavioral observation** (e.g., behaviors, speech patterns, level of arousal)
- **Mental status exam**
  - Brief orientation questions
  - Immediate 5-word memory
  - Digits backwards (3-, 4-, 5-, and 6-digit sequences)
  - Months in reverse order
  - Delayed 5-word recall (can be performed later in the exam if more time is required — at least 5 minutes)
- **Brief cranial nerve exam**
  - Pupillary reaction (III)
  - Extraocular eye movements (III, IV, and VI)
  - Smile, wrinkle forehead, puff cheeks, clench teeth (V, VII)
- **Cervical spine**
  - Palpation of midline spine and paraspinal musculature to look for points of tenderness and myofascial trigger points (may provoke or modulate headache, dizziness, or nausea symptoms)
  - Range of motion (including flexion, extension, rotation, and side-bending)
- **Upper shoulders** (trapezius, levator scapulae, and sternocleidomastoid [SCM]), especially palpation of musculature for tenderness and myofascial trigger points (this may provoke/modulate concussion-like symptoms, especially headache)

Perform the following portion of the physical exam if concussion diagnosis is not initially evident or if considering clearance for return-to-play/-work:
- **Focused upper and lower extremity sensorimotor exam**
- **Vestibular Ocular Motor Screening (VOMS)**, which involves evaluation for:
  - Reproduction/provocation of headache, dizziness, nausea, and/or fogginess.
  - Smooth pursuits (performed previously with extraocular muscle movement).
  - Horizontal/vertical saccades: (1) Two fingers are held 3 ft from patient and 3 ft apart; then, (2) Patient is asked to quickly shift focus horizontally, then vertically, from one finger to the other repetitively for 10 repetitions.
  - Near-point convergence: (1) Patient focuses on small target (~14 font size) at arm’s length and slowly brings target toward the tip of the nose; (2) Patient stops moving the target if/when they see two distinct images; (3) Distance is measured between target and tip of nose; (4) Repeat 3 times; (5) Abnormal if > 5 cm.
  - Vestibular ocular reflex (horizontal and vertical): (1) A single finger is held up 3 ft in front of patient at midline; (2) Patient rotates head side to side to 20° in either direction, performing 10 revolutions at ~180 beats/minute; (3) Repeat vertically as well (this has the highest symptom provocation).
  - Visual motion sensitivity: (1) Patient holds thumb at arm’s length; (2) Maintaining focus on thumb, patient rotates upper body about the waist 80° to the right and left; (3) Performs 5 revolutions.
- **Balance testing.** Perform a [unipedal stance test](#): (1) Patient stands unassisted on one leg with both hands on hips; (2) Time is recorded (in seconds) from raising of the foot until foot touches the ground and/or hands leave the hips; (3) Repeat with eyes open and closed; (4) Repeat on each leg; (5) See normative values.

### (c) Red flags for emergent evaluation
- Glasgow Coma Scale < 13
- Loss of consciousness > 60 seconds
- Post-traumatic amnesia > 1 day
- Persistent vomiting or headache
- Persistent focal neurologic deficits

### (d) Acute concussion symptoms

<table>
<thead>
<tr>
<th>New symptoms that present within 72 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
</tr>
<tr>
<td>Imbalance/dizziness</td>
</tr>
<tr>
<td>Visual problems</td>
</tr>
<tr>
<td>Fatigue/drowsiness</td>
</tr>
<tr>
<td>Cognitive problems</td>
</tr>
<tr>
<td>Light sensitivity</td>
</tr>
<tr>
<td>Noise sensitivity</td>
</tr>
<tr>
<td>Memory trouble</td>
</tr>
<tr>
<td>Sleep problems</td>
</tr>
<tr>
<td>Emotional difficulties</td>
</tr>
<tr>
<td>Numbness/tingling</td>
</tr>
</tbody>
</table>
ALGORITHM 2: INITIAL MANAGEMENT OF CONCUSSION

Patient with concussion diagnosis

PERFORM first-line treatment essentials

These first-line treatments may be all that are needed during an initial visit to manage a concussion. Use clinical judgement to determine whether or not to initiate targeted symptom-based management during this visit (see below).

- **DISCUSS** natural course of concussion, active symptom self-management, sleep hygiene, and appropriate nutrition (CONSIDER supplementation of DHA omega-3 fatty acids [1,000 mg orally, twice a day] as it may assist in recovery).
- **ADVISE** relative rest, high-risk activity avoidance, and early intervention for treatment of musculoskeletal pain. Sleep is key for the patient’s healing.
- **PROVIDE** reassurance and patient education on symptoms and expected recovery (see Concussion fact sheet). USE teach-back key messages, which may include the following:
  - It is not uncommon for patient’s symptoms to worsen for a few days before they show signs of improvement.
  - It is possible for patient’s functioning to improve even while symptoms worsen. If patient is engaging in an activity that makes symptoms worse, they should be advised to reduce the level of that activity.
  - Most sports-related concussions in the young are resolved within 3 weeks.

CONSIDER targeted symptom-based management based on clinical judgments and AT LEAST 1 of the clinical indications below (a)

Cognitive Problems  Headache  Neck/Shoulder Pain  Sleep Disturbance  Dizziness / Vertigo  Anxiety / PTSD

DETERMINE need for sports-related referral (IF BOTH)

- Sports-related concussion
- Appropriate team/sports physician

Sports referral indicated?

no  yes

no

PROVIDE patient with appropriate Return-to-Activity Recommendations (see page 10)

yes

REFER to team/sports physician for ongoing care

FOLLOW-UP in 1 week (see Follow-up Management of Concussion algorithm on page 6 for ongoing treatment)
## (a) Targeted symptom-based management (beware of polypharmacy)

<table>
<thead>
<tr>
<th>Clinical Indication</th>
<th>Intervention</th>
<th>Medication considerations</th>
<th>Contraindications</th>
<th>When to refer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Problems</td>
<td>CONTINUE graded Return-to-Activity Recommendations (see page 10).</td>
<td>May consider trial of amantadine for 1–2 weeks if cognitive slowing beyond 2 weeks.</td>
<td>AVOID symptom aggravation above a score of 3 out of 6 in severity on the Post-Concussion Symptom Scale (see page 7).</td>
<td>CONSIDER referral to neurorehabilitation if symptoms persist despite interventions. REFER to chronic TBI clinic when cognitive problems persist &gt; 3 months.</td>
</tr>
<tr>
<td>Headaches</td>
<td>ADVISE to stay hydrated and get plenty of rest.</td>
<td>• Acetaminophen for acute symptoms. • OTC NSAIDs (e.g., ibuprofen, naproxen) after first 3–5 days. • Anti-emetics if needed. • Triptan/ergot derivatives (for suspected migraines only).</td>
<td>AVOID opiates.</td>
<td>REFER to neurology for regular headaches persisting &gt; 4 weeks.</td>
</tr>
<tr>
<td>Neck / Shoulder Pain</td>
<td>REFER early to physical therapy.</td>
<td>• NSAIDs. • Tizanidine.</td>
<td>• DO NOT use benzodiazepines. • ENSURE cautious use of tizanidine in elderly.</td>
<td>REFER to physical therapy if pain presents early and persists &gt; 1 day (see Physical Therapy for Neck Pain and Headaches clinical guideline).</td>
</tr>
<tr>
<td>Sleep Disturbance</td>
<td>MANAGE initially with sleep hygiene and OTC sleep aids. May use prescription medications, if needed, for persistent symptoms.</td>
<td>• OTC sleep aids (e.g., melatonin, doxylamine [Unisom], diphenhydramine [Benadryl], etc.). • Prescription medications (i.e., trazodone [Oleptro, Desyrel] or mirtazapine [Remeron]).</td>
<td>AVOID benzodiazepines.</td>
<td>CONSIDER referral to rehab psychologist (e.g., clinical psychologist, neuropsychologist) if symptoms may be due to anxiety / PTSD.</td>
</tr>
<tr>
<td>Dizziness / Vertigo</td>
<td>EVALUATE for benign paroxysmal positional vertigo (BPPV) or persistent or chronic imbalance.</td>
<td></td>
<td></td>
<td>REFER to physical therapy early for treatment of BPPV or if dizziness and/or imbalance persist &gt; 3 weeks.</td>
</tr>
<tr>
<td>Anxiety / PTSD</td>
<td>INITIATE typical primary care treatments for these problems with referral to psychology / psychiatry as needed.</td>
<td>Medication management as appropriate for primary diagnosis.</td>
<td></td>
<td>REFER to rehab psychologist if anxiety or PTSD symptoms do not ameliorate with early interventions.</td>
</tr>
</tbody>
</table>
ALGORITHM 3: FOLLOW-UP MANAGEMENT OF CONCUSSION

Patient with concussion diagnosis

Perform 1-week follow-up visit

- RE-EVALUATE symptoms using Post-Concussion Symptom Scale (see page 7)
- REPEAT portions of physical exam as indicated
- RE-VISIT targeted symptom-based management (see page 5)

Have symptoms resolved?

- no
  - Is patient adhering to previous recommendations?
    - no
      - Is overall trend toward improvement?
        - no
          - REVIEW/CONSIDER second-line, targeted symptom-based management (see page 5)
            AND
            REINFORCE key areas
          - Has patient improved (with all treatment options exhausted)?
            - no
              - CONSIDER referral to concussion specialist for ongoing care
            - yes
              - FOLLOW UP in 1 week
                - GATHER interim history and functioning
                - ASSESS for “red flags”
                - REVIEW Post-Concussion Symptom Scale (see page 7), and compare to previous score(s)
                - DETERMINE factors that ameliorate or exacerbate symptoms
        - yes
          - PROVIDE patient with Return-to-Activity Recommendations (see page 10)
    - yes
      - ADVISE return to normal activities OR DISCUSS Return-to-Activity Recommendations (see page 10)

- yes
  - Is overall trend toward improvement?
    - no
      - REVIEW/CONSIDER second-line, targeted symptom-based management (see page 5)
        AND
        REINFORCE key areas
    - yes
      - PROVIDE patient with Return-to-Activity Recommendations (see page 10)
## Post-Concussion Symptom Scale (PCSS)

### Instructions:
For each item, indicate how much the symptom has bothered you over the past 2 days.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Headache</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2 Nausea</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3 Vomiting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4 Balance problems</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5 Dizziness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6 Fatigue</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7 Sensitivity to light</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8 Sensitivity to noise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9 Numbness/Tingling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Feeling mentally foggy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11 Feeling slowed down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12 Difficulty concentrating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13 Difficulty remembering</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sleep</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Drowsiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15 Sleeping less than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16 Sleeping more than usual</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17 Trouble falling asleep</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Emotional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Irritability</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19 Sadness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20 Nervousness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21 Feeling more emotional</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL _____ / 126**

Do you have any visual problems?  □ Yes  □ No

Do these symptoms worsen with:
- □ Physical Activity  □ Yes  □ No  □ Not applicable
- □ Thinking / Cognitive Activity  □ Yes  □ No  □ Not applicable

Over the past 2 days, my daily activity level has been ____ % of normal.

If "YES" to any visual problems, further qualify with the Convergence Insufficiency Symptom Survey.

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Links to Post-Concussion Symptom Scales:  
### MEDICATION TABLE: PEDIATRIC

<table>
<thead>
<tr>
<th>Generic name (Brand name)</th>
<th>Dosage and frequency</th>
<th>Estimated cost* (Tier)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Headache and/or pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acetaminophen (Tylenol)</td>
<td>15 mg/kg orally every 4 to 6 hours (not to exceed 75 mg/kg/day).</td>
<td>OTC: $ (N/A)</td>
<td>Not to exceed 15 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td>aspirin (Bayer)</td>
<td>2–11 years: 10–15 mg/kg orally every 4 to 6 hours (not to exceed 4 g/day).  &gt; 12 years: 325–650 mg orally every 4 hours (not to exceed 4 g/day).</td>
<td>OTC: $ (N/A)</td>
<td>Not to exceed 15 days per month to avoid rebound headaches. <strong>Do not use in children who have or who are recovering from chickenpox or flu-like symptoms.</strong></td>
</tr>
<tr>
<td>ibuprofen (Advil, Midol)</td>
<td>10 mg/kg orally every 6 hours (not to exceed 40 mg/kg/day.)</td>
<td>OTC: $ (N/A)</td>
<td>Not to exceed 15 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td>naproxen (Aleve, Naprosyn)</td>
<td>5 mg/kg orally every 12 hours (not to exceed 660 mg/day.)</td>
<td>OTC: $ (N/A)</td>
<td>Not to exceed 15 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td><strong>Headache only</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dihydroergotamine (Migranal)</td>
<td>&lt; 12 years: 0.5 mg intranasally, then repeat in 15 minutes. Repeat these steps every 8 hours for 3 days (not to exceed 6 sprays/day).  &gt; 12 years: 1 mg intranasally, then repeat in 15 minutes. Repeat these steps every 8 hours for 3 days (not to exceed 6 sprays/day).</td>
<td>Generic: $$ (Tier 1)</td>
<td>Not to exceed 10 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td>sumatriptan (Imitrex)</td>
<td>5–12 years: 5–20 mg in one nostril (not to exceed 10 mg/20–39 kg/dose or 20 mg/&gt;40 kg/dose).</td>
<td>Generic: $ (Tier 1)</td>
<td>Not to exceed 10 days per month to avoid rebound headaches. <strong>Do not test spray before use.</strong></td>
</tr>
<tr>
<td><strong>Insomnia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>melatonin (Melatonin Time Release, Bio-Melatonin, VesPro Melatonin)</td>
<td>0.5–3 mg orally 60 minutes prior to bedtime (not to exceed 10 mg).</td>
<td>OTC: $ (N/A)</td>
<td>Long-term use of melatonin has not been studied in children, and potential side effects with prolonged use are unknown.</td>
</tr>
<tr>
<td>diphenhydramine (Benadryl)</td>
<td>1 mg/kg orally 30 minutes prior to bedtime (not to exceed 50 mg).</td>
<td>OTC: $ (N/A)</td>
<td></td>
</tr>
<tr>
<td><strong>Nausea and vomiting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ondansetron (Zofran)</td>
<td>0.15 mg/kg orally every 6 hours (not to exceed 4 mg/kg/day).</td>
<td>Generic: $ (Tier 1)</td>
<td>Causes QT prolongation.</td>
</tr>
</tbody>
</table>

*Cost: $$ = low; $$ = low-moderate; $$ = moderate; $$ = high-moderate; $$ = high (based on typical SelectHealth 2017 benefit design; some benefit designs may differ.)
### MEDICATION TABLE: ADULT

<table>
<thead>
<tr>
<th>Generic name (Brand name)</th>
<th>Dosage and Frequency</th>
<th>Estimated cost* (Tier)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Headache and/or pain</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acetaminophen (Tylenol)</td>
<td>1,000 mg orally every 6 to 8 hours as needed (not to exceed 3,000 mg/day unless directed by physician)</td>
<td>OTC: $ (N/A)</td>
<td></td>
</tr>
<tr>
<td>aspirin (Bayer)</td>
<td>325–650 mg every 6 hours as needed (not to exceed 4 g/day)</td>
<td>OTC: $ (N/A)</td>
<td>Not to exceed 15 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td>ibuprofen (Advil, Midol)</td>
<td>400–800 mg orally every 6 to 8 hours as needed (not to exceed 3,200 mg/day)</td>
<td>OTC: $ (N/A)</td>
<td></td>
</tr>
<tr>
<td>naproxen (Aleve, Naprosyn)</td>
<td>750 mg orally for initial dose then 250–500 mg twice daily as needed (not to exceed 1375 mg/day for first day’s use, then not to exceed 1,100 mg/day thereafter)</td>
<td>OTC: $ (N/A)</td>
<td></td>
</tr>
<tr>
<td><strong>Headache only</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ergotamine (Migranal)</td>
<td>2 mg sub-lingually every 30 minutes (not to exceed 6 mg/day and 10 mg/week)</td>
<td>Generic: $$ (Tier 1)</td>
<td>Prescribe for headache only (not to exceed 10 days per month to avoid rebound headaches.</td>
</tr>
<tr>
<td>tizanidine (Zanaflex)</td>
<td>2 mg orally three times daily as needed (if creatinine clearance [CrCl] &lt; 25 mL/min, decrease dose by 50%); may titrate to optimal effect in 2–4 mg increments per dose, with a minimum of 1–4 days between dose increases (maximum dose of 16 mg, not to exceed 36 mg/day)</td>
<td>Generic: $ (Tier 1)</td>
<td>For headache only. Fall risk in the elderly. Contraindicated for use concurrently with ciprofloxacin.</td>
</tr>
<tr>
<td>sumatriptan (Imitrex)</td>
<td>50 mg orally (may repeat once in 2 hours) (not to exceed 200 mg/day)</td>
<td>Generic: $ (Tier 1)</td>
<td>Prescribe for headache only (not to exceed 10 days per month to avoid rebound headaches); 100 mg doses not shown to be more effective than 50 mg doses and may increase side-effect incidence.</td>
</tr>
<tr>
<td><strong>Insomnia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diphenhydramine (Benadryl)</td>
<td>25–50 mg orally 30 minutes prior to bedtime as needed (not to exceed 50 mg/day)</td>
<td>OTC: $ (N/A)</td>
<td>Risk of falls and anticholinergic effects in the elderly.</td>
</tr>
<tr>
<td>doxylamine (Unisom)</td>
<td>25 mg orally at bedtime as needed</td>
<td>OTC: $ (N/A)</td>
<td></td>
</tr>
<tr>
<td>melatonin (Melatonin Time Release, Bio-Melatonin, VesPro Melatonin)</td>
<td>0.5–3 mg orally 60 minutes prior to bedtime as needed (not to exceed 10 mg/day)</td>
<td>OTC: $$ (N/A)</td>
<td></td>
</tr>
<tr>
<td>mirtazapine (Remeron)</td>
<td>15 mg orally at bedtime as needed</td>
<td>Generic: $ (Tier 1)</td>
<td>Fall risk in the elderly. Effective for treating tension headache.</td>
</tr>
<tr>
<td>trazodone (Oleptro, Desyrel)</td>
<td>50–100 mg orally at bedtime as needed</td>
<td>Generic: $ (Tier 1)</td>
<td>Fall risk in the elderly.</td>
</tr>
<tr>
<td><strong>Irritability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>amantadine (Symmetrel)</td>
<td>100 mg orally twice daily</td>
<td>Generic: $$ (Tier 1)</td>
<td>Renally adjust CrCl &lt; 50 mL/min.</td>
</tr>
<tr>
<td><strong>Nausea, vomiting, or dizziness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ondansetron (Zofran)</td>
<td>4 mg every 6 to 8 hours as needed (not to exceed 8 mg/day)</td>
<td>Generic: $ (Tier 1)</td>
<td>Causes QT prolongation. Effective for treating nausea and vomiting.</td>
</tr>
<tr>
<td>meclizine (Bonine, Bonamine, Antivert)</td>
<td>25–50 mg orally every 12 hours as needed (not to exceed 100 mg/day)</td>
<td>OTC: $ (N/A)</td>
<td>Effective for treating dizziness.</td>
</tr>
</tbody>
</table>

*Cost: $$$$$ = low; $$$$$ = low-moderate; $$$$$ = moderate; $$$$$ = high-moderate; $$$$$ = high (based on typical SelectHealth 2017 benefit design; some benefit designs may differ).
### RETURN-TO-ACTIVITY RECOMMENDATIONS

#### Returning to school or work activities

Recommend a gradual return to school and/or work, if necessary. These activities can often cause concussion symptoms to worsen. The following table is a guideline for a possible return-to-learn/-work timeline.

**TABLE 3. Return-to-learn/-work recommendations by activities and goals.**

<table>
<thead>
<tr>
<th>Cognitive Activity Step</th>
<th>Activities at each step</th>
<th>Goal of each step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Symptom-free activities of daily living</td>
<td>Typical activities performed during the day that do not increase symptoms, such as:</td>
<td>Gradual return to typical activities</td>
</tr>
<tr>
<td></td>
<td>• Reading</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Texting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Screen time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gradual increase of activities (5–15 minutes at a time)</td>
<td></td>
</tr>
<tr>
<td>2. School/work activities</td>
<td>Gradual increase of cognitive/scholastic activities that do not increase symptoms including:</td>
<td>Increase tolerance to cognitive work</td>
</tr>
<tr>
<td></td>
<td>• Homework</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reading</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Other cognitive activities outside of the classroom or work setting</td>
<td></td>
</tr>
<tr>
<td>3. Part-time return to school/work</td>
<td>Gradual introduction of school/work duties; may need to start with partial-day hours (e.g., 2–4 hours) and/or rest breaks as needed during the day</td>
<td>Increase cognitive activity</td>
</tr>
<tr>
<td>4. Full-time return to school/work</td>
<td>Gradual progression of school/work activities until a full day can be tolerated</td>
<td>Return to full school/work schedule and activities; catch up on missed work</td>
</tr>
</tbody>
</table>

#### Returning to play or sports activities

Recommend that athletes should have returned to full school or work duties before being cleared to return to play/sports. Each step in the return-to-play recommendations below should take at least 24 hours before progressing to the next step. If symptoms worsen with a particular step, the athlete should return to the previous step. Written clearance by a healthcare provider is mandated by [Utah](https://www.legislature.utah.gov/) and [Idaho](https://www.legislature.idaho.gov/) state legislation prior to certain athletes returning to play/sport.

**TABLE 4. Return-to-play recommendations by exercises and goals.**

<table>
<thead>
<tr>
<th>Exercise step</th>
<th>Functional exercise at each step</th>
<th>Goal of each step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Symptom-limited activity</td>
<td>Daily activities that do not provoke symptoms</td>
<td>Gradual reintroduction of work/school activities</td>
</tr>
<tr>
<td>2. Light aerobic exercise</td>
<td>Walking or stationary cycling at slow-to-medium pace; no resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Running or skating drills; no head-impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Harder training drills; may start progressive resistance training</td>
<td>Exercise, coordination, and increased thinking</td>
</tr>
<tr>
<td>5. Full-contact practice</td>
<td>Following medical clearance, participate in normal training activities.</td>
<td>Restore confidence; functional skills assessment by coaching staff</td>
</tr>
<tr>
<td>6. Return to play/sport</td>
<td>Normal game play</td>
<td></td>
</tr>
</tbody>
</table>
RESOURCES

Patient Education

Clinicians can order Intermountain patient education fact sheets for distribution to their patients from Intermountain’s iprintstore.org. Fact sheets help educate patients and families about concussion symptoms and treatments. Intermountain concussion-related fact sheets include the following:

- Concussion
- After Brain Injury
- Benign Positional Vertigo (BPPV)
- Live Well, Sleep Well
- Traumatic Brain Injury (TBI)
- Self-treatment of BPPV

Provider Resources

This CPM, its references, and other concussion-related resources are accessible through the Clinical Programs Care Process Models page on intermountainphysician.org or the Neurosciences Clinical Program home page on intermountain.net.

Concussion Specialty Clinics

Salt Lake Valley Area

Intermountain TOSH Concussion Clinic
5770 South 250 East, Suite 475
Murray, UT 84107
801-314-2210
intermountainhealthcare.org/locations

Intermountain Neurosciences Institute
5171 South Cottonwood St., Suite 810
Murray, UT 84107
801-507-9800
intermountainhealthcare.org/locations

(Pediatric sports-related concussion only)

Northern Utah

Intermountain Logan Concussion Clinic
1350 North 500 East
Logan, UT 84341
435-716-2800
loganregionalorthopedics.org/concussions

McKay-Dee Orthopedic and Sports Medicine Clinic
3895 Harrison Blvd.
Ogden, UT 84403
801-387-7678
intermountainhealthcare.org/locations

(Swimmers and other aquatic sports-related concussion only)

Southern Utah

Intermountain St. George Concussion Clinic
652 South Medical Center Dr., Suite 120
St. George, UT 84790
435-251-3600
swconcussion@email.org

Utah Valley Area

Intermountain Utah Valley Concussion Clinic
1157 North 300 West, Suite 201
Provo, UT 84604
801-357-1200
uvpsportsmed.com

Utah Valley Sports Medicine American Fork
98 North 1100 East, Suite 103
American Fork, UT 84003
801-492-2330
intermountainhealthcare.org/locations
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This CPM presents a model of best care based on the best available scientific evidence at the time of publication. It is not a prescription for every physician or every patient, nor does it replace clinical judgment. All statements, protocols, and recommendations herein are viewed as transitory and iterative. Although physicians are encouraged to follow the CPM to help focus on and measure quality, deviations are a means for discovering improvements in patient care and expanding the knowledge base. Send feedback to Eric Robinson, MD, Concussion Development Team Chair, Intermountain Healthcare (eric.robinson@imail.org).