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## Directions for the Buffalo Concussion Physical Exam

**Vital signs:** A manual or automated blood pressure cuff is used to measure heart rate (HR) and blood pressure (BP). The first measurement is taken with the patient lying supine on the examination table for at least 2 minutes. The patient is then asked to stand up without support and with both feet firmly on the ground and a second measurement is taken after standing for 1 minute. The patient is asked if any dizziness or lightheadedness is experienced upon standing or by one minute. The test is considered to be clinically significant if symptoms are present plus any of the following: systolic BP drop of  $\geq 20$  mmHg or diastolic BP drop of  $\geq 10$  mmHg.

**Neck and Sub-occipital Region Exam:** The patient is asked to demonstrate range of motion of the neck. Flexion, hyper-extension, lateral flexion and rotation of the neck are tested and recorded as normal if they demonstrate full range of motion in the tested plan. While the patient is lying in the supine position, palpate the musculature of the neck. Begin from the base of the neck starting at the trapezius muscles, move up the paracervical muscles to the nuchal ridges, and then along the occipital ridges. Then, palpate the cervical spine itself from the occipital protuberance to the prominence of the T1 vertebra. Tenderness is documented according to the subjective reporting of pain by the patient and spasm according to objective palpation by the examiner.

**Head and Face Exam:** Physical examination of the cranium, face and jaw should be an integral part of the concussion-focuses physical exam given the frequency with which these areas may be traumatized and in turn result in a myriad number of potential impairments (some of which may be confused as emanating from the concussion itself) such as headache and tinnitus. Such assessment should include the following:

- Palpatory exam of the cranium including pericranial musculature.
- Palpatory exam of the face including sinuses and major branches of the trigeminal nerve (supra-orbital, supratrochlear, infra-orbital and auriculotemporal) via pressure or tapping over the nerve to assess for pain as well as referral.
- Jaw/TMJ assessment that should include testing for limitations in jaw excursion, normalcy of jaw tracking on opening and closing, TMJ sounds/clicks/subluxation and masticatory muscle (masseters, temporalis and pterygoids) assessment via direct palpatory exam for activated trigger points.

This portion can be omitted on the subsequent visits if no abnormality is seen initially.

**Cranial nerve Tests:** CN I – XII are tested using standard cranial nerve testing procedures. This should be done at the initial visit, but can be omitted on the subsequent visits if no abnormality is seen.

**Fundoscopy:** Performed using a standard ophthalmoscope.

**Pupil reactivity:** In a dimmed room, using a penlight or similar light source, shine light on one of the patient's pupils and observe the changes in the ipsilateral pupil. Remove the light source and wait until the pupil returns





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to the dilated position. Now shine the light on pupil while observing the contralateral pupil. Normal response is for the ipsilateral and contralateral pupil to constrict. Repeat on other eye.

**Visual Tracking:** Stand at an arm's length from the patient. Ask the patient to follow your finger with his/her eyes while keeping the head steady. Using your finger, trace an imaginary "H" or rhomboid shape, making sure that your finger moves far enough out and up/down so that you're able to see all appropriate eye movements. In the end, slowly bring your finger up to the patient's nose to check convergence/accommodation response. Patient should be able to track easily and smoothly.

**Smooth Pursuits:** The patient is asked to visually track an object moving slowly in the horizontal direction with the head stationary. Target movement should be limited to 30 degrees from neutral to avoid eliciting end-gaze nystagmus. Abnormal is sustained beats of nystagmus, staccatic (or jerking) eye motion, loss of conjugate vision, corrective (catch-up or back-up) saccades, loss of visual fixation *OR* symptom provocation (dizziness, nausea or headache). Repeat in vertical visual plane.

**Repetitive saccades:** The examiner holds both index fingers three feet apart from each other at half an arm length's distance from patient. The patient is instructed to move the eyes side to side in rapid succession in the horizontal visual plane, rapidly switching focus between the examiner's two index fingers. This is repeated in the vertical plane by having the patient move the eyes vertically in rapid succession between the examiner's two index fingers, three feet apart, located in the midline of the vertical field. Abnormal responses include delayed initiation of the eye movement, slow velocity, or inaccurate movements such as over/undershooting with greater than 1 re-fixation saccade. These eye movements in the healthy population can sometimes elicit eye strain, but do not provoke symptoms of increased headache or dizziness. Abnormal movements *OR* abnormal symptom provocation of increased headache or dizziness is considered to be an abnormal response. Patients are considered to have healthy function when they can do 30 side-to-side motions with normal velocity and accuracy without eliciting symptoms of headache, dizziness or nausea.

**Vesibulo-ocular reflex (VOR) or Gaze Stability Test:** The patient is asked to focus on the examiner's thumb located directly in the frontal-central field of vision, approximately 30 cm from the forehead. The patient then rotates the head as rapidly as possible for at least 10 complete turns while maintaining visual fixation on the finger. The eye movements are observed. Any staccatic eye movements, inability to maintain visual fixation (i.e., beating back to the center) *OR* symptom provocation of headache, dizziness, or lightheadedness is abnormal. Avoid this test if there is significant cervical impairment.

**Near Point of Convergence (NPC) and Accommodation:** Convergence (binocular) can be measured using an Astron ACR/21 Accommodation ruler (Gulen Ophthalmics, Elkins Park, PA) with a standard single 20/30 card as the visual target. Measurements are taken by placing the ruler at the forehead just above the subject's nose. The distance to convergence (measured to the nearest half centimeter) is recorded when either the patient reports image doubling (not blurring of vision) on the card or when the clinician notices binocular loss of convergence. An optional test is to assess Convergence Recovery as the target is moved back away from the subject when vision is reported to be single again. For some patients, NPS is normal, but recovery is





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prolonged. The better of two measurements is considered and  $\geq 10$  cm is considered to be abnormal for both NPC and recovery. Accommodation (monocular) is also measured to the nearest half centimeter using the same rule and standard card and is acquired over two trials for each eye. The patient is instructed to cover one eye. Starting at the furthers distance away from the nose, the target is moved slowly toward the patient's nose. Accommodation testing is discontinued when the patient reports blurring (not doubling) of the image.  $\geq 12$  cm is considered to be abnormal.

**Tandem Gait with Eye Open and Closed and Tandem Stance:** The patient is asked to walk in a straight line for 5 steps, heel to toe, with hands at the side, while looking straight ahead on a fixed point on the wall. The patient then walks backwards, toe to heel along the same line while looking straight ahead. The patient then performs the tandem gait again with eyes closed. The patient then performs a tandem stance with hands on the hips and one foot planted directly in front of the other and attempts to hold it for 20 seconds with eyes closed. Inability to walk the line, stumbling, or stepping out of line while walking forward, backward or during tandem stance is normal.

