Concussion Profiles: Moving Beyond the Graded Symptom Scale

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COMMENTARY

With the increased focus over the last decade on evidence-based practice, the majority of the discussion has been on evidence and the need for high quality evidence to assist athletic trainers in making important clinical decisions. Often left to last in the discussion of evidence-based practice, is the patient perspective. In the area of concussion evaluation and treatment, the patient perspective is critical. The assessment of symptoms has always been part of the multifactorial assessment paradigm for concussion, at baseline and post-injury. The use of these scales has been criticized as subjective in nature, although they are often the only aspect of the concussion clinical examination that assesses the patient perspective. As an injury that does not demonstrate many outward signs, reliance on the patient to provide input regarding symptoms is vital for the athletic trainer's concussion evaluation. However, the graded symptom scale is often administered independent of more detailed outcome measures or with limited follow-up questions, which limits its utility. In this commentary, we will discuss how to go beyond the graded symptom scale, using concussion profiles and patient-report outcome measures (PROs) to better understand the patient perspective following concussion.

While there are many symptom checklists and scales available, athletic trainers are probably most familiar with the symptom evaluation that is part of the Sport Concussion Assessment Tool-Version 5.[1] This symptom scale allows clinicians to assess a patient's symptom status across 22-items and allows the patients to express the severity of each symptom on a 0-6 scale. These short symptom scales allow the clinician to understand the number of symptoms a patient has and the individual and total symptom severity, resulting in the ability to document two scores: symptoms endorsed and total symptom severity or classify a patient as symptomatic vs. asymptomatic. The brevity and non-descript nature of the included symptoms can provide a high level symptom screen; however it is up to clinicians to take a deeper dive in their evaluation process to aid in a differential diagnosis and to better understand the influence of the patient's symptoms on their functional abilities.

First, in order to aid in our differential diagnosis and determine appropriate treatment strategies, we should be asking additional questions regarding endorsed symptoms. For example, a patient who endorses headache on a graded symptom scale should be asked follow-up questions regarding the onset, location, duration, characterization, aggravating factors, relieving factors and treatment. Similarly, an endorsement of dizziness can be related to concussion, but also a number of other differential diagnoses. As such, it is important to ask follow-up questions regarding the quality, timing and duration, triggers, and other associated symptoms. This approach can be taken with most of the symptoms

on a graded symptom scale to assist in learning more about the reported symptoms.

The next step in the evaluation process extends our interpretation of the graded symptom scale by grouping or categorizing the various symptoms into concussion profiles or sub-types. Authors have published different classifications for assigning concussion profiles (**Table 1**) allowing athletic trainers the ability to use the one that fits best with their clinical practice and directing physician standing orders. Regardless of which classification is used, clinicians should classify their patient's symptoms to determine their patient's primary concussion profile or sub-type. Due to the overlap of symptoms between profiles, often patients will have a secondary profile and in some cases a tertiary profile. Once the profiles are determined, the next step allows clinicians to learn more about how the patient's symptoms are affecting aspects of their lives.

While there has always been the recommendation to assess and manage each patient with an individualized approach, this philosophy becomes more important in our current era where we are moving to an active treatment paradigm. To facilitate active treatment of concussion, clinicians should be using the graded symptom scale as a screen to assign a symptom cluster or profile to each patient.[2] Once a symptom profile is assigned, further assessment using a patient-report outcome measure is indicated to allow a more thorough understanding of the patient's perception of elements of those symptoms on their perceived health (**Figure 1**). This will allow for a more thorough understanding of the patient's complaints and direct the clinician to an appropriate treatment strategy. While there is not one single PRO for sport-related concussion, there are many established PROs that could be used with the various concussion profiles **(Table 2)**[3] Clinicians should review the various options, understand licensing requirements (if applicable), and determine question relevance in their patient population. In the following section, we discuss an example in practice using the cervical profile.

EXAMPLE IN PRACTICE

The 22-item symptom evaluation previously mentioned evaluates the symptoms of headache, dizziness, cognitive impairment, and neck pain. These specific symptoms are important in a clinical context because they have been identified as common and shared symptoms of both concussion and whiplash associated disorder, and they are associated with similar mechanisms of injury.[4] This suggests that a patient history alone, including mechanism of injury and symptom profile, is unlikely to differentiate these conditions. The Neck Disability Index (NDI) is a PRO that, although not currently validated for concussion, has been validated in a wide variety of patient populations and languages for acute and chronic neck pain. The NDI is a 10-item scale measured 0 (no disability) to 5 (full disability) and the authors of a systematic review found that a MDC of 5/50 is appropriate and that a score between 0-10 likely is approaching a floor effect.[5] A study aiming to characterize cervical spine impairments in a younger population following concussion found that 90% of subjects demonstrated impairments in at least three out of five assessment categories; further, of those subjects for which the NDI was administered on initial physician assessment, over 80% were interpreted as having disability due to neck pain. The five assessment categories utilized by the authors for their analyses were posture/movement quality, muscle strength and endurance, myofascial tension to palpation, joint mobility, and selective tissue testing for upper extremity radicular symptoms.[6]

Due to the interrelationship of both mechanism and symptoms following trauma between concussion and whiplash associated disorder, it is of paramount clinical importance to evaluate a patient with suspected concussion for a cervicogenic origin of these symptoms. The NDI can offer a reliable and valid means to determine the need to complete a thorough assessment of the cervical spine

Table 1. Concussion profile or sub-type classifications.

Author	Classifications
Collins, 2014[7]	Vestibular, ocular, cognitive, migraine, anxiety/mood, cervical
Craton, 2017[8]	Cognitive, oculomotor, affective, cervical, headache, cardiovascular, vestibular
Harmon, 2019[2]	Vestibular, cognitive, fatigue, anxiety/mood, headache/migraine, ocular
Lumba-Brown, 2020[9]	Cognitive, ocular-motor, headache/migraine, vestibular, anxiety/mood
	Associated conditions: sleep disturbance, cervical strain
Kontos, 2020[10]	Anxiety/mood, cognitive/fatigue, migraine, ocular, vestibular
	Modifying factors: sleep, neck

Table 2. Possible patient-report outcomes for patients with different concussion symptom profiles.

Clinical Profile	Patient-Report Outcomes
Anxiety/Mood	Beck Depression Inventory
	Generalized Anxiety Disorders-7
	Profile of Mood States
	Patient Health Questionnaire
	Brief Symptom Inventory-18
	NeuroQOL Depression and Anxiety Subscales
Cognitive/Fatigue	Pediatric Quality of Life Inventory - Cognitive Subscale
	Multidimensional Fatigue Scale
	NeuroQOL Cognitive Subscale
Migraine	Headache Impact Test-6
	Migraine Disability Assessment
	Pediatric Migraine Disability Assessment
	Migraine Specific Quality of Life Questionnaire
Ocular	Convergence Insufficiency Symptom Survey
	National Eye Institute Visual Function Questionnaire–25
	Vision-Related Dizziness Questionnaire
Vestibular	Dizziness Handicap Inventory
	UCLA Dizziness Questionnaire
	Vertigo Symptom Scale
Cervical	Neck Disability Index
	Northwick Park Neck Pain Questionnaire.
	Copenhagen Neck Functional Disability Scale
	Whiplash Disability Questionnaire
Sleep	Basic Nordic Sleep Questionnaire
	Leeds Sleep Evaluation Questionnaire
	Medical Outcomes Study - Sleep Problems Measures
	Pittsburgh Sleep Diary
	Pittsburgh Sleep Quality Index
	Self-Rated Sleep Questionnaire
	Sleep Dissatisfaction Questionnaire

as well as benchmarking to track progress. A cervical spine exam would be indicated for any patient reporting at least mild disability on the NDI. This exam should begin with an assessment of ligamentous and vascular integrity in the upper cervical spine. At minimum, screening for the atlanto-occipital (sharp-purser test) and atlanto-axial (alar ligament test) joints in combination with a screen for vertebral basilar insufficiency is indicated. The clinical exam is then recommended to consist of the previously identified categories of assessment found in these patients.[6] Utilizing the graded symptom scale as an initial screen, followed by a PRO specific to patient's clinical profile can allow clinicians to further investigate the impact of the concussion in a more thorough manner and develop an appropriate treatment plan.

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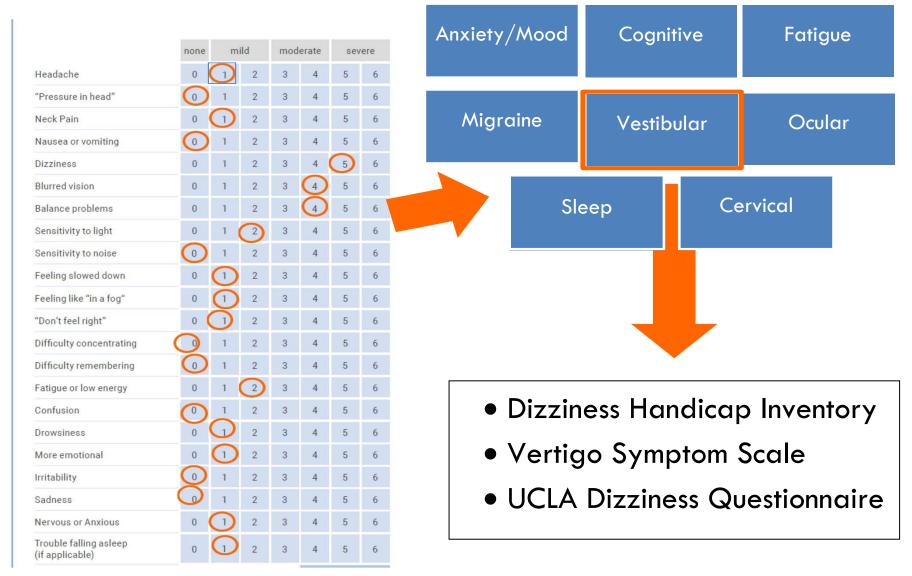
Figure 2. Example Using the Symptom Scale to Identify a Patient Profile