PERSPECTIVE & COMMENTARY

Commentary

“Chronic Pain and the Brain” Impairment: Introducing a Translational Neuroscience-Based Metric

This commentary is in response to Drs. Feinberg and Brigham’s request for feedback on their 2014 revision of their 2006 “Guide to the Guides…” [1]. They teach that its use improves rating accuracy. We concur. Their 2014 revision generates impairment rating protocols in injured workers that are based on the AMA Guides to the Evaluation of Permanent Impairment, 5th Edition (GUIDES) [2]. In response to their request for feedback, we wish to bring attention to published rating inaccuracies in the GUIDES and the unreliability of measuring chronic pain based only on self-report [3–6]. We have two goals. One is to introduce a neuroscience-based metric and related protocol that eliminates all identified GUIDES defects when rating chronic pain whole-person impairment. A second is to stimulate evaluation of this neuroscience-based assessment protocol as a potential gold-standard diagnostic benchmark in chronic pain medicine that currently does not exist. The search for a reliable chronic pain metric is the “holy grail” in all of medicine that challenges pain medicine practitioners, patients, drug developers, and the medical-legal community at large [6].

Historically we learn that the GUIDES is developed, “To enable physicians to evaluate functional impairment in an objective and consistent manner…” (p. 286 [5]). Seabury et al. challenge its “…controversial use when measuring impairment versus disability.” They, along with others, identify numerous “Catch 22s” that question GUIDES-derived impairment ratings as reliable and address them in detail [3–5]. As an example, we cite Dr. Rondinelli’s 2010 “Commentary” [4]. He writes “…that the ratings themselves remain largely consensual-based …and subject to various stakeholder priorities and biases…” (p. 1204 [4]). In our experience this invites speculative expert examiner opinions.

Our first goal is to introduce a translational neuroscience-based remedy that eliminates all published criticisms of GUIDES-based chronic pain ratings. It is entitled the Chronic Pain Autonomic Stress Test, or CPAST. Its assessment paradigm relies on monitoring cardiovascular reactivity (CVR) in response to a standardized orthostatic stress test. Its origin dates back nearly a century [7]. It may be helpful to recall that stimulating stretch receptors in the walls of the carotid sinus and aortic arch trigger reflexes that regulate blood pressure (ibid); and that “…systems involved in the regulation of blood pressure are physiologically linked to systems involved in the regulation of pain.” (p. 214 [8]). This linkage is first reported in 1983 by Randich and Hartounian [8]. Introducing the CPAST uses a “teaching case” from California disability claimants with “chronic pain and the brain” injuries secondary to “on-the-job” musculoskeletal injuries. “Chronic pain and the brain” is a metaphor for all body regions exposed to allostatic load damage from nociception [9]. These include the central nervous (CNS), autonomic nervous (ANS) and cardiovascular (CVS) systems [10]. “Teaching case” claimants are predictably referred for a neutral examiner’s medical-legal opinion regarding industrial versus non-industrial causation of a disputed injury to a specific body part. In the “teaching case” the disputed claim alleges injury to the “psyche,” not to the musculoskeletal system. In part this dispute arises from GUIDES-based impairment ratings that require medical examination of different body parts. The antiquated label “psyche” perpetuates the “mind-body” Cartesian Dualism inherent in the chronic pain biomedical model. The proposed remedy instead uses the chronic pain biopsychosocial model [11]. Proposing a remedy that addresses CNS, ANS and CVS synergistic involvement merits recalling that chronic pain is the quintessential chronic stress that triggers a “24/7” neuro-inflammatory allostatic load damaging all body regions involved with nociception [9,12].

CPAST chronic pain impairment ratings rely on accessing baroreceptor and nociceptor signals that are functionally interwoven within the CNS [10]. It is now accepted that arterial baroreceptor reflex activity (ABRA) provides the CNS with a continuous stream of information on changes in blood pressure [13]. Published evidence suggests that pain modulates the activity of neurons involved in the control of baroreceptor responses [14]. While statistical significance of this biological evidence was confirmed, its clinical importance is still ill defined. For this reason a researcher may encounter multiple barriers in trying to accurately translate chronic pain metrics obtained by subjective instruments.
to autonomic metrics of chronic pain [6]. The barriers include patient confusion when self-rating a chronic sensory or nociceptive experience. These include confusing pain intensity and frequency with severity of other pain-related experiences such as negative affect (e.g., pain distress or unpleasantness associated with anxiety, depression, irritation, and overall negative mood); negative cognition or thought disorganization (e.g., pain catastrophizing including helplessness, rumination, and magnification); and physical (functional) and psychosocial (interpersonal) behavioral problems. Second, pain frequency/duration and pain intensity (i.e., current, worst, average, and aggravated) are two different “burdening” (long-lasting trait) and “magnitude” (acute state) components of a chronic pain experience. They may also have different impacts on assessing chronic pain severity when translating their relationships to autonomic measures. Third, chronic pain patients may misuse pain rating scales non-linearly and inconsistently. For example, they may rate the present painful experience in comparison with prior ones, but not to a non-painful condition. Fourth, subjective pain ratings may be affected by individual maladaptive behavioral response styles. In general, use of autonomic metrics for clinically assessing chronic pain should be: (i) evaluated in populations of pain patients with different diagnoses and/or impairments in activities of daily living to demonstrate marker generalizability; (ii) investigated with respect to different dimensions of pain (e.g., sensational, affective, cognitive) to demonstrate marker specificity and sensitivity in patients or their general pain-related impact when compared with healthy controls; (iii) obtained by controlling for psychosocial context and habituation where stressfulness may modulate the pain experience and its impact on physiological processes; and (iv) lastly evaluated for tolerance to patient credibility and response styles.

The CPAST chronic pain impairment metric was derived when accounting for most of these caveats [15,16]. In this instance the CPAST is able to meet the California Labor Code’s requirement that medical examiners generate “most accurate” impairment ratings using any chapter of the GUIDES as long as the rating protocol falls within its four corners [17]. The CPAST fulfills this requirement without compromising its science-generated construction, because CPAST whole-person impairment ratings require an orthostatic stress test protocol. Chapter 13 of the GUIDES specifically addresses assessment of brain impairment; and that its assessment is different from other body parts. It validates using postural hypotension to detect autonomic dysfunction (p. 308) [2].

The centerpiece of the CPAST’s translational neuroscience assessment of “chronic pain and the brain” impairment is measuring CVR in response to an orthostatic stress test as a metric of ABRA [16]. Orthostatic CVR in chronic pain patients is significantly reduced [18]. This is attributed to impaired baroreflex mechanisms in those experiencing greater chronic pain [19]. The effects of chronic pain on orthostatic CVR are complex as well as intriguing. Familiarity with the neurophysiology of ABRA and CVR is de rigueur for understanding the roles they play when measuring “chronic pain and the brain” impairment [10]. An updated understanding is found in a recently published review [20]. Peer-reviewed publications validate that ABRA can be reliably measured when measuring orthostatic CVR [18,21]. Coupling measurement of ABRA with orthostatic CVR simply requires measuring heart rate (HR) and blood pressure (BP) in response to postural changes using the CPAST’s assessment protocol. Thus what qualifies the CPAST as a potential gold-standard diagnostic benchmark is its use of another gold-standard diagnostic benchmark; an automated blood pressure cuff [22]. Preliminary results from a University of California, Los Angeles, Institutional Review Board (UCLA-IRB)-approved case study of 50 disability claimants with litigated injury claims demonstrates that the CPAST generates empirical “chronic pain and the brain” impairment ratings in three separate dimensions that are “most accurate” at a 95% threshold of reliability and confidence [16]. The three separate pain dimensions are: pain severity; pain distress; and pain catastrophizing. The CPAST completely bypasses patient self-report, abnormal illness behavior, intentionality and examiner bias (ibid).

Use of the CPAST potentially leaves “one stone” unturned; i.e., the GUIDES reliance on different denominators within the same body part chapter for rating impairment as well as different body part chapters. We are prompted to introduce our use of a universal standardized World Health Organization (WHO) Disability Assessment Schedule 2.0’s (WHODAS 2.0) denominator for CPAST impairment ratings [23]. This is validated by statistical evidence that shows that one scientifically validated metric (ABRA) can be easily translated into another (WHODAS 2.0) when they are related to each other.

In summary, this commentary is prompted by Drs. Feinberg and Brigham’s 2014 revised update of their 2006 “Guide to the Guides…” that requests reader feedback [1]. We concur that the 2014 revision generates more accurate impairment ratings than the GUIDES itself. This commentary is prompted out of concern that achieving “most accurate” GUIDES-based impairment ratings according to California Labor Code’s introduction of SB863 in 2013 may lead to speculative expert examiner opinions that are no better than chance [4,24]. This prompts mention of the orthostatic cardiovascular reactivity metric generated by the Chronic Pain Autonomic Stress Test (CPAST) as an evidence-based alternative [16]. The CPAST meets all California Labor Code requirements for rating chronic pain whole-person impairment most accurately [17]. However, additional scientific experimentation is needed to affirm that “chronic pain and the brain” injuries are the principal cause of cardiovascular dysautonomia as measured by the CPAST [25]. We encourage further examination of the CPAST as a potential gold-standard diagnostic...
benchmark of chronic pain that currently does not exist clinically as well as forensically.

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