



Letter to the editor: chronic pain tidal wave after COVID-19: are you ready?

Adriaan Louw PT, PhD

Evidence in Motion: Pain Science, Story City, IA, USA

The coronavirus disease of 2019 (COVID-19) significantly impacted healthcare on a global scale, including physical therapy (PT). In the United States (US), PT was defined as an essential job, thus permitting therapist to continue working despite public health shelter in place orders. Despite this, there was a dramatic shift in the utilization of therapy services. While inpatient therapist demand drastically increased, outpatient PT visits plummeted. Outpatient therapists were sometimes furloughed or reassigned to other areas of healthcare, etc. For example, barriers to telehealth services provided by PTs and other providers were lifted by regulators and third-party payers. As for the aftermath of COVID-19, one must wonder as to the lasting impact upon healthcare, or specifically PT practice. It is already proposed that post-COVID-19 respiratory issues will be a new reality for therapists. In the pain community, medical journals are slowly-but-surely discussing the potential influx of chronic pain after COVID-19 (Clauw, Hauser, Cohen, and Fitzcharles, 2020). This chatter, in the pain community, seems to be medicine-specific. Where is the PT chatter about the impending post-COVID-19 pain tidal wave that is coming? Prior to COVID-19, the PT profession was very well versed in a different global epidemic: chronic pain and opioids. However, as we're learning, COVID-19 has, and continues to expose weaknesses in personal health, healthcare and society in general. What can we as PT expect post-COVID-19 in regards to pain?

A good place to start is to review what happened during and after the epidemic of sudden acute respiratory syndrome (SARS). During the SARS epidemic, the coronavirus caused acute viral illnesses often presenting with myalgia and fatigue, as well as organ-specific symptoms, as seen with influenza (Hui, Chan, Wu, and Ng, 2004). Following SARS, a chronic post-SARS syndrome emerged consisting of fatigue, diffuse myalgia, depression, and nonrestorative sleep which could persist for up to 2 years (Moldofsky and Patcai, 2011). Biologically, scientists also showed that chronic post-SARS syndrome was characterized by a mild hypoactivation of the

hypothalamic–pituitary–adrenal (HPA) axis. On a psychological level, survivors of SARS experienced long-term changes to their mental health. Up to 65% of survivors developed some type of psychiatric morbidity including major depression, anxiety disorders, panic disorder, various phobias, and psychosis. Between 25% and 44% of Hong Kong SARS survivors were diagnosed with posttraumatic stress disorder (PTSD), while 15% experienced depression for at least 30 months after the illness (Mak et al., 2009). Additionally, the annual suicide rate in older adults after the SARS epidemic did not return to pre-epidemic levels, suggesting that factors related to the epidemic had long-term consequences. On social levels, a so-called “post-SARS social syndrome” also wreaked havoc, with many patients facing social isolation and various barriers to reengage into society – a lot of this was likely driven by media coverage of SARS. What can we learn from the SARS epidemic to help us prepare for the post-COVID-19 issues we might face? One thing is very clear, SARS showed the importance of a biopsychosocial approach to patients (Hui, Chan, Wu, and Ng, 2004; Mak et al., 2009). The effect of SARS was not only measured on a biological level but had serious psychosocial consequences. For PT to be ready and truly impactful for COVID-19, a biopsychosocial approach is needed (Clauw, Hauser, Cohen, and Fitzcharles, 2020).

If one appraises traditional PT by its nature, it could be said that PT is a biological profession. Biological functions related to the immune system will be a big consideration. Closely tied to immune function are inflammatory responses. Acute viral illnesses often present with myalgia and fatigue, as well as organ-specific symptoms, as seen with influenza (Hui, Chan, Wu, and Ng, 2004), which will become a clinical feature for those presenting to PT. It has been shown that the presence and severity of somatic symptoms during acute infection is closely correlated with the subsequent development of chronic fatigue and pain, implying a triggering of both widespread and regional chronic pain (Hui, Chan, Wu, and Ng, 2004). Current estimates are that up to 20% of

laboratory-confirmed COVID-19 patients develop critical illness, requiring intensive care unit (ICU) admission (Clauw, Hauser, Cohen, and Fitzcharles, 2020). Chronic pain as a result of ICU admission after discharge is well reported. It has been shown that 40% of ICU survivors report chronic pain 4 years after ICU admission. Furthermore, in a study evaluating 575 patients 6 to 11 years after ICU discharge, many experienced persistent difficulty with mobility (52%); self-care (19%); activities of daily living (52%); pain/discomfort (57%); and cognition (43%) (Timmers et al., 2011). The immune system, already under threat, will be further challenged with comorbid depression, poor sleep, and opioid use, all of which have immune suppression effects (Clauw, Hauser, Cohen, and Fitzcharles, 2020). Inflammation and immune function are very closely related. Inflammation research related to COVID-19 has focused on the so-called “bradykinin storm” (Garvin et al., 2020). Bradykinin is a peptide that promotes inflammation, causing arterioles to dilate via the release of prostacyclin, nitric oxide, and endothelium-derived hyperpolarizing factor and makes veins constrict, thereby leading to leakage into capillary beds, due to the increased pressure in the capillaries. It is believed that bradykinin influx leads to leakage of fluid into the lungs combined with the excess hyaluronic acid, resulting in a “gelatin-like” substance, preventing oxygen uptake and carbon dioxide release in the lungs of severely affected patients with COVID-19 (Garvin et al., 2020). Bradykinin not only contributes to a pro-inflammatory state but sensitizes somatosensory fibers resulting in hyperalgesia, thus fueling a pain experience (Clauw, Hauser, Cohen, and Fitzcharles, 2020). These perspectives on immune and inflammatory changes may explain why the elderly and physically unfit (immune compromised) and overweight (increased inflammation) may have been more impacted by COVID-19. Additional biological consequences of COVID-19 may include: increased issues pertaining to encephalopathy; post-polio syndrome; and altered body schema due to structural changes in the brain blood-brain and spinal cord-brain barrier changes (Beggs, Liu, Kwan, and Salter, 2010).

Various social aspects such as isolation, financial impact, etc., are also associated with the pandemic. It would thus be reasonable to expect PT to also view COVID-19 from a psychosocial perspective. Psychosocial stressors such as limited interpersonal contact, isolation, fear of illness, future uncertainty, media coverage, financial strain, and concerns about “second-waves” would have the potential to add to increased rates of anxiety and fear (Bendau et al., 2020; Clauw, Hauser, Cohen, and Fitzcharles, 2020; Mahmud,

Talukder, and Rahman, 2020). Those with an underlying mental health disorder may be especially vulnerable to such factors. Persistent and extreme stress can lead to a variety of severe mental health consequences including anxiety, depression, sleep disturbances, or suicidal ideation (Bakioglu, Korkmaz, and Ercan, 2020; Elbay, Kurtulmus, Arpacioğlu, and Karadere, 2020; Hu et al., 2020; Stein, 2020). Preliminary evidence shows that anxiety and depression (16%-28%), self-reported stress (8%), and sleep disturbances are common reactions to this pandemic (Bakioglu, Korkmaz, and Ercan, 2020; Elbay, Kurtulmus, Arpacioğlu, and Karadere, 2020; Hu et al., 2020; Rajkumar, 2020; Stein, 2020). Sleep deprivation can lead to symptoms virtually indistinguishable from widespread pain, fatigue, and diffuse tenderness (Clauw, Hauser, Cohen, and Fitzcharles, 2020), and physical activity which typically attenuates sleep deprivation was and is severely curtailed by the pandemic. From a medical perspective, COVID-19 significantly impacted those who needed, or typically received care. Compromised regular medical visits (including PT), travel interruptions, delayed routine care due to COVID-specific cases and shortages in medicine, all add to the impact and potential downstream consequences expected after COVID-19. It is important to recognize that thoughts, emotions, and physical pain are very closely correlated, which makes sense in lieu of modern pain theories (i.e. pain neuromatrix) (Melzack, 2001). For example, it has been shown on functional magnetic resonance imaging that brain maps associated with physical pain and emotional pain (i.e. rejection) overlaps 88% (Kross et al., 2011). The psychosocial consequences of COVID-19 will thus very likely impact physical pain and vice versa. It is not yet known whether COVID-19 will cause an increase in new-onset chronic pain. Longitudinal studies have shown the presence of regional pain, female sex, and low socioeconomic status to be strong predictors for the development of widespread pain (Generaal et al., 2016). Those who already lived with chronic pain will likely have a significant negative impact related to COVID-19, whereas people with no chronic pain prior to COVID-19 may join the ranks of those struggling with chronic pain (Clauw, Hauser, Cohen, and Fitzcharles, 2020).

The above discussion of the various biopsychosocial factors from COVID-19 is not complete in any way, but provides an opportunity to consider the proposed impacts of COVID-19 on chronic pain, and how this, in turn, may impact PT. This population is characterized by a long-term presence of a complex interference of complaints on a psychological, physical, and social level. There is a high degree of co-morbidity, which means that, in addition to chronic and complex pain

complaints, there are also problems in the field of fear, mood, and personality. As a result, the clients are severely limited in their social and societal (professional) functioning. Their care must anticipate for this. The medical community is increasingly concerned that chronic pain rates may not only likely increase but the severity of its impact may have widespread implications for the care of people with chronic pain. PT providers should also acknowledge these facts that there is a tidal wave of chronic pain, post-COVID-19 heading our way. What should PT do? It is evident, whatever PTs answer is to this pending influx of chronic pain, it must be a biopsychosocial approach. Here, I offer three key things to consider. First, become a multidisciplinary provider. It is well established that complex chronic pain cases often require multidisciplinary care. Patients are encouraged to seek these pathways. In this scenario, various aspects of recovery are overseen by different providers. For example, a patient may see a PT for movement-based treatments, whereas he/she sees a mental health provider for depression; a dietician for nutritional advice; a yoga instructor for mindfulness and meditation, etc. In lieu of the impending increase in number and complexity of chronic pain, as well as limited resources, the modern PT must become a “multidisciplinary provider.” Current best-evidence for chronic pain calls for a three-pronged approach: cognitive intervention; movement and treatment aiming to calm the central nervous system (Nijs et al., 2020). The modern clinician must thus develop such skills. Cognitive treatment may include pain neuroscience education, cognitive behavioral therapy, and motivational interviewing, as an example (Nijs et al., 2020). Movement, a key element in PT can take various forms, as long as it's based on behavioral concepts of pacing and graded exposure (Louw, Zimney, O'Hotto, and Hilton, 2016). Calming the central nervous system, non-pharmacologically, includes mindfulness, meditation, sleep hygiene, nutrition, and graded motor imagery (Louw, Zimney, O'Hotto, and Hilton, 2016). Second, PT must move closer to lifestyle medicine and preventative care. COVID-19 clearly impacted those with poorer health (i.e. elderly, obese, unfit, anxious, and depressed). PT is ideally set up to treat those in the community afflicted by disease, but also lifestyle choices. In line with a true biopsychosocial approach, PT must embrace emotional well-being, nutrition, health promotion, sleep hygiene, and smoking cessation to impact humanity. Finally, COVID-19 also showed the burden of caring for others. Clinicians themselves must be in the best physical and mental place possibly to help those in need. It is already established PTs are challenged when it comes to treating people with chronic pain. Exposure

to a multitude of stressors simultaneously, or over time, may pose a significant risk for later somatic and/or psychological consequences. In fact, various stressors for health-care providers pertaining to COVID-19 are being taunted as risk factors for the development of post-traumatic stress disorder, similar to what was seen after SARS (Carmassi et al., 2020). Even though risk factors typically relate to frontline health-care providers (i.e. physicians and nurses), risk factors of years of work experience, social and work support, job organization, age, gender, and coping skills spill over to PT. All of this strongly support the notion of self-care and work-life balance, including an emphasis on own personal physical and emotional well-being.

Prior to COVID-19, the PT profession already faced the challenge of a growing global chronic pain and opioid epidemic. COVID-19 is set to increase the rate and severity of chronic pain, which will increase the demands on all of healthcare, including PT. Therapists are urged to prepare themselves accordingly, using a true biopsychosocial approach, since the challenges will be more than just physical.

References

- Bakioglu F, Korkmaz O, Ercan H 2020 Fear of COVID-19 and positivity: Mediating role of intolerance of uncertainty, depression, anxiety, and stress. *International Journal of Mental Health and Addiction* Online ahead of print. doi:10.1007/s11469-020-00331-y.
- Beggs S, Liu XJ, Kwan C, Salter MW 2010 Peripheral nerve injury and TRPV1-expressing primary afferent C-fibers cause opening of the blood-brain barrier. *Molecular Pain* 6: 74. doi:10.1186/1744-8069-6-74.
- Bendau A, Petzold MB, Pyrkosch L, Mascarell Maricic L, Betzler F, Rogoll J, Grosse J, Strohle A, Plag J 2020 Associations between COVID-19 related media consumption and symptoms of anxiety, depression and COVID-19 related fear in the general population in Germany. *European Archives of Psychiatry and Clinical Neuroscience* Online ahead of print. doi:10.1007/s00406-020-01171-6.
- Carmassi C, Foghi C, Dell'Oste V, Cordone A, Bertelloni CA, Bui E, Dell'Osso L 2020 PTSD symptoms in healthcare workers facing the three coronavirus outbreaks: What can we expect after the COVID-19 pandemic. *Psychiatry Research* 292: 113312. doi:10.1016/j.psychres.2020.113312.
- Clauw DJ, Hauser W, Cohen SP, Fitzcharles MA 2020 Considering the potential for an increase in chronic pain after the COVID-19 pandemic. *Pain* 161: 1694–1697.
- Elbay RY, Kurtulmus A, Arpacioğlu S, Karadere E 2020 Depression, anxiety, stress levels of physicians and associated factors in Covid-19 pandemics. *Psychiatry Research* 290: 113130. doi:10.1016/j.psychres.2020.113130.
- Garvin MR, Alvarez C, Miller JI, Prates ET, Walker AM, Amos BK, Mast AE, Justice A, Aronow B, Jacobson D 2020 A mechanistic model and therapeutic interventions

- for COVID-19 involving a RAS-mediated bradykinin storm. *eLife* 9: e59177. doi:10.7554/eLife.59177.
- Generaal E, Vogelzangs N, Macfarlane GJ, Geenen R, Smit JH, de Geus EJ, Penninx BW, Dekker J 2016 Biological stress systems, adverse life events and the onset of chronic multi-site musculoskeletal pain: A 6-year cohort study. *Annals of the Rheumatic Diseases* 75: 847–854. doi:10.1136/annrheumdis-2014-206741.
- Hu D, Kong Y, Li W, Han Q, Zhang X, Zhu LX, Wan SW, Liu Z, Shen Q, Yang J, et al. 2020 Frontline nurses' burnout, anxiety, depression, and fear statuses and their associated factors during the COVID-19 outbreak in Wuhan, China: A large-scale cross-sectional study *EClinicalMedicine*. 24: 100424. doi:10.1016/j.eclinm.2020.100424.
- Hui DS, Chan MC, Wu AK, Ng PC 2004 Severe acute respiratory syndrome (SARS): Epidemiology and clinical features. *Postgraduate Medical Journal*. 80(945): 373–381. doi:10.1136/pgmj.2004.020263.
- Kross E, Berman MG, Mischel W, Smith EE, Wager TD 2011 Social rejection shares somato-sensory representations with physical pain. *Proceedings of the National Academy of Sciences of the United States of America* 108: 6270–6275.
- Louw A, Zimney K, O'Hotto C, Hilton S 2016 The clinical application of teaching people about pain. *Physiotherapy Theory and Practice* 32: 385–395. doi:10.1080/09593985.2016.1194652.
- Mahmud MS, Talukder MU, Rahman SM 2020 Does 'Fear of COVID-19' trigger future career anxiety? An empirical investigation considering depression from COVID-19 as a mediator. *International Journal of Social Psychiatry* Online ahead of print. doi:10.1177/0020764020935488.
- Mak IW, Chu CM, Pan PC, Yiu MG, Chan VL 2009 Long-term psychiatric morbidities among SARS survivors. *General Hospital Psychiatry* 31: 318–326. doi:10.1016/j.genhosppsych.2009.03.001.
- Melzack R 2001 Pain and the neuromatrix in the brain. *Journal of Dental Education* 65: 1378–1382. doi:10.1002/j.0022-0337.2001.65.12.tb03497.x.
- Moldofsky H, Patcai J 2011 Chronic widespread musculoskeletal pain, fatigue, depression and disordered sleep in chronic post-SARS syndrome; A case-controlled study. *BMC Neurology* 11: 37. doi:10.1186/1471-2377-11-37.
- Nijs J, Wijma AJ, Willaert W, Huysmans E, Mintken P, Smeets R, Goossens M, van Wilgen CP, Van Bogaert W, Louw A, et al. 2020 Integrating motivational interviewing in pain neuroscience education for people with chronic pain: A practical guide for clinicians *Physical Therapy*. 100: 846–859. doi:10.1093/ptj/pzaa021.
- Rajkumar RP 2020 COVID-19 and mental health: A review of the existing literature. *Asian Journal of Psychiatry* 52: 102066. doi:10.1016/j.ajp.2020.102066.
- Stein MB 2020 Editorial: COVID-19 and anxiety and depression in 2020. *Depression and Anxiety* 37: 302. doi:10.1002/da.23014.
- Timmers TK, Verhofstad MH, Moons KG, van Beeck EF, Leenen LP 2011 Long-term quality of life after surgical intensive care admission. *Archives of Surgery* 146: 412–418. doi:10.1001/archsurg.2010.279.