

Which is challenging: Chronic Pain or Chronic Pain-associated Medical Education/Training?

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Chronic pain is perceived by physicians and healthcare systems worldwide as a major challenge, costing US \$650 billion per year, which is more than the costs of cancer, cardiovascular diseases, and diabetes [1]. Despite major efforts to find cost-effective solutions, these efforts are heading in the wrong direction. Worldwide, chronic pain-associated knowledge and pain practices are dissociated, and approaches to diagnosis and treatment are mostly based on outdated knowledge and are highly reductionist. Research, medical education, legislation priorities, and directions are influenced by economic dominance, and chronic pain clinical practices, for a significant majority, are going against medical ethics, evidence-based medicine, and cost-effectiveness. In USA, chronic pain patients are misdiagnosed 40-80% of times according to research from John Hopkins Hospital physicians [2]. Over the past 30 years to date, a huge body of research evidence from the perspectives of conventional pain medicine, complementary/integrative pain medicine, and regenerative pain medicine has not been incorporated into chronic pain medical education/training. Therefore, an extensive and comprehensive 30-month clinical fellowship training program was created at McMaster University in Canada (2007–2010) to fill these gaps. Its main outcome is a major shift in pain management goals from extremely costly, unsafe pain relief to the cost-effective treatment or curing of most chronic pain syndromes and their underlying causes.

Worldwide Situational Analysis

Approximately 100 million Americans have chronic pain [1]. Despite major efforts from western governments, human rights agencies, the World Health Organization (WHO), the International Association for the Study of Pain (IASP), other associations, and academic institutions, these efforts continue to move in the wrong direction. According to research from John Hopkins Hospital Physicians, chronic pain patients are misdiagnosed 40-80% of times [2]. Based on my close clinical observation over 9 years, the vast majority of chronic pain patients in the Kingdom of Saudi Arabia are misdiagnosed.

The following three major gaps exist in chronic pain-associated medical education/training:

1. A lack of musculoskeletal medicine related education and training,
2. A lack of evidence-based complementary and integrative pain medicine-associated education,

3. A lack of recent research findings on cell biology, cellular dysfunctions, and extra-cellular matrix stiffness and dysfunctions associated with chronic pain.

The approach to diagnosis worldwide is mostly based on outdated knowledge, including radiological test findings, especially for chronic musculoskeletal pain and dysfunction. Recent research findings have shown that relying mainly on radiological tests usually misleads diagnosis [3,4]. Accurate diagnoses of chronic musculoskeletal pain and disorders require advanced knowledge and clinical skills. Chronic pain treatment approach usually falls short of evidence-based medicine, medical ethics, and cost-effectiveness. A large body of good evidence has shown a significant increase in cardiovascular risk associated with the use of non-steroidal anti-inflammatory drugs (NSAIDs). For instance, Diclofenac increases the risk of a second heart attack and cardiac arrest by 50% [5]. According to a review on the effect of intra-articular corticosteroids on particular cartilage, corticosteroid injections can contribute to cartilage and connective tissue weakness/damage. 6 Meanwhile, oral corticosteroids significantly increase the risk of serious bacterial infection, in addition to other significant side effects [6]. In a report from the National Institute of Drug Abuse, 115 people die every day in the United States due to opioid overdose [7]. A high rate of surgical treatment dominates surgical practices [8]. Most surgical treatments are not scientifically indicated, and unnecessary surgical treatment for chronic pain represents a major epidemic worldwide. Multidisciplinary pain centers in North America have been shown to be cost-effective, although the goal of treatment is to achieve at least 30% improvement in pain and dysfunction [9]. These centers' main goal is pain relief using psychological, rehabilitative, and conventional pharmacotherapy, including NSAIDs, opioids, anti-depressants, and anti-convulsants. These medications, despite being good at pain relief and improving some aspects of mental and physical dysfunction, carry significant risks and may contribute to mental dysfunction and fatigue in many patients. Because these medications are prescribed on a large scale, they may represent a significant contributor to community health morbidity/mortality. Integrative pain medicine brings conventional and complementary approaches together [10]. Integrative pain medicine approach is more advanced than the conventional multidisciplinary approach.

The Innovative Solution at McMaster University, Canada

Following the completion of one-year fellowship training in palliative medicine at McMaster University in 2008, I felt disgruntled that other kinds of chronic pain, such as chronic non-malignant pain, were unconsidered; hence, I presented a proposal to McMaster University to launch a comprehensive fellowship training program that combines chronic pain, headache, and musculoskeletal medicine from the perspectives of both conventional western medicine and complementary/integrative medicine. The proposal was reviewed and approved by McMaster University and the College of Physicians and Surgeons of Ontario (CPSO). I was the first graduate of this training program in January 2010. After combining the specialties of chronic pain, headache, and musculoskeletal medicine and studying them from the multiple perspectives of pain management under anesthesia, physical medicine and rehabilitation, podiatry, sports medicine, neurology, spinal surgery, pain psychiatry, palliative medicine, mind-body medicine and pain psychology, cell biology/physiology, the anatomy lab, advanced acupuncture, pain herbal medicine, dietary supplements, pain food as medicine, and integrative medicine, I recognized the substantial gaps that existed within these specialties in the management of chronic pain. This learning and clinical practice journey, which over the last 11 years has included an extensive literature review and learning from expert professors' experiences in Canada and the United States and close clinical observations in Saudi Arabia and Canada, prompted me to reach the following conclusion: chronic pain syndrome is treatable or curable in the majority of cases. It is not refractory to treatment; what is refractory is chronic pain-associated medical education/training. My understanding, which is based on an extensive and continuous review of the research of the past 30 years to date and 10 years of learning and clinical practice and learning from others' experiences, is that chronic pain syndromes, chronic musculoskeletal disorders, and age-related chronic pain/dysfunction share to a varying degree approximately 11 underlying micro-dysfunctions at the cellular level. These micro-dysfunctions interact with each other in a complex manner that is not yet fully understood. The cellular dysfunctions are the consequences of a change in the stiffness/composition of the extracellular matrix, as these determine the synthetic function of the cell. The concentration and type of extracellular matrix contents determine its stiffness. Micronutrients, environmental toxins, medications, hormones, inflammatory markers, and cell/tissue injury products influence the composition/elasticity of the extracellular matrix [11,12]. Signaling and cell functions are controlled by the elasticity of the extracellular matrix, and cellular and extracellular dysfunctions represent the chronic disease process of chronic pain. Peripheral and central sensitization is one of the consequences of such micro-dysfunctions. Chronic pain syndromes have an underlying chronic disease process that, to a varying degree, may include the following 11 path physiological mechanisms:[13].

1. An alteration in the stiffness of the extracellular matrix,
2. Chronic oxidative stress,
3. A chronic inflammatory response,
4. Chronic immune dysfunction,
5. A chronic stress-related inflammatory response,
6. Gut microbiome-related intestinal barrier dysfunction,
7. DNA damage and altered gene expressions,
8. Insulin resistance,
9. Micro-nutrient deficiency or insufficiency-related cellular dysfunction,
10. Chronic endothelial dysfunction and impaired cellular

respiration,

11. The end result of the above listed mechanisms is the gradual cellular/tissue degenerative process and impaired or failed healing.

To my knowledge, this advanced medical education/training and approach is not yet available at the world-leading institutions, for instance, John Hopkins and Harvard universities.

Central Pain Pathway Reset Theory (CPPR THEORY)

It has been stated that the central pain pathway's cellular dysfunctions are the primary mechanism of pain chronicity. The CPPR theory state that apart from psychogenic pain and central pain, pain chronicity is always caused by dysfunction in peripheral nerve cells and dysfunction in their extracellular matrix. It is possible in the majority of cases to induce permanent reset of the central pain pathway's dysfunction by treating the peripheral nerve cells and the dysfunctions in their extracellular matrix. This can only be achieved if one or more of the components of the seven options treatment protocol is used. I called it the RRMMHSS protocol. This protocol include:

1. Regenerative options (R): Dextrose prolotherapy, autologous stem cells, autologous blood, ozone, platelet-rich plasma, certain dietary supplements and prescribed exercises.
2. Rehabilitative options (R): Biomechanical dysfunction-specific rehabilitation and other mechanisms specific modalities;
3. Mind-body interventions (M): Relaxation therapies, food as medicine, psychotherapy, and others;
4. Conventional medications (M);
5. German Commission-E approved herbs (H);
6. German Commission-E approved supplements (S);
7. Surgical treatment (S).

This protocol works through multiple mechanisms of action by matching the various mechanisms of chronic pain and dysfunction. A number of the above-listed options can be used to improve, treat or reverse the underlying chronic disease process and the biomechanical dysfunctions of chronic pain [14].

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