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Between 2015 and 2017, we traveled across North America from Harrisburg, Pennsylvania to Vancouver, Canada to Naples, Florida, and lectured to professional organizations on the biopsychosocial model of treating chronic pain, chronic pain as a disability, and why opioids seldom work in the treatment of chronic pain. Below is a summation of our presentation to those organizations. We hope you find it interesting and useful.

Chronic Pain: Why Opioids do not Work

Chronic pain, usually defined as pain lasting three months or longer, costs the U.S. economy between 560 and 635 billion dollars annually in direct medical expenditures and lost productivity combined, according to the Institute of Medicine. Prescription drug abuse dominates the headlines, and stories of the so-called "opioid crisis" have led President Donald Trump to promise an emergency declaration to combat the recalcitrant problem of opioid abuse. According to *The New York Times*, drug overdose deaths in 2016 most likely exceeded 59,000, and drug overdoses are now the leading cause of death among Americans under the age of 50.

Treating chronic pain with opioids seldom works because chronic pain is not purely biological in nature, but it has psychological and social components as well. To better understand the multiple aspects of chronic pain, we need to appreciate what George L. Engel, M.D., a University of Rochester psychoanalyst, told us in an April 8, 1977, *Science* article titled, "The Need for a New Medical Model: A Challenge for Biomedicine." Dr. Engel advocated for an end to the mind-body dualism and argued for the adoption of a biopsychosocial model of illness (and healing). The World Health Organization now employs a biopsychosocial model of disability.

Most primary care physicians and pain management specialists would agree that chronic pain, illness, and health are more complex than simply understanding and treating the biological disease only. Yet, between 1997 and 2005, opioids – compounds designed to treat only the biological source of pain – were the most commonly prescribed class of drugs in the U.S., with increases in prescriptions over that time span documented as: oxycodone, 588%; methadone, 933%; fentanyl, 423%; and morphine, 154%. Most narcotic analgesics are prescribed by primary care physicians. In March 2016, the Centers for Disease Control and Prevention issued new guidelines for prescribing opioids to treat chronic pain.

Meanwhile, medical schools barely teach about pain and its biopsychosocial complexities. A 2011 study from the Johns Hopkins Curriculum Development Team reveals that over the course of four years, North American medical students receive a median number of nine hours of pain instruction.

For those who want to develop a greater understanding of why opioids have limited efficacy in the treatment of chronic pain, it is worth recognizing that biological, psychological, and social factors fuel health and drive pain. Unless we are willing to acknowledge this truth, we will not reduce the suffering associated with chronic pain and the losses often precipitated by opioid abuse.

As a primer, those who want to better appreciate the complexities of chronic pain will want to know more about adverse childhood experience (ACE), pain proneness, and opioid-induced hyperalgesia (OIH), as well as the value of psychometrics in assessing chronic pain and associated syndromes. We need to educate ourselves of the potential benefits of complementary and alternative medicine (CAM) in reducing and/or resolving chronic pain. As an introduction to these concepts, it is worth considering a case illustration, the true story of an individual who acquired chronic pain and claimed total disability. Following the illustration, we will revisit these critical concepts.

A Case Illustration

A woman in her early 40s was referred by her employer's insurance carrier for vocational evaluation and potential job placement. We have come to call this woman Norma Rae, as her social and occupational histories reminded us of the character Sally Field played in her award-winning movie by the same name.

The Norma Rae whom we evaluated had a history that included a climb, albeit short-lived, to a leadership position in a textile factory. She had sustained a work-related injury two years prior to our examination. Norma Rae ran the full gamut of physical investigation and rehabilitation. She had undergone imaging and electrical studies, diagnostic arthroscopic procedures, and physical medicine and rehabilitation, including physiotherapy and work hardening programs. Numerous independent orthopedic examinations failed to find a disease to explain her continuing problems. Some examiners hypothesized reflex sympathetic dystrophy or complex regional pain syndrome as a cause for her continuing muscle atrophy and skin changes. She was given various narcotic painkillers, including OxyContin and fentanyl "lollipops," to quell her pain complaints.

She grew depressed, and most observers concluded that her physical complaints were subjective and in excess of her objective findings. The employer refused to return Norma Rae to work unless she was capable of "full duty" employment. It became our job to "rehabilitate" Norma Rae.

Until our intervention, no one had taken the time to gather a complete history from Norma Rae. The following is a synopsis of what she told us.

Norma Rae had grown up in the mountains of West Virginia. She was the oldest child in a family of nine offspring. Her father, an abusive alcoholic, worked intermittently as a coal miner, and her mother, a seamstress, toiled from home to supplement the family's meager income. Life was harsh. Being the oldest, Norma Rae was often given adult responsibilities, and at an early age, she was "parentalized" by having to care for her siblings and mediate arguments between her mother and father. Norma Rae's father verbally and physically abused his wife. He frightened his children, and during more than one drunken blackout, he sexually assaulted Norma Rae.

Eventually, Norma Rae's mother became so desperate that she took two of the youngest children and left the house to live with her sister. Norma Rae's mother had convinced her that this would be only a temporary situation, and she would be back to retrieve her and her remaining siblings. Unfortunately, the exodus exacerbated the father's drinking behavior, and life for the next six weeks was "hell" for Norma Rae and her remaining siblings. When her mother returned home, it was only a short time thereafter that she became ill from metastatic ovarian cancer. She died six months later and never fulfilled her promise to Norma Rae.

Life at home only became worse for Norma Rae following her mother's death. She was 17 years old when the West Virginia Bureau for Children and Families finally intervened. By that time, Norma Rae's father was dying of both pneumoconiosis and liver disease. She was given the option of foster home placement or relocating to Pennsylvania to live with her maternal aunt. The State was forced to place her brothers and sisters in different homes, and Norma Rae vowed to find work, earn enough to reconstitute her family, and move them to Pennsylvania.

Norma Rae's father had inadvertently taught her how to survive, and her mother had consciously taught her daughter how to sew. Norma Rae established herself as a hard-working production machine operator in a Reading, Pennsylvania textile company. She eventually moved into her own apartment and was able to establish enough of a home to become the legal guardian to three of her siblings. She was 19 years old.

With time, Norma Rae established herself at work, and after several promotions, she found herself in charge of one floor of machine operators. Without an abusive father in her life, the intrusive memories of her childhood in West Virginia faded. Life for a time actually seemed pleasant and rewarding to her.

Unfortunately, the textile factory in which Norma Rae seemed to prosper was privately owned and non-unionized. She began to experience conflict with management, as she felt the need to help her non-union "brothers and sisters" at work receive better pay and worker termination procedures, as well as improved work conditions and increased benefits. The American Federation of Labor and Congress of Industrial Organizations recruited Norma Rae and trained her in union organizing and recruitment strategies. Norma Rae often thought that if her father had worked under union protection, he would have been a healthy person as well as a good parent and husband. She felt determined that she had to create a safer work environment for the men and women she supervised.

In the months following Norma Rae's union activities, the company owner placed his 39-year-old son in charge of the plant. By that time, Norma Rae had been there eight years, and the owner's son had only been told that she could be trouble. He felt strangely familiar to Norma Rae, perhaps because he frequently harassed women and probably because of the alcohol that she could smell on his breath when he returned from his extended lunch breaks. The new manager and Norma Rae did not have a good working relationship, and slowly but steadily, the tensions between them increased.

The owner's son was placed in command at the same time a recession brought a downturn in the textile market. He felt pressure from his father to maintain profits. However, orders were not coming in, and working conditions only worsened as he attempted to curb costs. In Norma Rae's mind, regardless of the economic climate, the plant's employees still had the right to work in a safe environment. Rumor had it that if Norma Rae continued to push for more rights and benefits, the plant manager would find some way to "get rid of her." However, she felt compelled to protect her coworkers.

Norma Rae drew up a petition, reluctantly signed by 95 percent of the 115 production operators, which said there would be a work stoppage unless seams in the concrete floor of the factory were removed so that material handlers would not continue to injure themselves while pulling carts over the open seams. When Norma Rae presented the petition at an emergency rally, the plant manager threatened her and ripped it up. As she attempted to gather support from her coworkers, Norma Rae quickly realized that the vast majority of them would rather do anything to keep their jobs in a threatening recession than walk out over a safety issue. Rumors circulated that her time was up.

No one knows for certain if it was a genuine accident, but two days later, Norma Rae tripped over one of the concrete seams and injured her knee. Two years later, after exhaustive diagnostic procedures and attempts to physically rehabilitate Norma Rae, she remained on workers' compensation. The horrors of her childhood had resurfaced, and she experienced anxiety, depression, and panic attacks. She was medicated with antidepressants and powerful narcotics.

Ultimately, after several unilateral attempts by the employer's carrier to terminate her workers' compensation benefits, Norma Rae was referred for vocational rehabilitation. Now represented legally, emotionally depressed, and over-medicated, a return to gainful activity was the last agenda that Norma Rae was willing to consider. For her, betrayal was the only truth that stuck.

A retrospective cost analysis found that with wage replacement benefits, as well as medical, legal, and administrative claims payments, Norma Rae's "accident" cost her employer's insurance carrier more than $975,000 before they reached a $185,000 commutation of her benefits. Notably, this was only a portion of the total costs that were precipitated by the crack in the factory floor, as Norma Rae's absence led to an informal, but nonetheless evident, slowdown in the workplace following her accident.

It should be noted that until Norma Rae was assigned to us for vocational rehabilitation, no one charged with the responsibility of assisting her had ever taken the time to hear her complete story. Obviously, her biopsychosocial story was more than that of a "troublemaker" falling over the widening seam in a concrete factory floor.

Norma Rae was the victim of ACEs, which are stressful childhood experiences or traumatic events, such as abuse and neglect. They may also encompass household dysfunction, such as witnessing domestic violence or growing up with family members who have addiction disorders. ACEs include: physical abuse, sexual abuse, emotional abuse, physical neglect, emotional neglect, intimate partner violence, household mental illness, substance misuse within the household, and incarcerated household member(s).

ACEs are strongly related to the development and prevalence of a wide range of health problems throughout a person's lifespan, including those associated with chronic pain. There is also a strong relationship between ACE and poorer health status in patients with chronic pain. Most studies that demonstrate a strong relationship between ACE and chronic pain have focused on analysis of women. Research demonstrates the importance of including a history of ACEs in the care and management of chronic pain patients.

Because of ACEs and other developmental experiences, it is hypothesized that individuals can be prone to developing chronic, disabling pain. Dr. Engel also introduced the concepts of the pain-prone patient and psychogenic pain. From these concepts and the substantial literature supporting their validity, we later hypothesized that individuals could be "disability prone." At face value, there can be

no argument that Norma Rae was disability prone and that under the unfortunate circumstances of her employment in a stressful environment and subsequent failures of proper diagnosis and treatment, her acquisition of chronic pain and associated occupational disability were inevitable.

Chronic opioid use can actually increase pain. Nobody is sure what triggers it, but chronic ingestion of narcotic medication can cause hyperalgesia. In certain people, opioids seem to accelerate the nervous system (a process called central sensitization) instead of calming it down. OIH is characterized by a paradoxical response whereby a patient receiving opioids for the treatment of pain can actually become more sensitive to certain painful stimuli. The type of pain experienced might be the same as or different from the original underlying pain. The fact that narcotic pain relievers can actually increase pain complicates the already complex opioid prescribing problem. When a person in pain takes opioids and keeps experiencing worse pain, the obvious assumption is that the dose should be increased. However, that is precisely the wrong act if the problem is OIH.

The use and misuse of opioid compounds in the U.S. and Canada is unfortunate and has led to what Judy Foreman, in her bestseller, *A Nation in Pain: Healing Our Biggest Health Problem*, calls the "opioid wars." In 2016, the day after I lectured to a professional gathering in Vancouver, Canada on how opioids have failed to solve the chronic pain epidemic in North America, I purchased a local paper that described the number of deaths tied to an increasing number of overdoses in Vancouver from pharmaceutical-grade fentanyl that was manufactured in China and diverted into the hands of street users. Wonderful people were literally dying in the streets of this beautiful city because of their biological dependence on an illicitly manufactured opioid that replicated a drug that had been originally created to treat cancer pain. However, the so-called "opioid wars" are more complex than dynamics found in the illicit drug trade between countries.

On October 17, 2017, CBS News revealed that pharmaceutical distributors have pumped millions of narcotic drugs into "bad pharmacies" and physicians' offices while former industry lobbyists and Congress derailed the Drug Enforcement Administration's efforts to stop the flow of opioids into American communities. According to federal filings, 102 million dollars were spent by major drug companies, distributors, chain drugstores, and pharmaceutical manufacturers lobbying Congress on the Marino bill and other legislation. Congressman Thomas Marino was nominated to be President Trump's new drug "czar," but he withdrew his name from consideration for the position after "60 Minutes" and *The Washington Post* jointly investigated the legislative activities behind the opioid crisis.

Nonmedical prescription opioid misuse remains a growing public problem in need of action and is concentrated in areas of the U.S. with large rural populations such as Kentucky, West Virginia, Alaska, and Oklahoma. Katherine M. Keyes, Ph.D., and her colleagues conducted research funded by the National Institute of Alcohol Abuse and Alcoholism. They hypothesized the existence of four factors influencing the rise of opioid abuse in low income, nonurban areas: (1) greater opioid prescriptions in rural areas, creating availability from which illegal markets can arise; (2) an out-migration of young adults; (3) greater rural social and kinship network connections, which may facilitate drug diversion and distribution; and (4) economic stressors that may create vulnerability to drug use more generally. The crisis of nonmedical use of prescription opioids is an important public health priority, and the greatest public health threat remains concentrated in rural, low-income areas of the U.S.

Norma Rae came from one of the communities graphically portrayed in J.D. Vance's memoir, *Hillbilly Elegy*, a bestseller. Vance's memoir is a must-read for someone who wants to truly appreciate the psychosocial dynamics of being poor in rural America and developing work dysfunctions and

disability through ACE and addiction. Until we integrate biological, psychological, and social investigations into the causes of chronic pain, we are unlikely to utilize those same causative agents to provide legitimate remedies to the problems associated with chronic pain and opioid misuse and abuse.

In *A Nation in Pain*, Ms. Foreman also introduces us to an alternative set of modalities used to treat chronic pain, in the form of CAM, including but not limited to: acupuncture, massage, and forms of psychotherapy. Interdisciplinary chronic pain management, often in the form of inpatient programs, have been allowed to fail in an effort to reduce healthcare costs, but non-opioid treatment alternatives do exist, and outpatient healthcare practitioners would be wise to help their patients take advantage of these alternatives. According to its website, the National Center for Complementary and Integrative Health provides information and resources recognized by the U.S. National Institutes of Health. The Center's top research priorities are said to include: nonpharmacologic management of pain; neurobiological effects and mechanisms; innovative approaches for establishing biological signatures of natural products; disease prevention and health promotion across the lifespan; clinical trials utilizing innovative study designs to assess complementary health approaches and their integration into health care; and communications strategies and tools to enhance scientific literacy and understanding of clinical research.

Using Mindfulness to Combat Pain

Individuals with chronic pain may benefit from utilizing mindfulness-based approaches in managing their pain. Mindfulness is a mental framework that allows individuals to be fully present in the moment and become more open and accepting. Mindfulness-based stress reduction (MBSR), mindfulness-based cognitive therapy (MBCT), acceptance and commitment therapy (ACT), and dialectic behavior therapy (DBT) are four types of mindfulness practices that have been used to manage chronic pain.

In their article, "Mindfulness-based approaches for managing chronic pain: Applications to Vocational Rehabilitation and Employment," published in the *Journal of Vocational Rehabilitation* (2017), Davenport, Koch, and Rumrill assert that these approaches can be particularly helpful when applied to a workplace setting, and they can help those with chronic pain "prepare for the workday, identify and implement reasonable accommodations, reduce job stress, improve work relationships, and, consequently, decrease the risk of premature departure from the workforce." Although further research is needed on the matter, mindfulness could be an effective tool to help workers cope with chronic pain. More about each of these mindfulness methodologies are found in the February-March 2014 issue of *American Psychologist*, the journal of the American Psychological Association, dedicated to "Chronic Pain and Psychology."

Neuromodulation: Positive Market Growth for Positive Change

In terms of pain management, neuromodulation involves treatments that alter the activity of nerves, particularly through electrical stimulation or drug delivery. One of the more common examples of neuromodulation is that of a spinal cord stimulator, which helps pain in several areas of the body, including the back, neck, arms, and legs. Neuromodulation could also involve deep brain and cortical stimulation to treat numerous diseases, such as epilepsy and Parkinson's disease.

Studies have suggested the neuromodulation market is growing, and it is estimated to grow even more within the next few years. This growth is not only "positive" in numbers, but perhaps, it is a "positive" for the pain management industry, as physicians are considering some forms of neuromodulation technology as effective alternatives to opioid treatment.

Exercise for Chronic Pain

Appropriate exercise, perhaps initially supervised by a physical or occupational therapist, now appears to be the best known method of treating chronic pain. According to James Rainville, M.D., a spine and rehabilitation specialist at the New England Baptist Hospital's so-called boot camp, "…there is no scientific evidence that activity and exercises are harmful, or that pain-inducing activity must be avoided."

For the most common chronic non-cancer pain problems, including arthritis, fibromyalgia, and chronic low back pain, exercise appears to desensitize a hyperactive nervous system and release endogenous opioids to combat chronic pain signals to the brain. Patient education and proper supervision in selecting an appropriate exercise regimen is a meaningful way to treat many forms of chronic pain. Please watch this video regarding boot camp.

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