

Complimentary Care: Opportunity to Explore Non-Drug Pain Management

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Abstract

Aristotle (4th century B.C.) defined pain as emotion, being the opposite of pleasure. Whereas, Buddha stated "Pain is the outcome of sin", as evidence that an individual was possessed by demons. In some religions it is the cost of attachment. Spiritual counseling thus may be more of a preference than medical management. Many non-physiologic factors (psychological, familial and societal attitudes, life stressors, and cultural or spiritual) contributing to the experience of and response to pain. Emotional stress, for example, anxiety and depression assume a key job in understanding of agony. Endless agony is related with expanded dimensions of burdensome side effects, anxiety, and insomnia paying little heed to disability status. it has both modifiable factors (mental health, co-morbidities, smoking, alcohol, obesity, physical activity/exercise, sleep, nutrition, economic status and occupational) and non-modifiable factors (age, sex, cultural and socioeconomic background, history of trauma/injury/ interpersonal violence, heritage). The relationship between increased BMI and chronic pain in adults seems intuitive and may be related, in part, to increased weight-bearing on joints, reduced physical activity and deconditioning. Patient with physical disabilities may have co-occurring chronic pain, but the prevalence and specific associated factors are unknown. Neuropathic pain (NeP) can be the result of a variety of conditions, including metabolic disease, infection, malignancy, trauma, medications, and toxins; estimates of 60% among those with chronic pain. Chronic pain affects 20% of the European population and is commoner in women, older people, and with relative deprivation. Its administration in the network remains commonly unacceptable, somewhat as a result of absence of proof for successful intercessions. Additionally, family and guardians' convictions and demeanors towards torment, either decidedly and contrarily to endure and express torment are imperative. Hazard factors incorporate socio-demographic, clinical, psychological, and biological factors. Pain increases depression risk 3-5-fold. Pain, rather than chronic disease, is associated with the recurrence of depressive and anxiety disorders; 50-80% of chronic pain patients report insomnia of a severity that warrants clinical attention. It is estimated that approximately one in five of the adult population in Europe suffers chronic pain, which is therefore more prevalent than asthma or diabetes. Chronic pain has long-term biological, psychological and social causes and consequences that are important in prevention and management.

Keywords: Pain, Patient, Cancer, Fibromyalgia, Osteoarthritis, Surgical Pain

INTRODUCTION

Pain is an important determinant of HRQoL. Unfortunately, the experience of pain is frequently characterized by undue physical, psychological, social, and financial suffering. Adults who reported

experiencing a pain condition in the prior month were found to have greater work productivity loss and HRU, including HCP and ER visits, and hospitalizations, than controls. Indirect costs due to work impairment, early retirement, and

disability appear to account for much of the financial burden and hospitalizations being the greatest factor affecting direct costs. Inadequately controlled intense postoperative torment is related with expanded dismalness, utilitarian and personal satisfaction impedance, deferred recuperation time, delayed span of narcotic use, and higher medicinal services costs. Traditional opioids remain the standard of consideration for the administration of intense postoperative torment; nonetheless, the danger of narcotic related unfavorable occasions can restrict ideal dosing for absence of pain, prompting inadequately controlled intense postoperative torment. Danger of conventional agony regulation with torment executioners are all around announced and lethal impacts and potential reliance of manufactured opioids are not totally seen yet. Deaths from overdoses of opioids and sedatives had extremely substantial increments in the United States somewhere in the range of 2000 and 2014, an example not seen before ever. Acclaimed big names like Bruce Lee, Chris Penn, Elvis Presley, Heath Ledger, Anna Nicole Smith passed on from narcotic overdose. The monetary weight of medicine narcotic overdose, misuse and reliance is assessed to be \$78.5 billion

every year in the United States. Keeping up spotlight on biomedical medicines, including drugs, has constrained achievement in interminable agony. In addition, a substantial US outpatient consider found that just 0.12% of interminable agony meetings included torment pros. Dynamic self-administration and solid way of life decisions are crucial to tending to multisystem unpredictability and bridling neuroplasticity in unending torment. Pain relieving pharmaceutical medications are generally connected with an assortment of unfriendly reactions, for example, constipation, urinary retention, nausea, sedation, respiratory depression, myoclonus, delirium, sexual dysfunction, and hyperalgesia. Using UROPP to manage postsurgical pain after discharge did not result in any negative health consequences. These instances clearly reveal importance of understanding current evidence on noninvasive no pharmacological treatment of chronic pain. Consensus guidelines recommend multi-modal chronic pain treatment with increased uptake of NPMs. The challenge of achieving adequate pain control without adverse side effects further compounds the problem and provides rationale for seeking complementary medicine alternatives.



Figure 1: Graphical Abstract

Over 76 million people in the US (that is one in every four Americans) have experienced pain that lasts longer than one day. Millions more suffer from acute pain every day. According to recent statistics put forth by the National Institutes of Health, “pain affects more Americans than diabetes, heart disease, and cancer combined.” (Source: Dr. Veronique Desaulniers. In Pain? 7 Natural Pain Management Techniques to Consider. Web The Truth About Cancer October 5, 2016)

Highlights

1. The costs associated with chronic pain incurs an annual cost of \$874 billion by the US population.
2. Approximately 70 to 85% of the western population will develop low back pain at least once during their lifetime.
3. In France, work productivity loss contributed almost 90% of the total costs incurred by patients with fibromyalgia
4. Pain killers are usually associated with a variety of adverse side effects, such as constipation, urinary retention, nausea, sedation, respiratory depression, myoclonus, delirium, sexual dysfunction, and hyperalgesia.
5. The economic burden of prescription opioid overdose, abuse and dependency is estimated to be \$78.5 billion each year in the United States.
6. Chronic pain affects 20% of the European population and is commoner in women, older people, and with relative deprivation.
7. Neuropathic pain (NeP) estimates of 60% among those with chronic pain.
8. Asia, Africa, and Latin America are collectively home to more than 50% of cancer patients; with more than half of global cancer-related mortalities occurring in Asia alone.
9. Cancer pain is prevalent in almost 50% of all cancer patients and more than 70% of patients with advanced cancer.
10. Postoperative pain is not adequately managed in greater than 80% of patients in the US.
11. The economic burden of migraine in the United States was \$36 billion in 2016.
12. Mild -to-moderate pain may be relieved by non-drug techniques alone. Moderate- to-severe pain may require medication in addition to nondrug techniques
13. Non-drug techniques can decrease pain intensity and can decrease awareness of pain to enable better coping some have been proven to work
14. Public and private insurers have not yet widely adopted payor policies that are consistent with the ACP guideline, National Pain Strategy, and reported patient preference
15. It has been estimated that 12.5% of men and 5.2% of women who aged 74–84 years had Abdominal Aortic Aneurysm (AAA). Furthermore, evidence has revealed that approximately 11,000 deaths were attributed to AAA each year in the United States.
16. Chronic Postsurgical Pain (CPSP) reported 50%–85% following limb amputation, 11%–57% following mastectomy, 30%–55% after cardiac surgery, 5%–65% after thoracotomy, and 5%–63% following hernia repair.
17. Companion of choice at birth increases the likelihood of vaginal births, reduces the need for caesarean sections, the use of forceps or vacuum during vaginal births, need to use pain medications during labor, shortens the duration of labor, improves women’s satisfaction with care and improves Apgar scores.
18. An 8-week moderate intensity aerobic exercise at 40%–60% of heart rate reserve combined with conventional physiotherapy, significantly reduced nearly 50% Non-Specific Chronic Low Back Pain (NSCLBP).

19. Of those who suffer from Hemiplegic Shoulder Pain (HSP), up to 75% report moderate to severe pain with a third refractory to available treatments.
20. TENS as an adjunct is effective in reducing lower limb spasticity when applied for more than 30 minutes over nerve or muscle belly in chronic stroke survivors.
21. Although acupuncture is widely used to manage chronic pain, it remains highly controversial, largely due to the lack of a clear mechanism.
22. Physical therapy should strongly be considered for the management of chronic pain to gradually increase flexibility and strength.
23. Despite a number of reports and reviews supporting efficacy of yoga in health care, the awareness and integration of yoga in conventional healthcare remain limited.
24. An 8-week yoga intervention resulted in improvement in pain and quality of life scores compared to the control group that was treated with NSAIDs.
25. Modern medical system suggests Complementary and Alternative Medicine (CAM) and pharmacotherapy together, instead of long-term use of pain killers alone.



Figure 2: Pain Cycle

When a person gets injured, the common response to pain is to guard their muscles. Over time, however, that guarding pattern, combined with fear, interferes with mobility—and when the patient reduces mobility, that in turn can cause more pain leading to increased lack of mobility, often including anger, frustration, and a sense of helplessness—truly a vicious cycle. Early intervention is really the key to prevent the onset of the cycle of chronic pain. If an injury is sustained—perhaps from a fall—and it still hurts a week after the event, certainly it should be assessed. It may, as the result of this assessment,

recommended a course of treatment, or refer the patient to a massage therapist, a physical therapist, or an orthopedic surgeon or neurosurgeon, depending on the type and severity of the injury (Source: Duncan CA. The Goal: Break the Chronic Pain Cycle. Web Health & Healing Online)

Prevalence and Economic Burden of Chronic Pain

Over 100 million Americans are living with chronic pain, and pain is the most common reason that patients seek medical attention [279]. In France, work productivity loss contributed almost 90%

of the total costs incurred by patients with fibromyalgia [187]. Chronic uncomplicated neck pain, back pain, and lower back pain, with incidences of 18%, 17.7% and 36%, respectively [268]. In a Canadian study of patients waiting for multidisciplinary pain treatment, direct and indirect costs were CAN\$1,462 with time costs accounting for 84% of overall total costs [188]. The US spent 17.8% of it 's GDP on healthcare in 2015, expected to increase to 20% or higher by 2025 [189,190]. The direct and indirect costs associated with chronic pain from any cause in the USA are estimated to range from US\$560 to US\$635 billion yearly, which is almost twice as much as for cardiovascular diseases or cancer [188]. However, it affects nearly 1 of 2 adults and incurs an annual cost of \$874 billion, found in another study [273]. These cost estimates are proportionally similar to those of European countries such as Ireland (€5.34 billion per year) and Sweden (€32 billion per year). Approximately 70 to 85% of the western population will develop LBP at least once during their lifetime. Of the people that consult their general practitioner for low back pain, one year later about 60% still report pain [191]. More than 50% pregnant women suffer from LBP during their pregnancy and such incidence has been reported as nearly 80%. Such painful condition can result in a long-term pain and disability after the delivery [192-194]. Pain is a common complication after SCI with prevalence of 18 to 96%, and almost 30% of this pain are diagnosed as neuropathic pain. The intensity of the pain varies amongst these patients and it has been reported that 77.7% of patients with spinal cord injuries have moderate to severe pain [214]. Asia, Africa, and Latin America are collectively home to more than 50% of cancer patients; with more than half of global cancer-related mortalities occurring in Asia alone [195]. Studies have shown that at least 20–40% of cancer pain was not adequately relieved by application of the analgesic ladder

[258]. Endometriosis-associated pain (EAP) has been reported that about 6% to 10% women (Manifested as dysmenorrhea, non-menstrual pelvic pain, and dyspareunia) [186]. Cancer pain is prevalent in almost 50% of all cancer patients and more than 70% of patients with advanced cancer. About half of patients suffer with advanced cancer experience moderate-to-severe pain, while almost a quarter of patients suffer with more severe pain [195]. Pain is also associated with cancer treatment with more than 25% of patients enduring moderate-to-severe pain during treatment [196]. Postoperative pain is not adequately managed in greater than 80% of patients in the US, although rates vary depending on such factors as type of surgery performed, analgesic/anesthetic intervention used, and time elapsed after surgery [197]. Chronic orchialgia is defined as testicular pain, which may be either unilateral or bilateral, lasting for more than 3 months It is estimated that 25% of chronic orchialgia cases are idiopathic [218]. Migraine is now ranked as the second most disabling disorder worldwide reported by the Global Burden of Disease Study 2016 [227]. The prevalence and burden of self-reported migraine and severe headache in the US adult population is high, affecting roughly 1 out of every 6 American and 20% women over a 3-month period. Headache is consistently the fourth or fifth most common reason for visits to the emergency department, accounting for roughly 3% of all ED visits annually. In reproductive aged women, headache is the third leading cause of emergency department visits [228]. The economic burden of migraine in the United States is substantial. In 2016, these direct and indirect costs amounted to an estimated total annual cost of \$36 billion [229]. The incidence rate of MM is three times higher in more developed countries compared to less-developed countries. The bone tissue destruction in MM results in bone pain, pathological fractures, and less frequently spinal cord compression [283].

Exhibit 1: Pathophysiologic Consequences of Unrelieved Pain [137-142]

Immune system	Decreased natural killer cell number, function and activity. Can lead to death.
Pulmonary system	Reflex muscle spasm leads to splinting which decreases pulmonary vital capacity, functional residual capacity, alveolar ventilation. Leads to atelectasis, which often is followed by pneumonia and hypoxemia.
GI system	Increased sympathetic activity, which increases GI secretions and smooth muscle sphincter tone decreases intestinal motility. Leads to gastric stasis and paralytic ileus.
CVS	Sympathetic over activity which increases heart rate (decreased O2 to heart), peripheral resistance, BP, cardiac output, and O2 use. Leads to hypoxemia and ischemia, especially of the heart and peripheral tissues.
Musculoskeletal system	Segmental and supra segmental reflexes with increased muscle spasm leads to impaired muscle metabolism and to muscle atrophy.
Psychologic consequences	Anxiety, fear, depression, distress, and suffering, hopelessness, helplessness and a decreased will to live (wish for assisted suicide or euthanasia).
Neuronal plasticity	Primary and secondary hyperalgesia with enabled NMDA receptors and aberrant communication of neurons in the peripheral and central nervous system.

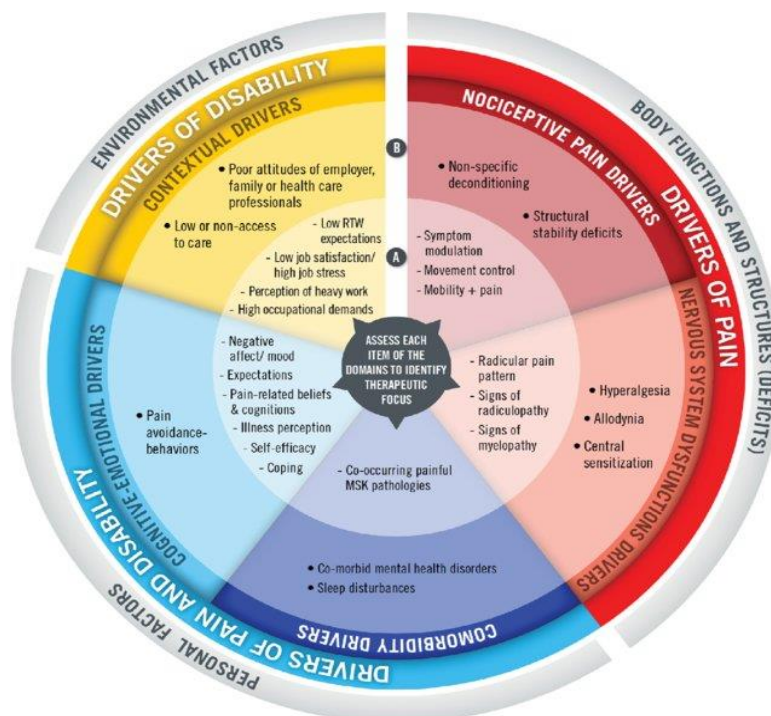


Figure 3: Pain and disability driver management model

(A) refers to more common and/or modifiable elements; (B) refers to elements that are more complex and less modifiable, and that will prompt more aggressive or require interdisciplinary care to effectively address the problematic domain. Abbreviations: RTW, return to work; MSK, musculoskeletal. Patients present with certain physical and/or mental health comorbidities that can influence other domains driving symptom severity and disability. Musculoskeletal conditions such as low back pain, joint pain, arthritis, and rheumatism are the leading causes of

disability in people during their working years. Notwithstanding its importance as a personal and clinical issue, chronic pain has turned into a sociopolitical and financial issue for open and private disability safety net providers. In spite of the fact that the expenses to debilitated people of their decreased prosperity can't be precisely estimated, disability program consumptions can be evaluated. There are numerous projects and arrangements to serve handicapped specialists. They contrast as far as their qualification criteria, the degree to which the receipt of

advantages is liable to a methods test, the cutoff points on the dimension of market earnings allowed for continuation of benefits, and the degree to which these benefits are taxable (Source: Institute of Medicine (US) Committee on Pain, Disability, and Chronic Illness Behavior; Osterweis M, Kleinman A, Mechanic D, editors. Pain and Disability: Clinical, Behavioral, and Public Policy Perspectives. Washington (DC): National Academies Press (US); 1987. 5, Economic Issues and the Cost of Disability. Available from:

<https://www.ncbi.nlm.nih.gov/books/NBK219239/?report=classic>.

Potential merits and misunderstandings of non-drug techniques

Mild -to-moderate pain may be relieved by

non-drug techniques alone. Moderate- to-severe pain may require medication in addition to nondrug techniques [4], [11]. Advantages to nondrug interventions are:

- Low cost and low risk of side effects,
- Decrease in a patient’s unhelpful emotional reactions (such as anxiety, depression, aggressive behavior)
- Increase in a patient’s sense of personal control and hope,
- Better sleep and improved interpersonal relationships.
- Increase the individual control feeling and decrease the feeling of weakness.
- Improves the activity level and functional capacity.
- Reduces the pain behavior and focused pain level.
- Reduces the needed dosage of analgesic drug s thus decreasing the side effects of the treatment [4], [13], [15].

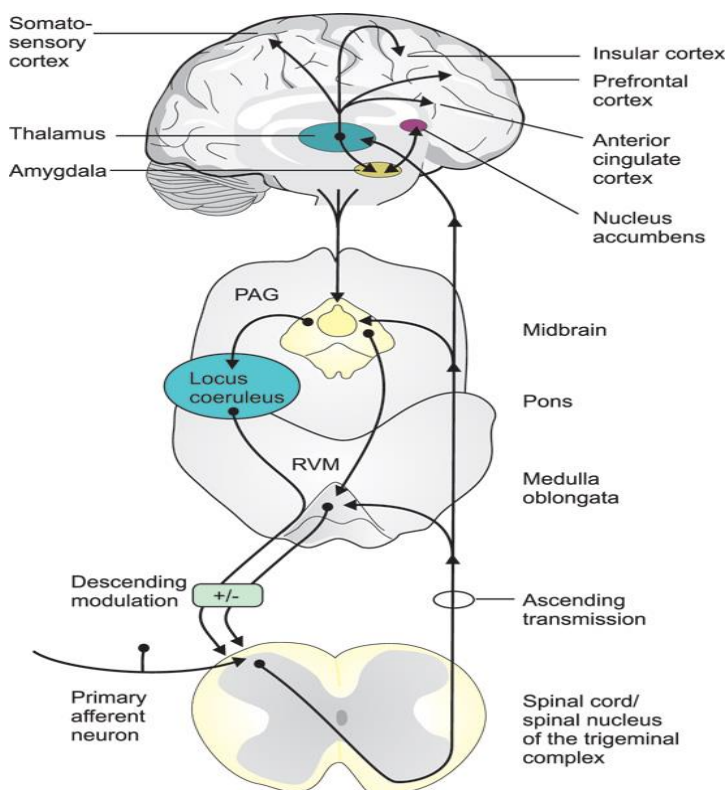


Figure 4: Pathways and brain regions involved in the transmission and modulation of pain signals

Essential afferent neurons, with their cell bodies in the dorsal root ganglia, or trigeminal ganglion (mouth and face), couple over to auxiliary neurons in the dorsal horn of the spinal line, or the spinal

core of the trigeminal complex. The axons of the second request neurons cross the midline and task to the thalamus and an assortment of different focuses in the medulla oblongata, pons and mid mind,

including the rostral ventral medulla (RVM) and the periaqueductal grey (PAG). Third order neurons, with their cell bodies in the thalamus, undertake to the somatosensory cortex, in charge of the tactile discriminative viewpoints (intensity, location and quality) of pain, and to limbic cortical regions, for example, the front cingulate, insula, and the prefrontal cortex engaged with the intercession of the full of feeling/emotional segments (aversiveness) of pain. Thalamic neurons additionally venture to the amygdala, which thus interfaces with the core component, a locale associated with both pain preparing and the intercession of remuneration inspirational conduct. These various brain regions also give input to the PAG, which via the raphe nuclei in the RVM, and to the locus coeruleus, send descending pain modulatory projections back to the first synapses in the afferent pathways (Source: Brodin E, Ernberg M, Olgart L. Neurobiology: General considerations -

from acute to chronic pain. Nor Tannlegeföreling Tid. 2016; 126: 28-33) While, potential demerits include not as well researched (a technique that works well for one person may not work well for another) [12]. Misunderstandings may keep patients and staff from trying the techniques but truth is: some patients may find the techniques burdensome or stressful, advanced techniques require special training (music and art therapy, therapeutic massage) [14]; non-drug techniques can decrease pain intensity and can decrease awareness of pain to enable better coping some have been proven to work; others are less well studied [15]. moderate- to-severe pain typically requires a combination of medication and non-drug therapy; hot and cold can work when applied to the opposite side of the body, or at a different site [16], enabling these techniques to be used when radiation therapy or open wounds prohibit use at the site of pain distraction can decrease pain and increase ability to cope; successful distraction does not mean pain is not real [17].



Figure 5: The fear-avoidance model

Psychological variables assume a noteworthy job in both intense and chronic back pain, and in the change from intense to chronic pain. Psychosocial factors have in reality been found to have a more noteworthy effect than biomedical or biomechanical factors on back pain disability. Patients with a dread of the long-term outcomes of medical procedure are likewise at expanded danger of long haul pain and poor recuperation.

Instructing patients and their carers about pain empowers an increasingly inspirational demeanor to pain relief5 and where conceivable we should endeavor to include patients in their pain the board technique. Data can give consolation that the sensations experienced after a system are typical and non-undermining. For instance, following an absolute knee substitution, patients are urged to prepare inside long stretches of medical procedure.

This might be awkward; however, it is imperative that patients are consoled that pain does not equivalent harm, that it is ordinary to encounter some uneasiness and it doesn't imply that they are endangering their task or that something isn't right. Through dynamic inclusion patients build up a more prominent feeling of self-adequacy in regards to treatment and ailment related practices and might be bound to finish on the practitioner's choices came to. Patients who react inactively to pain show more noteworthy distress and disability contrasted with the individuals who endeavor with tackle the issue. Assuming some responsibility for the reason for pain or the technique for absence of pain has a valuable impact. Social connections can likewise impact pain announcing and disability. The outflows of pain are fortified by the accomplice who acts to ease the patient's conduct action, and this is reflected in the expanded dimension of pain (Source: Reddi D, Curran N Chronic pain after surgery: pathophysiology, risk factors and prevention Postgraduate Medical Journal 2014;90:222-227).

Non-Drug Options of Pain management

Unfortunately, non-pharmacological therapy is seldom used for acute postoperative pain relief, although it is beneficial and devoid of any significant adverse effects. No pharmacologic therapies have demonstrated benefit for acute pain with opioid sparing in hospital settings for inpatient post-operative pain and for acute pain not related to surgery [1,2]. Non-pharmacological pain management is the management of pain without medications [3]. Non-pharmacological methods used in pain management can be classified in different ways. In general; they are stated as physical, cognitive, behavioral and other complementary methods or as invasive or -non-invasive methods. This method utilizes ways to alter thoughts and focus concentration to better manage and reduce pain. Methods of non-pharmacological pain include:

- Education and psychological conditioning
- Hypnosis
- Comfort therapy
- Physical and occupational therapy
- Psychosocial therapy/counseling
- Neurostimulation
- Biofeedback techniques
- Electrical stimulation
- Meditation [1-10], [13]

Exhibit 2: Selected Pain Terminology [47], [49]

Pain--An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

Pain from pathogenic/biological origin-- osteoarthritis (OA), rheumatoid arthritis (RA), systemic inflammatory rheumatic diseases, connective tissue diseases, post-herpetic neuralgia, and peripheral neuropathy, which are typically diagnosed via objective biologic or inflammatory markers, radiologic evidence or other identifiable tissue damage.

Pain from idiopathic origin, which often rely on subjective patient report, include complex regional pain syndrome (CRPS), fibromyalgia (FM), chronic widespread pain (CWP), subsets of chronic low back pain (LBP), and chronic pelvic pain (CPP).

Nociceptive pain—pain that arises from actual or threatened damage to nonneural tissue and is due to the activation of nociceptors (high threshold sensory receptors of the peripheral somatosensory nervous system that can transduce and encode noxious stimuli). This term, designed to contrast with neuropathic pain, is used to describe pain occurring with a normally functioning somatosensory nervous system as opposed to the abnormal function seen in neuropathic pain.

Inflammatory pain—pain in the presence of inflammation that is increased by pressure.

Dysfunctional pain—maladaptive pain, typically triggered without an external stimulus, which does not serve a known protective function (e.g., pain associated with fibromyalgia, irritable bowel syndrome, and some types of headache).

Neuropathic pain—pain caused by a lesion or disease of the somatosensory nervous system. Neuropathic pain is a clinical description (and not a diagnosis) that requires a demonstrable lesion or a disease that satisfies established neurological diagnostic criteria.

Clearly, public and private insurers have not yet widely adopted payor policies that are consistent with the ACP guideline, National Pain Strategy, and reported patient preference. Specifically, most health plans surveyed did not have policies in place that (1) emphasize the use of no pharmacological treatments at the forefront of the patient experience; (2)

provide meaningful levels of coverage for care professionals who focus on guideline-adherent nondrug therapies such as spinal manipulation, exercise, massage, acupuncture, and cognitive behavioral therapy; or (3) use financial incentives that favor the use of no pharmacologic options over commonly prescribed pharmaceuticals, including opioids [275].

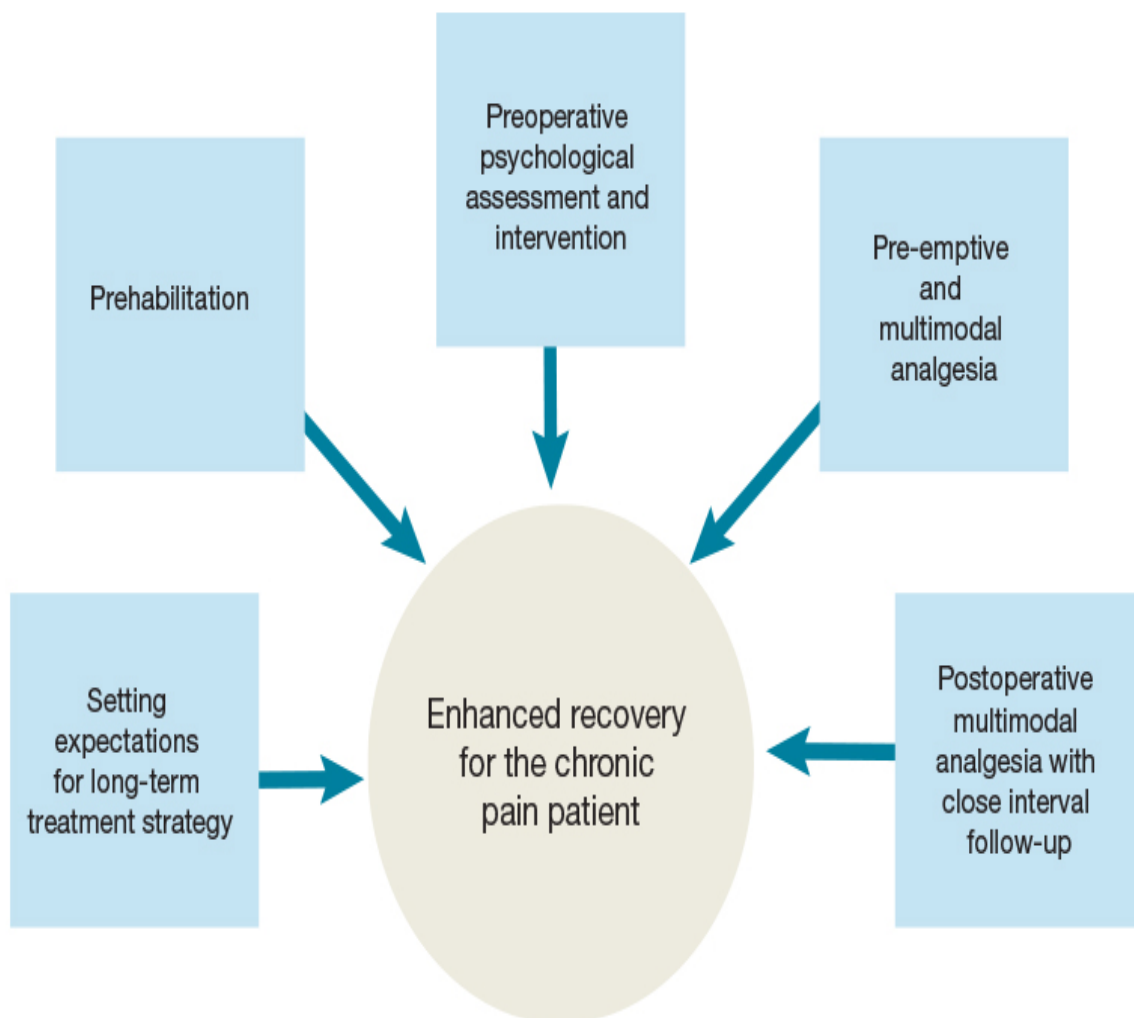


Figure 6: *Enhanced recovery for the chronic pain patients*

Strategies implemented preoperatively optimize the patient for surgery. Intraoperative and postoperative intercessions proceed a multimodal way to deal with pain the board. Preoperative advising for elective systems for the most part happens in the outpatient setting.

Despite the fact that talk customarily has secured the sort of system and its related dangers, advantages, and options, new rules propose an increasingly careful and extensive methodology is justified. Individualized patient-focused training programs positively affect the perioperative

course, affecting decreases in preoperative anxiety, narcotic prerequisites, and medical clinic length of remain. Prehabilitation is the way toward expanding practical limit before medical procedure so as to moderate the stress of the medical procedure.

Prehabilitation may include oxygen consuming activity, quality preparing, or useful assignment preparing [Source: Moulder JK, Johnson KP. Enhanced recovery after surgery for the patient with chronic pain. OBG Manag. 2018 March; 30(3)]

Exhibit 3: Cognitive–emotional drivers [278]

Categories	Operational definition and elements
Maladaptive cognition	Cognitive–emotional drivers include maladaptive cognitive strategies toward pain (ie, pain coping, pain catastrophizing), pain-related fears (ie, pain-related anxiety and fear, fear of movement), negative perception of pain/disability and expectations toward pain (ie, illness perception, pain self-efficacy), as well as negative mood (which is distinct from clinical depression). According to the fear-avoidance model, when maladaptive cognitive drivers are not addressed and if pain/disability persists, factors such as catastrophizing, illness perceptions, negative emotions, and pain-related fears may lead to the development of maladaptive behaviors (eg, activity avoidance), which, in turn, may contribute to the maintenance of pain-related disability.
Maladaptive behaviors	Maladaptive behaviors can be manifested in various ways. For example, they may include “communicative” pain behaviors such as facial expressions (eg, grimacing or wincing) or verbal/paraverbal pain expressions (eg, pain words, grunts, sighs, and moans). They may also include “protective” or “safety” behaviors such as guarding of the back straight while lifting or bending/rubbing the back after performing an activity, strongly bracing before doing a functional task, or even completely avoiding performing a task. In addition to avoidance, displays of “protective/safety” behaviors (eg, guarding, holding, or rubbing the back) or communicative pain behaviors (eg, grimaces) have also been associated with heightened levels of perceived functional disability. Maladaptive behaviors are known to be strongly influenced by cognitive–emotional factors; their presence suggests that cognitive–emotional drivers of pain must be assessed and addressed through behavioral or cognitive-behavioral treatment interventions.
They are clearly linked to enhanced pain perception, are predictors of long-term disability, and can explain the presence of persistent painful symptoms. As personal factors of an individual, the fourth domain relates to cognitive–emotional drivers, as “maladaptive cognition” (category A) and “maladaptive behaviors” (category B) will undeniably influence the treatment approach.	

Education and psychological conditioning

High levels of pain, significant anxiety, or depressive symptoms before surgery put patients at elevated risk for chronic pain and prolonged opioid use following surgery [37]. Preoperative depression has been connected to an assortment of unfavorable results following lumbar combination, including expanded pain, disability, and 30-day readmission rates. The relationship among depression and narcotic utilize following lumbar combination is progressively applicable given the plague of narcotic maltreatment clearing the nation as of late [38]. It has been evaluated that 12.5% of men and

5.2% of ladies who matured 74– 84 years had AAA. Moreover, proof has uncovered that around 11,000 deaths were ascribed to AAA every year in the United States. More than one-fourth of patients planned for AAA fix may have preoperative anxiety or depression [39]. Current psychological ways to deal with the administration of chronic pain incorporate intercessions that expect to accomplish expanded self-administration, social change, and intellectual change instead of straightforwardly wipe out the locus of pain. As such, they target the frequently overlooked behavioral, emotional, and cognitive components of chronic pain and factors contributing to its maintenance [18].



Figure 7: Pre- and Post-Operative Education and Psychological Conditioning

Individualized education is important for preparing patients for the operation both physically and psychologically. Surgeries cause emotional, cognitive and physiological reactions in patients. Patients undergoing surgical intervention usually experience worries over outcomes such as becoming permanently disabled, loss of control over their body, loss of working ability, pain, loss of sexual ability, inability to wake up from anesthesia, and fear of death. Due to fear and anxiety, majority of patients have difficulty in coping with the operation process. Not having information about

the diagnosis and treatment methods, patients may experience anxiety, including depression, in the pre-operation period. Studies report that with individualized care and education, patients' anxiety decreases and their satisfaction increases. The individualized education is given to patients before surgery was found to have potential effects on their post-operative pain levels (Source: Ertürk EB, Ünlü H. Effects of pre-operative individualized education on anxiety and pain severity in patients following open-heart surgery. *Int J Health Sci (Qassim)*. 2018;12(4):26-34.).

Table 1: Psychological interventions in the management of patients with chronic pain

Approaches	Description
Psychophysiological techniques	Biofeedback is a learning technique through which patients learn to interpret feedback (in the form of physiological data) regarding certain physiological functions. For example, a biofeedback device may show measurements of muscle tension. Biofeedback may help to control pain, including chronic headaches and back pain [18,19].
Behavioral approaches (Relaxation Training) It can help reduce muscle tension and stress, lower blood pressure, and control pain [19].	Diaphragmatic breathing is a basic relaxation technique lowering the harmful effects of the stress hormone cortisol, HR, BP and chances of injuring or wearing out muscles. It helps to cope with the symptoms of PTSD. It improves core muscle stability, body's ability to tolerate intense exercise [20]. PMR is a systematic technique used to achieve a deep state of relaxation and has been shown to improve health-related QOL in a variety of medical and psychiatric illnesses. It is an effective and widely used strategy for stress relief that creates a state of deep relaxation by involving alternate tensing and relaxing of muscles [21,22]. Autogenic training (AT) combines passive concentration, visualization and deep breathing techniques, likely to produce specific cognitive effects such as reducing anxiety and enhancing positive mood. The emphasis is to not to control these natural healing systems, but rather to use their intrinsic potentials more fully. Autogenic training is the preferred mode of arousal regulation in many European countries [23-25]. Visualization/Guided imagery is one component of CBT that frequently is used and found effective in fibromyalgia. Imagery has been defined as a dynamic, psycho-physiological process in which a person imagines, and experiences, an internal reality in the absence of external stimuli. The guided imagery audio is

	<p>accompanied by soft background music and directs the visualization and imagination to a pleasant and peaceful place that has meaning for the participant to replace negative or stressful feelings [26, 27].</p> <p>FAM of chronic pain is a heuristic most frequently applied in the context of non-operative populations like chronic LBP. The FAM is a psychosocial model that seeks to understand the role of cognitive, behavioral, physical, and emotional factors in persistence of pain and disability. FAM measures have moderate relationships with preoperative pain and disability. Preoperative depression and work-related fear-avoidance beliefs were able to significantly explain the 10-week clinical outcome variances (leg pain, back pain, and disability) [28, 29].</p>
Cognitive-behavioral approaches	<p>CBT interventions are delivered within a supportive and empathetic environment that strives to understand the patient’s pain from a bio psychosocial perspective and in an integrated manner, most common psychologic intervention for individuals with chronic pain. CBT is generally based on the “ABC” model and aims at changing dysfunctional thoughts, emotions, and behaviors. Additionally, CBT has been reported to improve quality of life and activities of daily living, chronic headache, facial pain, arthralgia, and fibromyalgia. Behavior modification strategies to effectively reduce pain and fatigue, and improve sleep, overall physical function and coping CBT focuses on reducing pain and distress by modifying physical sensations, catastrophic thinking, and maladaptive behaviors. Combining CBT approaches for pain and for sleep may produce greater improvements in pain and sleep outcomes compared to either approach in isolation. Women benefit more from multimodal pain therapy including CBT-oriented group program than men. CBT had similar effects with fusion spine fusion surgery, but at 12 months the CBT group showed less fear avoidance [18], [30-35].</p>
Acceptance-based approaches	<p>Acceptance and commitment therapy (ACT) are the most common of the acceptance-based psychotherapies. ACT is a relatively newer psychological intervention being implemented in the chronic pain health care setting. ACT is based on behavioral principles and the psychological flexibility model, and unlike CBT, it does not emphasize the restructuring of distorted or catastrophic cognitions. The goal within ACT is to reduce the dominance of pain in person’s life through increased psychological flexibility. Unlike other approaches, ACT does not focus on symptom reduction – even though this can happen in ACT – but on making patients’ responses toward symptoms more successful in relation to their own goals. When used as an adjunctive therapy in pain management, ACT fosters the possibility of improved pain acceptance, which can have important implications for adaptive recovery in postsurgical patients [18], [33], [36].</p>

Pain lasting longer than the normal healing process after surgery is an unwanted adverse event in any operation. CPSP can represent a severe nuisance to patients, leading to functional limitation and psychological trauma, as well as a problem for the operative team in the form of feelings of frustration and disappointment. Studies have reported incidences ranging from 50%–85% following limb amputation, 11%–57% following mastectomy, 30%–55% after cardiac surgery, 5%–65% after thoracotomy, and 5%–63% following hernia repair. One reason for this variability is the difference in the time reference considered by each researcher for labeling pain as CPSP (varying from 2 months to 1 year

postoperatively). More than a half of CPSP patients have neuropathic pain, the remainder having nociceptive (somatic or visceral) pain. A patient may have different components of pain, and these must be identified for effective management. During the preoperative and early postoperative period, it is very important to provide patient education and counselling about the chances of developing CPSP [40]. Multidisciplinary pain-management programs with psychological approaches, including CBT and mindfulness-based psychotherapy, have shown efficacy as treatments for chronic pain, and show promise as timely interventions in the pre/perioperative periods for the management of PSP [33].

Exhibit 4: Evolution of behavioral psychotherapeutic approaches [31]

	Behavioral psychotherapy type	Theoretical background
First wave	Behavioral therapy	Behavior analysis takes into consideration every behavior, including overt and covert. The therapist focuses on specific learned behaviors and how the environment influences such behaviors.
Second wave	Cognitive behavioral therapy	CBT focuses on the development of individual strategies aimed to solve current problems and to change unhelpful patterns in cognitions (i.e., thoughts and beliefs), behaviors, and emotional regulation.
Third wave	Acceptance and commitment therapy Dialectical behavioral therapy Integrative behavioral couples' therapy Behavioral activation Cognitive behavioral analysis	Third wave therapies prioritize the holistic promotion of health and well-being and are less focused on reducing psychological and emotional symptoms. These therapies abandon key assumptions associated with traditional cognitive therapy and is informed by emerging research in cognitive psychology and neuroscience. Concepts such as metacognition, acceptance, mindfulness, personal values, and spirituality are frequently incorporated into what might otherwise be considered traditional behavioral interventions.

Comfort Therapy

Complementary therapies can increase comfort, decrease pain, promote relaxation and increase the quality of life for hospice patients and their families. Therapies can be used individually or in combination. All therapies are individually tailored for each patient to offer unique benefits [41]. Comfort therapy can help improve the quality of life by alleviating symptoms of pain and providing relaxation and comfort. Response to treatment or therapy is individual and that what works for some might not be as effective for others [42]. Studies suggest that CAT enhance quality of care for patients nearing the end of life. Some types of CAT are associated with a lessening of symptoms, including anxiety and pain, and improvements in mood and sense of control [43]. Comfort therapy may involve the following:

Companionship Patients with chronic pain from a non-supportive family tended to show more pain behaviors and more emotional distress compared with pain patients coming from supportive families [44]. Due to inadequate knowledge and skill, family caregivers may be unfamiliar with the type of care they must provide or the amount of care needed [45]. According to the Operant Conditioning Model of

Chronic Pain, both verbal and non-verbal forms of communication are used to convey patients' desire for support, attention and intimacy, and to elicit empathic responses from others. In turn, affected patients' communication may be maintained by social reinforcement (e.g. the sympathetic response of significant others) [46]. WHO recommend intervention to improve labor outcomes and satisfaction. Companion of choice at birth increases the likelihood of vaginal births, therefore reduces the need for caesarean sections and the use of forceps or vacuum during vaginal births. In addition, it reduces the need to use pain medications during labor, it shortens the duration of labor and improves women's satisfaction with care. It also improves Apgar scores (a measure of the physical condition of a newborn infant) of the newborns [49].

Moderate Exercise (Walk and Stretch)

Physical activity is a well-documented, viable therapeutic modality for chronic pain conditions with beneficial effects on pain, sleep, cognitive function and physical function. Alternatively, self-directed physical activity can be inexpensive, requiring minimal resources such as walking around one's

neighborhood and home-based programs. Quite uniformly, low to moderate intensity exercise defined as 50-60% of maximum heart rate (maxHR) tends to improve chronic pain symptoms [31], [52]. Exercise is effective for the management of chronic low back pain for up to 1 year after treatment and for fibromyalgia syndrome for up to 6 months [50]. An 8-week moderate intensity aerobic exercise intervention at 40%–60% of heart rate reserve combined with conventional physiotherapy, significantly reduced NSCLBP by 47% [54]. Muscle soreness that sometimes occurs with starting a new exercise subsided as the participants adapted to the new activities [51]. Combined training, which included aerobic and resistance exercises for eight months, succeeded in decreasing pain from breast cancer [53]. Numerous helpful projects proposed for painful conditions comprise of non-intrusive treatment programs with preparation, and about 70% of outpatients and inpatients are alluded to active recuperation programs for painful conditions (primarily neck and low-back pain, lower-appendage osteoarthritis, sports wounds, all out joint substitution, upper-appendage musculoskeletal clutters, fiery joint inflammation). The exercise and mobilization techniques of physical therapy include aerobic training, specific muscular strength exercises, active and passive mobilization, and proprioceptive techniques [54]. Prevalence of knee OA increases with age, ranging from 3% among those aged 45–54 years old to 44% in those at least 80 years old. These prevalence estimates are expected to increase as the US population continues to age and obesity rates rise. Therapeutic exercise is often recommended as a first-line conservative treatment for knee OA [55].

Heat/cold application: Superficial heating and cooling of tissues to provide pain relief in low to moderate levels of acute and chronic pain in adults [56].

Naturopathic non-intrusive treatment altogether improves foot usefulness and pain scores in impact point pain. Also, rotating packs improve foot usefulness scores [57]. RCTs have demonstrated that heat-wrap treatment gives transient decreases in pain and disability in patients with intense low back pain and gives fundamentally more prominent pain alleviation of DOMS than does cold treatment [58]. Cryotherapy (the utilization of extraordinary cold in medical procedure or other restorative treatment) and thermotherapy as remedial strategies in the patients with intense and chronic low back pain equally affected assuaging the pain dependent on evaluative and distinct measures [59]. Utilization of virus advances alleviation of pricking pain sensation and concealment of autonomic reactions, and that use of warmth has no such impact [50]. In the United States, 75 % of patients with low back pain are treated with warming treatment and 7 % with cooling treatment. cooling treatment diminishes tissue blood stream because of vasoconstriction, and that it additionally lessens tissue digestion, oxygen usage, and irritation. Cooling treatment diminishes the speed of nerve conduction in shallow tissues by moderating the terminating of muscle axle afferents and reflex reactions, accordingly diminishing muscle fits and pain. Use of cooling therapy for musculoskeletal problems can also reduce intake of painkillers because it reduces pain and body fluid penetration [60]. Pain after thoracotomy is probably the most severe pain experienced after surgeries and patients who underwent cardiac surgeries report having most severe pain while coughing and deep breathing. Pain was significantly decreased with the use of cold gel packs [119]. Usually the chest tube removal (CTR) has been described as one of the worst experiences by patients in the intensive care unit. Regarding the relaxation and cold application methods showed relatively equal effects on reducing the pain owing to CTR [120].



Figure 8: Essential oils for aromatherapy

Elective treatments are habitually used to alleviate different indications of patients. They are utilized rather than standard therapeutic medications and elective treatments are particular from correlative drug which is intended to go with, not to supplant, standard restorative practices. Aromatherapy is usually used in combination with massage, can successfully treat pain when combined with conventional treatments. Additionally, the cost associated with aromatherapy is far less than the cost associated with standard pain management treatment (Source: Lakhan SE, Sheaffer H, Tepper D. The Effectiveness of Aromatherapy in Reducing Pain: A Systematic Review and Meta-Analysis. *Pain Res Treat.* 2016; 2016:8158693).

Lotions/massage therapy: Therapeutic massage is a CIM therapy which involved manipulation of the soft tissue of whole-body areas to bring about generalized improvements in health [61, 62]. Reflexology treatment consists of massage of the disordered reflex zones. Massage is mainly used to promote relaxation, treat painful muscular conditions; it can also

foster communication, including decreased stress (and decreased cortisol), improved sleep patterns, and enhanced immune function, [62-64]. The massage group had lower pain and anxiety levels and shorter duration of labor; lower pain than the ultrasound participants and reported greater functional status as measured on the foot and ankle pain assessment; significant improvement was noted for knee arthritis and pelvic (after 8 weeks therapy) pain; immediate reductions in neck pain [65]. Aromatherapy refers to the medicinal or therapeutic use of essential oils absorbed through the skin or olfactory system (although rare phototoxicity and carcinogenicity reported), is used as a part of nursing in many countries including Switzerland, Germany, England, Canada, and America [66-69]. Aromatherapy with orange oil can relieve pain in patients with fractured limbs. A study has shown that edible oil of orange can reduce breast pain caused by premenstrual syndrome [69]. The essential oils rosemary, geranium, lavender, eucalyptus, and chamomile can be safely used by nurses in the clinical setting, if applicable [70].



Figure 9: Ayurveda Massage. (Source: *Healing with Ayurvedic Herbs | Panchakarma Treatment Centre in Croydon London*)

Exhibit 5. Massage Techniques [61]

<p>Effleurage—Gentle stroking along the length of a muscle Petrissage—Pressure applied across the width of a muscle Friction—Deep massage applied by circular motions of the thumbs or fingertips Kneading—Squeezing across the width of a muscle Tapotement—Light slaps or karate chops</p>
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Meditation: Mindfulness meditation was introduced as a clinical intervention for conditions such as chronic pain and anxiety in 1979 [71]. Chronic pain patients increasingly seek treatment through mindfulness meditation, thought to work by refocusing the mind on the present and increasing awareness of one’s external surroundings and inner sensations, allowing the individual to step back and reframe experiences [72]. Meditation-based interventions improve pain symptomology across a wide spectrum of pain-related disorders, including fibromyalgia, migraine, chronic pelvic pain [73]. Meditation, after the four-session intervention, during noxious heat produced a mean 40% reduction in pain intensity and 57% reduction in pain

unpleasantness ratings [74]. A variety of factors are now known to either increase or decrease pain-related brain activation, including: predictive cues, distraction, attention, expectation, beliefs, placebo, hypnosis, stress, anxiety, mood and emotional state [75]. Focused attention (FA), also known Shamatha (from Sanskrit), is associated with maintaining focus on a specific object, often the changing sensation or flow of the breath or an external object [76]. By contrast, open monitoring (OM), or Vipassana (Sanskrit translation), is associated with a non-directed acknowledgement of any sensory, emotional or cognitive event that arises in the mind. Zen meditation is considered to be one form of OM practice [77].

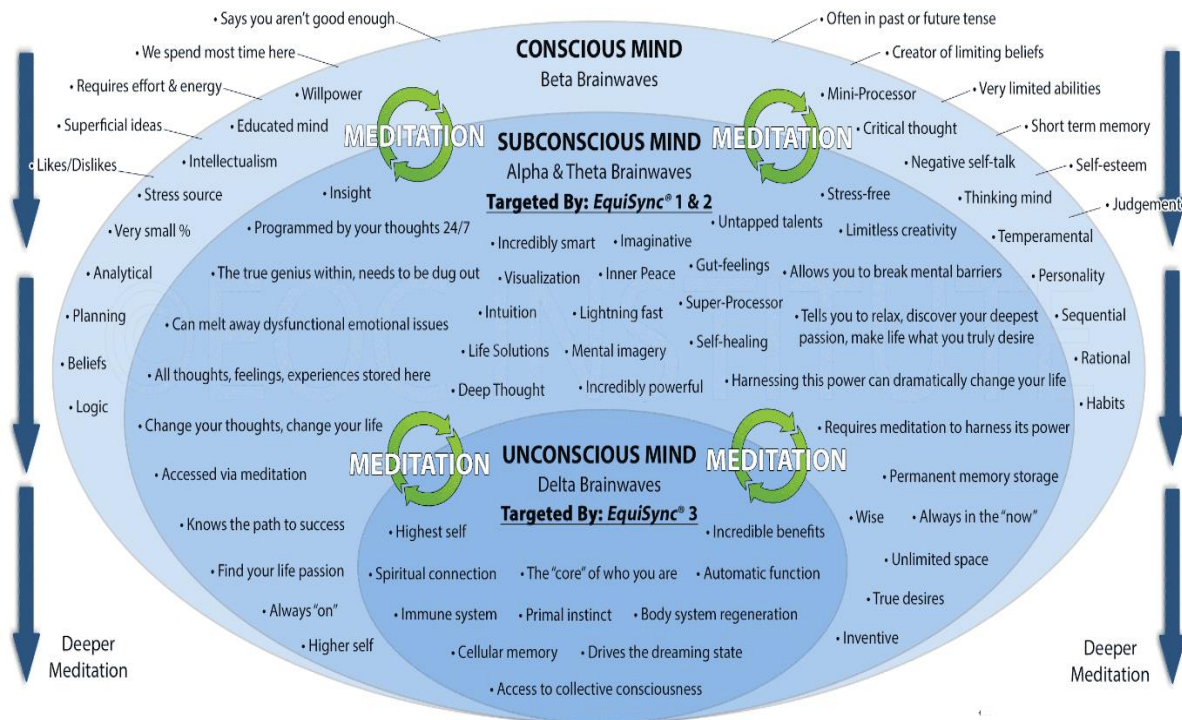


Figure 10: Anatomy of Mind: Meditation gives access to most powerful layers of mind

(Results may vary from person to person). Hypnosis has been pragmatically used for limited therapeutic targets, while Eastern meditation has much wider philosophical and existential implications, aiming for a radical liberation from all illusions, attachments, suffering and pain. The accessible information on the history, phenomenology, and neuropsychology of spellbinding and reflection demonstrate a few basic highlights, for example, the accompanying: (a) acceptance dependent on centered consideration; (b) ability to achieve a purposeful control of both biologic-substantial exercises and cognizant oblivious procedures. The Hypnotic Brain can fill in as an approach to tap neurocognitive inquiries and our intellectual tests can thus reveal new insight into the neural bases of mesmerizing. Discrete reflective styles are probably going to target distinctive neurodynamic designs. Late discoveries accentuate expanded attentional assets enacting the attentional and striking nature systems with rational observation. Cognitive and emotional equanimity gives rise to a eudemonic state, made of calm,

resilience and stability, readiness to express compassion and empathy, a main goal of Buddhist practices. Structural changes in gray matter of key areas of the brain involved in learning processes suggest that these skills can be learned through practice. Hypnosis and Meditation represent two important, historical and influential landmarks of Western and Eastern civilization and culture respectively (Source: De Benedittis G. Neural mechanisms of hypnosis and meditation. *J Physiol Paris*. 2015 Dec; 109(4-6):152-164. doi: 10.1016/j.jphysparis.2015.11.001. Epub 2015 Nov 10. Review. PubMed PMID: 26554845).

Music, art, or drama therapy: Music is one of a number of non-pharmacological methods of relieving chronic pain, along with exercise and cognitive behavioral therapy, that have been found to be effective in RCTs [78]. VMT may be effective in building essential stepping stones for chronic pain management, namely developing: 1) a positive relationship with one's self; 2) enhanced

self-efficacy; 3) motivation and empowerment to take charge of one's pain management; and 4) renewed social engagement [79]. The U sequence is a music therapy technique specifically developed for pain management [80, 81]. A single session of music therapy is effective in significantly reducing cancer pain when used along with standard palliative care in cancer patients with moderate to severe pain, chronic pain and anxiety/depression, by altering affective, cognitive, and sensory processes, music may decrease pain perception by distraction, change in mood, increased control, use of prior skills, and relaxation, reduces opioid requirements, improve QoL [82-89], [91]. Cepeda et al., shows that music therapy was best for short term pain after surgery [86]. Music is expressive; individuals may trigger a variety of

emotions through creating music in groups or individually. Via its ability to modify the affective or cognitive state of the listener, music can be adapted to function as a behavioral intervention for pain [88]. Tolstoy said that music is the shorthand of emotion, and Congreve explained that music has charms to soothe a savage breast [90]. As a treatment adjuvant to reduce chronic pain in FM, and FM-associated sleep disturbances and increase functional mobility thereby reducing the risk of disability. However, effectiveness is higher when combined with aerobic exercise, which brings about further improvements in quality of life and balance [91-93]. Drama therapy made an important contribution to the healthy adjustment of some patients both to hospital life and to acquired disability [94-96].



Figure 11: Music Therapy: Pain Management Part 2 | Michael Tyrrell

In the UK, music specialists are prepared to ace's dimension and are enlisted with Health and Care Professions Council as unified wellbeing experts. Aristotle perceived the natural capacity of tunes to outperform "emotions, for example, pity and dread, or excitement," and in this way "mend and sanitize the spirit." The Greeks distinguished Apollo as the dad of both recuperating and music, nearby his numerous different honors (as God of light, sun, truth, prediction, plague and verse). Two doctors acclaimed for utilizing their melodic capacities to actualize medicinal accomplishments portrayed chest percussion. Working room is a peaceful spot and genuine that there will be any additional clamor to the diversion and meddle with verbal correspondence between individuals. Music is a free method to improve patients stress and pain previously and amid medical procedure. Although there isn't enough evidence in order to draw a net conclusion about the effect of music in operating rooms (Vahed N, Kabiri N, Oskouei MM, Gavgani VZ, Khatooni AA, Sadooghi N. 130: THE EFFECT OF MUSIC IN OPERATING ROOM: A SYSTEMATIC REVIEW. *BMJ Open*. 2017; 7(Suppl 1): bmjopen-2016-015415.130. Published 2017 Feb 8. doi:10.1136/bmjopen-2016-015415.130).

Expressive Writing Intervention (EWI)

Composing expands wellbeing and health in changed ways. people who have expounded on their own horrible encounters show factually noteworthy enhancements in different proportions of physical wellbeing, decreases in visits to doctors, and better safe framework working [96]. Written emotional disclosure in adolescents with recurrent abdominal pain, and anger letter writing in adults with heterogeneous pain may be beneficial. Most disclosures of patients with RA were about the daily stress of the

disease or other publicly known stressors (e.g., divorce, death of loved ones) rather than private or stigmatized stressors, which might have been more powerful to address [97]. Improved physical symptoms and reduced healthcare utilization in people with colorectal, breast, or prostate cancer and reduction in depressive symptoms, trauma-related cognitions and general behavioral problems in children with post-traumatic stress disorder also reported [98]. EWI may have a significantly positive impact on the physical health but not the psychological health in BC patients, but this benefit may not last long [99]. Patients with IBS treated with psychological therapy had not only reduced pain and anxiety but also reduced activity of the cingulate cortex and Para hippocampal gyrus [100]. Positive expressive writing may also be beneficial to those with musculoskeletal pain. Positive writing may be useful to the extent that it increases self-compassion and self-efficacy [146]. EWI is shown to be an effective intervention to improve QoL for Chinese-American breast cancer survivors [147]. A positive effect of expressive disclosure specifically on anxiety and specifically for young adults who were highly emotionally expressive [148]. EWI had a significant impact on reducing risk of eating pathology in female students and distress/depression during ART therapy of infertile women [149,150]. EWI with clinical samples shows potential benefit of written time management for stressed caregivers [151].

PASTOR: The Pain Assessment Screening Tool and Outcomes Registry (PASTOR) is a 20-30-minute survey that produces a comprehensive 3-page clinician report of a patient's chronic pain. PASTOR was developed as a direct result of the PMTF recommendations; it is designed to provide an outcomes registry to improve

evidence-based decision making by health care providers and to facilitate pain research [106]. PASTOR incorporates the DVPRS, pain interference assessment, neuropathic pain scale, headache assessment, and patient-defined activity goals. In addition, PASTOR includes screens for the following conditions: PTSD, anxiety, depression, and alcohol misuse. Additional pain correlates including global health, fatigue, satisfaction with social roles, anger, sleep-related impairment, and physical function are also assessed [101,102,105]. It uses the computerized adaptive learning system of the NIH PROMIS which contains a large, validated databank of patient-reported outcome surveys. PASTOR serves two major purposes: first, it collects actionable information that can be used by clinicians to assess response to treatment and to guide pain management; and second, when aggregated from large numbers of respondents, it can identify best clinical practices [104,105,108]. PROMIS Pain Interference (PI) scores was a superior tool to gauge a patient's preoperative level of pain and functional ability compared to NPRS in foot and ankle patients [106].

Pet Therapy: Pets provide companionship, unconditional love, and joy. For those with chronic pain, pets can give their owners even more [109]. According to the Delta Society (Non-profit), pets decrease feelings of depression, loneliness, and isolation. Pets may also be able to do your heart some good — they are credited with lowering blood pressure and cholesterol [110]. The American Veterinary Medical Association classifies therapeutic animal assisted interventions (AAI) into three categories: animal assisted activities (AAA) that utilize companion animals; animal assisted

therapy (AAT) that utilizes therapy animals and service animal programs (SAP) that utilize service animals [115]. Therapy dog visits in an outpatient setting can provide significant reduction in pain and emotional distress for chronic pain patients [111]. Reductions in measures of cardiovascular stress, improvements in neurophysiological stress markers (e.g., cortisol), increases in endorphins, and enhancement of immune factors is also reported. An average 12 minutes exposure to a therapy dog reduces anxiety in 34% of fibromyalgia patients, together with reductions in pain and improvements in mood [112]. Patients with major joint replacement exposed to dog therapy required less pain medication than controls [113]. The ED simultaneously represents an environment that has great need for the potential benefits of animal assisted therapy, but also presents unique challenges to its implementation. In one ED, 93% of all patients indicated desire to see a therapy dog [114]. Therapy dogs offer a novel and useful complementary therapy for children undergoing surgical procedures [115]. AAA has the potential to benefit children with cancer because pediatric oncology patients often suffer from distress due to physical examinations, venipuncture, chemotherapy infusions, spinal taps, surgery, hospitalization, pain, fear of medical procedures, unpleasant physical symptoms, uncertainty, and worry about death [116]. Patients with brain tumors face serious and unique challenges with neurologic and neuropsychological problems that are specific to the location of the tumor and just not the systemic symptoms of the cancer [116,117]. Pet therapy significantly increases patients' overall feeling of wellbeing and reduces anxiety about future uncertainty [118].



Figure 12: Hospitalized kid on animal visit

Understanding whether AAA is safe and effective for pediatric cancer patients is critical, especially because of concern about infection in immunosuppressed persons. Conducting AAA research in pediatric oncology requires understanding current regulations and variations in practice. Knowledge of regulations helps us understand elements required for intervention protocols (e.g., hand-cleaning), whereas knowledge of practice variation can help us identify research opportunities (Source: Chubak J. Therapy-dog visits for kids with cancer: A safe way to induce smiles? Web Kaiser Permanente Washington Health Research Institute July 6, 2017.

Positioning: Simply assisting a patient to change position in the bed or chair or while ambulating can improve comfort. Also, fitting body arrangement and backing of limits can improve quiet solace and viewpoint. Keeping things inside reach additionally makes a patient increasingly agreeable. Back pain is soothed by a few positions. The first is to put the head and trunk at 20° to 30° point. Wedge cushions are utilized to achieve this. At that point place a couple of pads under the knees, in the event that it is an emergency clinic bed, this is done effectively without pads. Moving the arms and legs while keeping the storage compartment still can exacerbate side effects. For instance, lifting a leg up while

lying on the back would in general reason protests of back and leg pain. A few patients additionally had expanded back pain when lying face down and twisting the knee or handing the hip over or out. The patient can more often than not do it without anyone else's help utilizing the bed controls. Weight decrease happened in the sacral area with the pad and wedge frameworks brought about expanded weights in the back sidelong areas of the hindquarters and thighs. When utilizing off-stacking gadgets, thought ought to be given to all components, including tissue interface weights on the sacrum, expanded weights on other body areas, and the probability that these expanded weights will result in tissue harm. The pain is more terrible while changing positions or when hacking or wheezing in low back pain. Guaranteeing that the over-bed table, the phone, the attendant call catch, and the PCA control catch are all inside a patient's achieve diminishes rehash requests from the patient, yet in addition diminishes tolerant anxiety. Coming up next are purposes behind changing a patient's position:

- To promote comfort and relaxation.
- To promote good circulation.
- To improve lung function.
- To relieve pressure on skin and prevent skin breakdown (pressure sores)
- To prevent loss of muscle tone
- To prevent atrophy and contractures
- To prevent edema (swelling) [121-127]

Exhibit 6: Differential Diagnosis of Low Back Pain [127]

Mechanical Low Back Pain	Nonmechanical Spine Disease	Visceral Disease
Lumbar strain or sprain [†] Degenerative disease Disks (spondylosis) Facet joints [‡] Diffuse idiopathic skeletal hyperostosis [‡]	Neoplasia Metastatic carcinoma Multiple myeloma Lymphoma and leukemia Spinal cord tumors Retroperitoneal tumors	Pelvic organs Prostatitis Endometriosis Chronic pelvic inflammatory disease
Spondylolysis [§] §	Infection Osteomyelitis Septic discitis Paraspinal or epidural abscess Endocarditis	Renal disease Nephrolithiasis Pyelonephritis Perinephric abscess
Spondylolisthesis [¶]		Vascular disease Abdominal aortic aneurysm Aortoiliac disease
Herniated disk		
Spinal stenosis		
Osteoporosis with compression fracture		
Fractures	Inflammatory arthritis Ankylosing spondylitis Reiter's syndrome Psoriatic spondylitis Inflammatory bowel disease Polymyalgia rheumatica	Gastrointestinal disease Pancreatitis Cholecystitis Perforated bowel
Congenital disease Severe kyphosis Severe scoliosis		
Paget's disease		

[†]A variety of terms are used to refer to muscle or ligament strains or sprains of the low back including lumbago, facet joint syndrome, sacroiliac syndromes, segmental or somatic dysfunction, fibromyalgia, and myofascial syndrome.
[‡]The relationship between symptoms and objective findings for these conditions is not clearly established.
[§]Spondylolysis is a defect in the pars interarticularis without vertebral slippage.
[¶]Spondylolisthesis is anterior displacement of one vertebra, typically L5, over the one beneath it.

Hypnosis

The vast majority of the trance intercessions for chronic pain incorporate guidelines in self-spellbinding. Spellbinding intercessions reliably produce noteworthy reductions in pain related with an assortment of chronic-pain issues. Likewise, entrancing was commonly observed to

be more viable than no hypnotic mediations, for example, consideration, active recuperation, and training [129]. Therapeutic employments of entrancing in dermatology incorporates diminishing distress from tingling or skin pain, adjusting instilled dysfunctional propensities, for example, scratching and so on [130].



Figure 13: Use of Hypnosis in the Treatment of Pain

There are three components in entrancing; retention, separation, and suggestibility. Retention is submerging profoundly into observation, creative ability, or a dynamic ordeal. The individuals who tend to effortlessly encounter assimilation are more hypnotizable than individuals with no experience. Separation is the isolating of the components of the psyche and conduct, for instance while reviewing a self-portraying memory, it is like the condition of imagining where the subject is both the onlooker, just as the principle character, at the same time. There could be a conduct in the condition of obviousness, or an affair of impression of the other body parts isolated to different pieces of the body. Suggestibility is that the subject effectively complies with the advisor's bearings amid mesmerizing. Be that as it may, this does not imply that the subject has totally lost his or her volition. Rather, as the subject is immersed in a state of hypnosis, the subject's judgment is reserved for a short time (Source: Lee JS, Pyun YD. Use of hypnosis in the treatment of pain. Korean J Pain. 2012; 25(2):75-80).

The cerebrum regions that are initiated when pain is experienced are the thalamus, essential somatosensory cortex (SI), auxiliary somatosensory cortex (SII), insula, forebrain (eg. prefrontal cortex), amygdale, and front cingulated cortex (ACC) [131-133]. These cerebrum zones are known as the neuromatrix. ACC is in

charge of the feelings (initiated amid adoration, love and eminently feeling) [131, 134]. Amid mesmerizing, when a disagreeableness because of pain is recommended to increment or reduction, the obnoxiousness changed in agreement to the recommendations, and the ACC action likewise changed as needs be [131,134-136]. Be that as it may, there were no adjustments in pain force and cerebrum movement including SI and SII [131]. The potential advantages of joining pain training (PE) with clinical spellbinding (CH) in the main preliminary appearing extra utilization of trance with PE results in improved results over PE alone in patients with chronic nonspecific low back pain [143]. Trance has been utilized in ophthalmic medical procedure for a long time, and a few instances of fruitful mesmerizing application have been accounted for. Easing of pain, particularly for patients who experienced clear pain amid the main eye medical procedure additionally detailed [144]. Patients with serious chronic ailments and propelled malignant growth accepting palliative consideration, have a mind boggling scope of pain and anxiety that can emerge right off the bat over the span of disease. Clinical entrancing can be viewed as a compelling adjuvant treatment for pain and anxiety control in malignancy just as in serious chronic ailments for patients accepting palliative consideration [145].

Studies show hypnosis reroutes brain signals. Hypnotized people who are told that their left hand is paralyzed show brain patterns (yellow) that differ from those who aren't hypnotized (red) and from those who aren't hypnotized but are told to pretend their left hand is paralyzed (green).

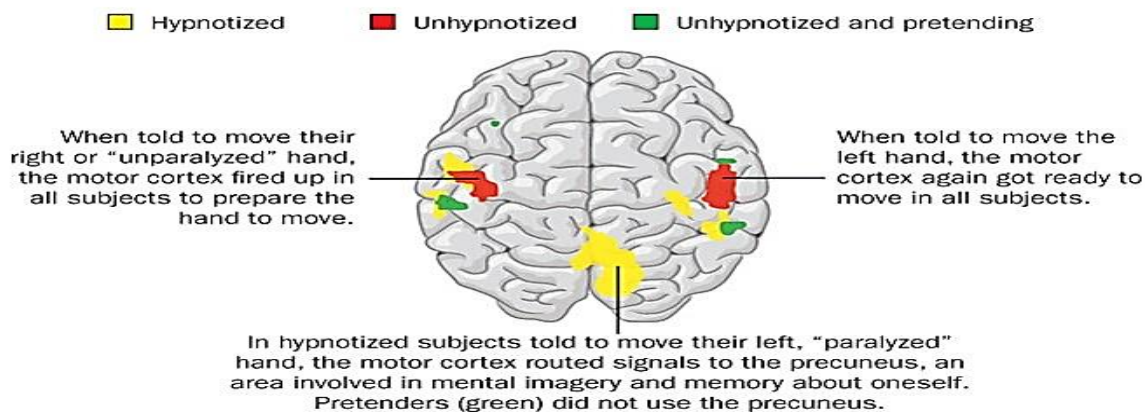


Figure 14: Changes in Different Areas in Brain after Hypnosis

Three general conclusions can be drawn from this body of work. First, hypnosis and hypnotic analgesia suggestions have been shown to affect virtually all of the neurophysiological processes that underlie the experience of pain, from those in the periphery to those in the spinothalamic tract and numerous cortical areas. Second, the specific effects of hypnosis on brain activity depend on the wording of the hypnotic suggestions. Last, although people can respond to suggestions for pain relief without a hypnotic induction, the efficacy of analgesia suggestions is

enhanced when they are preceded by this step. This latter finding might be related to neurophysiological changes that occur with a hypnotic induction, which are thought to reduce overall monitoring and executive functioning activities (Source: 136. Jensen MP, Day MA, Miró J. Neuromodulatory treatments for chronic pain: efficacy and mechanisms. *Nat Rev Neurol.* 2014 Mar; 10(3):167-78. doi: 10.1038/nrneuro.2014.12. Epub 2014 Feb 18. Review. PubMed PMID: 24535464; PubMed Central PMCID: PMC5652321).

Exhibit 7: Counseling Points for the Patient with Neuropathic Pain [152]

A combination of treatment strategies is essential to achieve some degree of relief from chronic pain because the pain is the result of multiple causes.

Understanding medications, dosing schedules, side effects. Track of multiple medications may be required.

Realizing that medications may not be FDA-approved for treatment of neuropathic pain, and reference information may not be readily available.

Cautions about using alternative or natural medicines to provide relief. These usually are not effective and can be expensive.

Physical therapy, exercise, and psychological treatments are important to the treatment plan. Keeping appointments and being patient with expectations.

Setting reasonable goals for pain relief. Pain most likely will not be able to be completely cured.

Understanding neuropathic pain. Being knowledgeable about condition gives an opportunity to have input into the treatment plan.

Becoming proactive about health, and to achieve successes.

Electrical Stimulation

Electrical stimulation can relieve some severe and otherwise persisting pains. At its best it can be associated with either a gradual reduction in the pain or an increased ability by the patient to control his suffering. It seems particularly appropriate for use in the field of benign persistent pain [153]. It involves using a device to send a gentle electric current to nerves or muscles. This can help treat pain by interrupting or blocking the pain signals [19]. These devices are generally safe. However, they involve sending electrical impulses through body. So, it's important to talk with physicians if patient has a pacemaker, another implanted device, is pregnant, with epilepsy, or having a heart problem [155]. It might have been prudent to separate these currents according to their primary uses in physiotherapy practice, rather than combining them together. TENS and IFC are used primarily for pain relief; HVPC is used for wound care and sometimes for pain relief; and

NMES is used for muscle-fiber recruitment. NMES can be used safely and effectively in patients with cancer, chronic obstructive pulmonary disease, and heart disease [155,156]. Electrical stimulation often is used to augment physical therapy program after an injury or illness; it should not be the only treatment received when attending physical therapy [163]. There are different ES forms, including transcutaneous electrical nerve stimulation (TENS), neuromuscular electrical stimulation (NMES), interferential current (IFC), pulsed electrical stimulation (PES), noninvasive interactive neurostimulation (NIN), Iontophoresis [163,164]. Broader types include: Transcutaneous electrical stimulation (TENS); Implanted electric nerve stimulation (eg. PNS); Deep brain or spinal cord stimulation [19]. The recent advancements include improvement in ultrasound technologies, integration of ultrasound into clinical practice, percutaneous implantation techniques, smaller devices, and rechargeable and larger-capacity batteries [169].

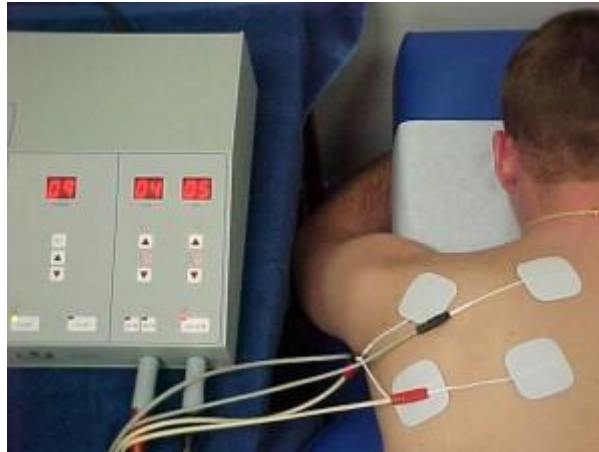


Figure 15: Electric Stimulation Therapy

Electrical incitement treatment includes setting glue cushions with terminals on the patient's skin so as to coordinate a controlled electrical flow through the body. The anodes are set with the end goal that the electrical flow achieves the influenced territory of the body and causes a withdrawal of a focused on single muscle or gathering of muscles. While it might appear to be unnerving to send power through the body, it is really reproducing the electrical motivations that happen in the body amid typical development and exercise. Most patients don't feel any pain while accepting the treatment. The created withdrawal makes an expansion in blood supply the focused on zone, which can result in improved muscle quality and expanded recuperating. Contingent upon the seriousness of the condition, the electrical incitement can be expanded for an increasingly commanding constriction or diminished for a gentler withdrawal. An extra advantage of this treatment is that the nerves in the influenced territory are animated, which can square pain signals from the nerves to the cerebrum. This is why electric stimulation therapy is often used to help treat chronic conditions, but many acute conditions can be effectively treated as well. It is also thought that the electrical stimulation causes the body to produce endorphins, which naturally provide pain relief (Source: Web Back & Body Medical. Electric Stimulation Therapy)

Implantable Peripheral Nerve Stimulation (PNS)

The peripheral nervous system includes pathways outside of the spinal cord, specifically various plexuses and peripheral nerves. Peripherally implanted nerve stimulation entails the placement of electrodes on a selected peripheral nerve. The stimulating electrode array is connected to an implanted pulse generator [165]. PNS has been shown to be efficacious in several chronic pain conditions including trigeminal neuropathic pain, episodic cluster headache (supraorbital nerve stimulation), chronic migraine/headache disorders (occipital nerve stimulation), fibromyalgia (C2 area stimulation), postherpetic neuralgia, complex regional pain syndrome type I and type II, isolated peripheral neuropathy, ilioinguinal, iliohypogastric, and lateral femoral cutaneous neuralgia, back pain, foot pain (tibial nerve stimulation), and coccydynia [169]. Post-stroke HSP is highly prevalent. Of those who suffer from HSP, up to 75% report moderate to severe pain with a third refractory to available treatments [166,168]. Data suggest that surface electrical stimulation (ES) is efficacious for treating HSP. However, it is not well-tolerated and requires skilled personnel to maintain [166]. The mechanism of PNS-mediated pain relief may include improvement in biomechanics of the glenohumeral joint and reversal of central

sensitization. Reduction in pain, reduction in pain interference, and improved pain-free external rotation ROM without serious adverse events reported [166,167]. The use of ultrasound technology during implantation allows for percutaneous placement of the PNS electrode [25] and almost eliminates the need for skin incision and tissue dissection [171]. Currently, extra-neural electrodes have proven safe for chronic applications while invasiveness and long-term stability of intraneural electrode remain challenging for permanent implantation. Safety limits of stimulation parameters are still predominantly described in terms of electric charge [172]. Compared to the conventional battery-powered system, WINeRS (under research) can be used in closed-loop recording and stimulation experiments over extended periods without adding the burden of carrying batteries [173]. However, the criteria for patient selection for conventional PNS are:

- Clear-cut etiology and corrected pathology (eg. Nerve entrapment syndrome)
 - Only patients with intolerable pain despite exercise, medication and TENS
 - Pain consistent with the sensory distribution of a single peripheral nerve
 - A positive diagnostic peripheral nerve block
 - Exclusion of nerve entrapment neuropathies
 - The patient is free of major psychological or psychiatric disease [169,170]
- Contraindications for the use of PNS mainly relate to surgical risk and include:
- Coagulopathy,
 - Infection in the surgical site,
 - Psychiatric illness,
 - A failed diagnostic trial,
 - Requirement of periodic MRIs, such as for cancer patients, and
 - Complete sensory loss [169].

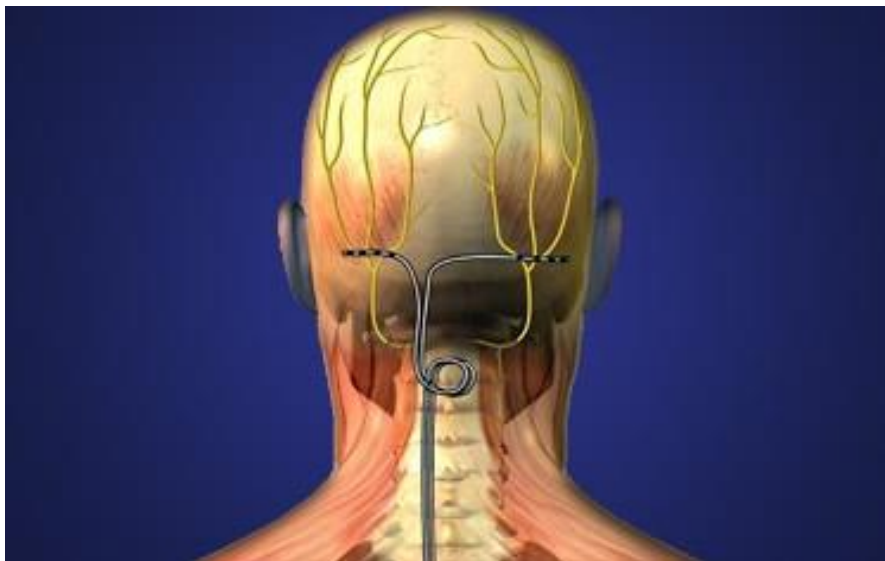


Figure 16: Peripheral Nerve Stimulation (PNS)

Following a fruitful preliminary, a perpetual gadget, comprising of slender wires with electrical leads on their tips, is put through a needle under the skin. Furthermore, a battery is put under the skin through a little entry point. Everything is little enough to stay covered up under the skin. The framework can be

turned on or off by the patient utilizing a remote control. Notwithstanding nerve wounds, a fringe nerve trigger embed is frequently used to treat conditions, for example, CRPS (complex provincial pain disorder) and lower back pain. (Source: Web National Spine & Pain Centers. Peripheral Nerve Stimulation (PNS))

Interrupts Pain Signals of Damaged Nerves).

Neuromuscular Electrical Stimulation (NMES)

In sports, NMES has been utilized for muscle fortifying, support of bulk and quality amid delayed times of immobilization, specific muscle retraining, and the control of edema. A wide assortment of triggers, including the burst-adjusted substituting current ('Russian trigger'), twin-spiked monophasic beat current and biphasic beat current triggers, have been utilized to deliver these impacts [174]. It is often used to "re-train" or "re-educate" a muscle to function and to build strength after a surgery or period of disuse [178]. During short-term disuse, NMES represents an effective interventional strategy to prevent the loss of muscle mass by increasing muscle protein synthesis rates [175]. Programs of NMES appear to be acceptable to patients and have led to improvements in muscle function, exercise capacity, and quality of life after Cardiovascular surgery [176, 179]. NMES can be safely implemented even in patients immediately after cardiovascular surgery and it helps to regain muscle strength only when applied for a sufficient number of days [177, 180]. It is safe for critically ill patients; however, it should be applied by duly trained professionals and with proper evidence-based parameters. Recent studies with variable methodological designs have shown that NMES is safe, feasible and beneficial for patients admitted to the ICU but available data are still inconclusive due to the heterogeneity of protocols and the small sample sizes [181]. A packaged intervention of TMT plus NMES may be a means of addressing not only LBP, but also impaired physical function and resultant disability, but studies among older adults have been limited [182]. Prevalence of postpartum LBP (PPLBP) has been reported to be 35% in the first month after the delivery, it is still the most prevalent painful condition, and is

considered as a serious problem by one-third of pregnant women. Limited data of using NMES for treating patients with PPLBP are available and it is ineffective to patients with PPLBP [183]. It might not benefit for patients with wrist dysfunction after AIS after 4-week treatment [184]. Although clinical meaning reported improvement is difficult to interpret, a 20% improvement in swallowing performance following treatment reported in an older study in use of NMES in the rehabilitation of swallowing disorders [185]. It is effective in female Chinese patients with EAP after 10-week treatment. Further studies are still needed to warrant this result [186]. CUR is a very tricky disorder, involving inability to voluntarily urinate for patients with TBI. NMES could not relieve symptoms of Chinese patients with CUR after TBI, as well as improve their quality of life after 8 weeks of treatment [198]. NMES is a valuable adjunct in patients with dysphagia and in patients with vocal fold paresis [199]. Combined NMES/TENS may be a valuable adjunct in the management of chronic back pain. Further research investigating the effectiveness of both NMES and combined NMES/TENS seems warranted [200]. No study found using NMES for the management in patients with NPP after SCI [201]. The efficacy of NMES being distinctly superior to that of TENS in maintaining long-term analgesia in HSP. However, NMES was not more efficacious than the TENS in improving the shoulder joint mobility, upper limb function, spasticity, the ability of daily life activity, and stroke-specific quality of life in HSP patients [202]. A recent trial found insufficient and inconclusive evidence from RCTs to inform on the role of NMES for treating people with PFP in current clinical practice [203]. NMES training appears to offset the changes in quadriceps structure and function, as well as improve the health status in patients with knee OA [204, 205]. NMES was not found effective for patients with CLBP after 4-week treatment [206].

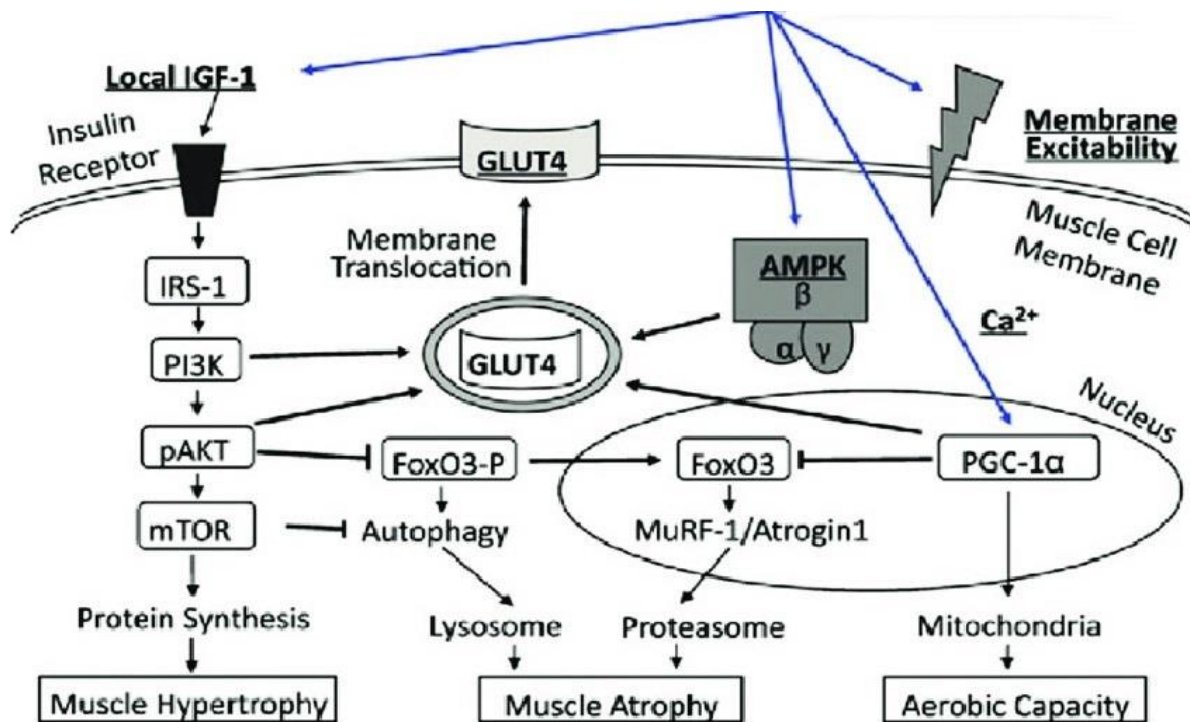


Figure 17: Repeated Muscle Contraction by NMES

Suggested advantageous effects of neuromuscular electrical stimulation (NMES) with regard to muscle hypertrophy, atrophy, aerobic capacity, membrane excitability, and membrane translocation of GLUT4. NMES may preserve membrane excitability. Membrane translocation of GLUT4 is regulated by IGF-1, AMPK, PGC-1 α , and its downstream targets, which may all be affected by NMES. Atrophy gene expression (MuRF-1, atrogin-1) increases upon dephosphorylation of FOXO3 transcription factors, which is inhibited by downstream insulin signaling (Source: Yuki Iida and Kunihiro Sakuma. Chapter 16. Skeletal Muscle Dysfunction in Critical Illness. In: Physical Disabilities - Therapeutic Implications <http://dx.doi.org/10.5772/intechopen.69051>)

Transcutaneous Electrical Nerve Stimulation (TENS)

TENS, is a methodology that utilizes electric flow to enact nerves for remedial reasons. The TENS unit is a little gadget, frequently battery-worked, which can here

and there even fit into a pocket. It uses cathodes set on the skin and which associate with the unit by means of wires to address a focused on remedial objective. The units are said to be titratable, allowing for a high level of client resistance with few symptoms. Contrasted with numerous prescriptions, the gadget is free from the danger of overdose. TENS units are frequently very customizable, enabling the client to control beat width, force, and recurrence. Low recurrence of < 10Hz related to high force is utilized to create muscle withdrawals. High frequencies of > 50 Hz are used with low intensity to produce paresthesia without muscle contractions [158], [207-212]. IASP works on two types of TENS: high frequency TENS [50-100 Hz, pulse per second (pps)], with low intensity (paresthesia, non-painful), pulse duration (50-200 μ s); and low frequency TENS (<10 pps), with high intensity (to tolerance threshold), pulse duration (100-400 μ s). What makes TENS worthwhile is that this technique, while substantially relieving acute and chronic pain, is noninvasive, inexpensive, safe and easy to use [220].

Exhibit 8: Exclusion criteria/contraindications for the use of a TENS unit [213]

TENS unit cannot be placed over the eyes.
 TENS unit electrodes cannot be placed on opposite sides of the head that would result in a trans-cerebral current.
 TENS unit electrodes cannot be placed on the chest and back that would result in a transthoracic current.
 TENS units cannot be placed on the anterior neck due to the possibility of a vasovagal event or laryngospasm.
 TENS units cannot be placed internally.
 TENS unit electrodes cannot be placed directly over the spinal column.
 TENS unit electrodes should not be placed near any sort of implantable device (spinal stimulator, pacemaker, etc.) where current from the TENS would interfere with the device.
 For pacemakers or pacemaker/defibrillators, a TENS unit must be placed at least six inches away from the pacemaker AND during initial TENS unit placement, the patient should be on a cardiac monitor to watch for any interference.
 TENS units should not be used over the uterus in pregnant women.

TENS units appeared to be effective in ED for reducing pain [213]. TENS is useful and safe adjuvant in spinal cord injury patients for the management of neuropathic pain [214]. There is strong evidence that TENS as an adjunct is effective in reducing lower limb spasticity when applied for more than 30 minutes over nerve or muscle belly in chronic stroke survivors [215]. Repeated applications of TENS as an adjunct therapy for improving walking capacity and reducing spasticity in the same population [234]. After 6-week treatment, patients with AS did not show more promising outcomes in pain reduction [216]. TENS and IFC have similar global effects on acute/chronic pain and positive effects on function in both WOMAC and RMDQ questionnaires [217]. TENS is effective in reducing pain and improving patients' QoL in cases of ICO. TENS is an easy-to-use, effective, noninvasive, and simple method for ICO-associated pain control and QoL improvement [218]. It has the potential to be a valuable therapeutic tool for women FSD in women without bladder problems [219]. It has been used for more than 45 years. However, despite all these advantages, there has been very little research into the therapeutic effects of TENS on brain activity [220]. Gamma band is a kind of brain wave which consists of very rapid oscillations (>30Hz) [221]. Moreover, it has been found that gamma band has an important role in pain

perception as well as pain processing [222-224]. High frequency TENS could reduce the enhanced gamma band activity after inducing tonic pain in healthy volunteers [220]. The effect of local and spinal TENS combined with the SWC for PI produced a significant improvement in size, healing, skin temperature, and pain levels in older adults with chronic PIs and cognitive impairment [225]. Treatment with TENS is effective for reducing pain in people with fibromyalgia. In addition, the inclusion of TENS in therapeutic exercise programs seems to have a greater effect than practicing therapeutic exercise in isolation [226]. TENS may serve as an effective and well-tolerated alternative for migraineurs. However, low quality of evidence demands further research [230]. TENS was not superior to fentanyl for pain relief in laparoscopic surgery with patients who underwent gynecologic laparoscopy under spinal anesthesia [231]. It can provide additional reduction in chronic post-stroke spasticity, mainly as additional therapy to physical interventions. Studies with better methodological quality and larger sample are needed to increase evidence power [232]. TENS was effective in reducing pain intensity during carboxytherapy in patients with cellulite in the gluteal region [233]. FS-TENS is an effective option for treating multisite chronic pain in a real-world setting. The most significant impact was a clinically meaningful reduction in pain interference

with activity and mood. There were also statistically significant reductions in pain intensity and pain interference with sleep. Pain intensity and pain interference with activity and mood

exhibited a dose–response association [235]. TENS may be effective for long-distance walking in patients with pre-radiographic knee osteoarthritis [236].

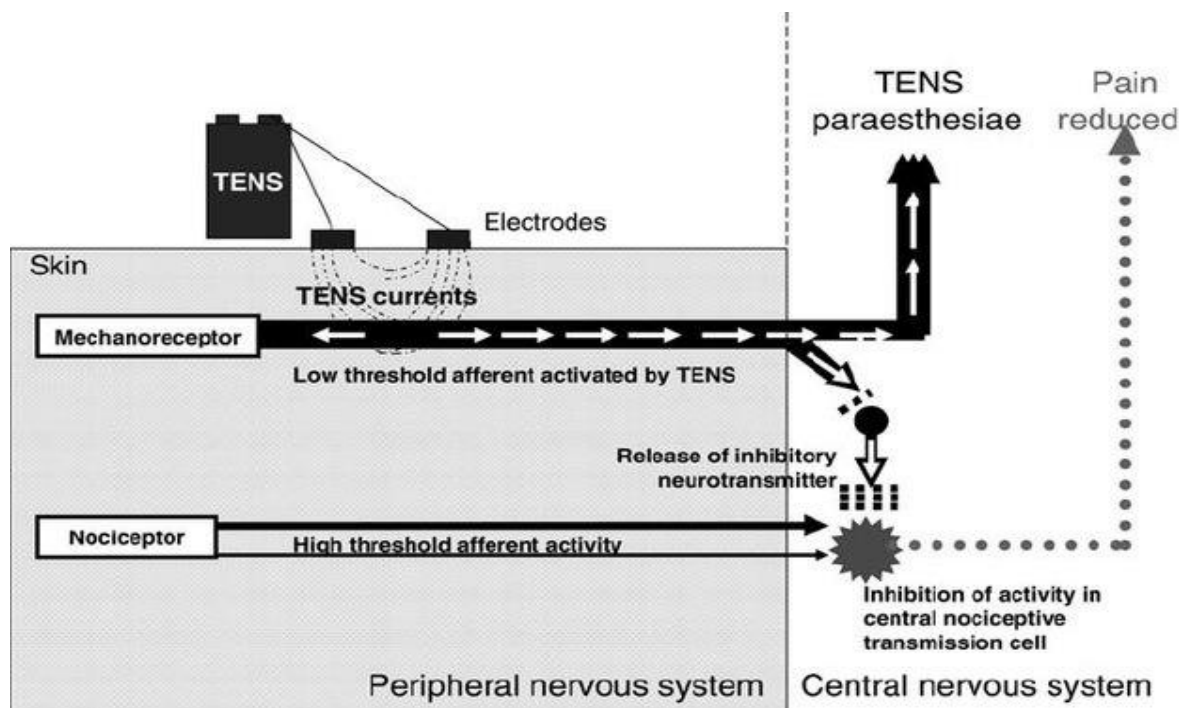


Figure 18: Postulated mechanisms of action for TENS-induced analgesia

TENS activates a complex neuronal network to result in a reduction in pain. TENS reduces hyperalgesia through both peripheral and central mechanisms which may involve: (1) Neurotransmitters & receptors that mediate TENS analgesia: HF TENS produces analgesia by activating endogenous inhibitory mechanisms in the central nervous system involving opioid GABA, and muscarinic receptors. (2) Reduction in central excitability: HF

TENS also reduces central neuron sensitization and release of the excitatory neurotransmitters glutamate and substance P in the spinal cord dorsal horn in animals with inflammation. (3) Peripheral mechanisms: Some of the analgesic effects of TENS are mediated through peripheral adrenergic receptors (Source: Vance CG, Dailey DL, Rakel BA, Sluka KA. Using TENS for pain control: the state of the evidence. Pain Manag. 2014;4(3):197-209).

Exhibit 9 General Features of TENS [157-162]

It is a non-invasive, inexpensive, self-administered technique to relieve pain. There are few side effects and no potential for overdose so patients can titrate the treatment as required. TENS techniques include conventional TENS, acupuncture-like TENS and intense TENS. In general, conventional TENS is used in the first instance. The purpose of conventional TENS is to selectively activate large diameter non-noxious afferents (A-beta) to reduce nociceptor cell activity and sensitization at a segmental level in the central nervous system. Pain relief with conventional TENS is rapid in onset and offset and is maximal when the patient experiences a strong but non-painful paraesthesia beneath the electrodes. Therefore, patients may need to administer TENS throughout the day. Clinical experience suggests that TENS may be beneficial as an adjunct to pharmacotherapy for acute pain although systematic reviews are conflicting. Clinical experience and systematic reviews suggest that TENS is beneficial for chronic pain.

Spinal Manipulation Primary Therapy (Chiropractic Care)

Chiropractors use hands-on spinal control and other elective medicines, the hypothesis being that legitimate arrangement of the body's musculoskeletal structure, especially the spine, will empower the body to mend itself without medical procedure or drug [237-239]. While the pillar of chiropractic is spinal control, chiropractic care may likewise incorporate different medicines, including manual or manipulative treatments, postural and practice instruction, and ergonomic preparing (how to walk, sit, and remain to confine back strain). Chiropractors today often work in conjunction with primary care doctors, pain experts, and surgeons to treat patients with pain [240-242]. Chiropractors use 4 broad categories of therapeutic interventions: (a) joint manipulation and mobilization, (b) soft tissue manipulation and massage, (c) exercise and physical rehabilitation prescription, and (d) home care and activity modification advice. In addition, nutritional and dietary counseling, physical therapy modalities (eg, heat, ice, ultrasound, electro-modalities), and taping/bracing are also used as adjunct procedures [251]. Survey by Swedish Agency for Health Technology Assessment and Assessment of Social Services, SBU shows 69% of the physiotherapists stated that they frequently used 'circulation training' as compared to 36% of chiropractors and 13% of the physiotherapists regularly used spinal manipulation whereas the corresponding figure for chiropractors was 96% [243]. Chiropractors are frequent providers of care for patients with lower back pain. Practitioner attitudes and beliefs have been shown to be associated with clinical outcomes for patients with low back pain [244]. Numerous people with LBP have never been to a chiropractor and may not

be available to attempting it out of the blue for an assortment of reasons, including adverse open observations about chiropractic. Many have likely found out about the likelihood that chiropractic care may cause genuine damages, including vertebral course analyzation (VAD) prompting stroke, loss of motion, or demise. Notwithstanding, few are likely mindful that VAD itself may result in neck pain, provoking people to look for consideration, regardless of whether from chiropractors, PCPs, or different suppliers [249]. Spinal Manipulation confers some advantage in back pain with no unfavorable occasions [245]. For young people with chronic LBP, spinal control joined with exercise was more powerful than exercise alone over a 1-year time frame, with the biggest contrasts happening at a half year. These findings warrant replication and evaluation of cost effectiveness [246]. Chiropractic was superior to sham chiropractic and physiotherapy treatments, but it was less effective than pharmaceutical treatment and other therapies [254]. SMT could not lead to significantly different outcomes (clinical and biomechanical) in participants with CTP than a control condition only including the evaluation of spinal stiffness [247]. Chiropractic was one of the leading alternatives to standard medical treatment in cancer pain management [248, 250]. The effectiveness of chiropractic was equivalent to these conventional treatments in the management of neck pain [252]. Chiropractic demonstrated no significant difference with any other treatment mode in fibromyalgia [253]. CTTT is common, contributing to significant loss of work and high socioeconomic costs. Chiropractors have capacity to offer an additive approach to patient care in FHT setting within collaborative care models [255].

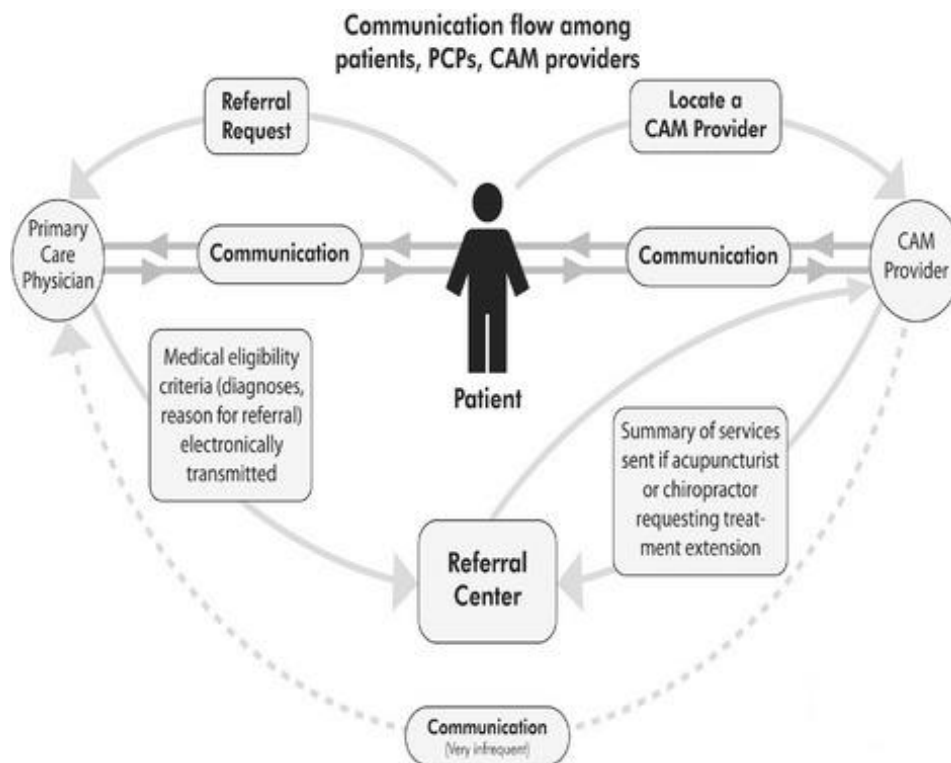


Figure 19: Communication flow among patients, PCPs, CAM providers

This outlines the unpredictable stream of correspondences among patients with chronic musculoskeletal pain, essential consideration suppliers (PCPs), and integral and elective prescription (CAM) suppliers inside and outside of an oversight consideration framework. The CAM suppliers are acupuncturists and chiropractors. In spite of the fact that advancement is being made, poor joining of consideration remains a test over the US social insurance framework. As more safety net providers offer elective treatment benefits and as more doctors bolster the utilization of CAM medicines for pain the board, extra potential coordination challenges emerge. Patients, PCPs, and A/C suppliers want more correspondence; in this way frameworks should be made to encourage progressively open correspondence which could emphatically profit persistent results. Collaborative care provides patients with therapeutic options within an environment where health care providers and patients are informed (Penney LS, Ritenbaugh C, Elder C, Schneider J, Deyo RA, DeBar

LL. Primary care physicians, acupuncture and chiropractic clinicians, and chronic pain patients: a qualitative analysis of communication and care coordination patterns. *BMC Complement Altern Med.* 2016; 16:30. Published 2016 Jan 25. doi: 10.1186/s12906-016-1005-4).

Acupuncture

Acupuncture is a customary Chinese routine with regards to medication that has picked up prevalence in Western culture and around the globe. It includes the inclusion of slender needles into the skin to animate nerves, muscles, and connective tissues all through the body with the objective of mitigating pain, strain, and stress. All the more extensively, needle therapy is really a group of various methodology. There are related dangers; be that as it may, genuine reactions are uncommon [256]. The Standard Acupuncture Nomenclature distributed by the WHO recorded around 400 needle therapy focuses and 20 meridians associating a large portion of the focuses [266]. Needle therapy treatment and

control aggregate mediations in parallel-bunch randomized preliminaries of needle therapy are not in every case definitely announced. While trying to improve guidelines, a global gathering of experienced acupuncturists and scientists conceived a lot of suggestions, assigning them STRICTA. The planned result is that mediations in controlled preliminaries of needle therapy will be all the more enough detailed, consequently encouraging an improvement in basic examination, investigation and replication of preliminaries [260]. Although acupuncture is widely used to manage chronic pain, it remains highly controversial, largely due to the lack of a clear mechanism [261]. American College of Physicians' guidelines recommend acupuncture as one of several options, such as manual therapy or exercise, for patients with back pain [262]. UK NICE guidelines recommend acupuncture for chronic headache or migraine [263]. The adverse effects of acupuncture are short-lasting and mild, such as tiredness and drowsiness, making acupuncture potentially a safer choice of treatment for improving QoL of chronic PAWS patients [257]. There have been recommendations against using acupuncture for osteoarthritis in several guidelines including those from NICE [264] and the American Academy of Orthopedic Surgeons (AAOS) [265]. Compared with conventional drug therapy acupuncture alone did not show superior effects on pain relief. But along with drug

therapy, resulted in increased remission rate of pain, shorter onset time of pain relief, longer duration of analgesia time, and better quality of life without serious adverse effects, as compared with drug therapy alone [258]. Acupuncture is effective for the treatment of chronic pain and is therefore a reasonable referral option [259]. Differences between true and sham acupuncture are smaller than those between true acupuncture and no acupuncture control [259,261]. No current guidelines recommend acupuncture for neck or shoulder pain [261]. Acupuncture is effective for the treatment of chronic musculoskeletal, headache, and osteoarthritis pain [267]. No systematic review has evaluated the effectiveness of acupuncture for combined neck pain, back pain, and lower back pain [268]. It is a safe and well-tolerated treatment option, improving a broader proportion of patients than current pharmaceutical options for women with fibromyalgia [269], however, for pain relief and reducing the number of tender points, acupuncture proved superior to drugs [270]. Acupuncture may depress pain by activating a number of neurotransmitters or modulators such as opioid peptides, norepinephrine, serotonin, and adenosine. Acupuncture may also activate the endogenous pain inhibitory pathway. Certain modes of acupuncture improved postoperative pain on the first day after surgery and reduced opioid use [271, 272].

Exhibit 10: Conditions that may be amenable to acupuncture identified by the WHO [266]

Upper respiratory tract disorders	Acute sinusitis; Acute rhinitis; Acute tonsillitis
Gastrointestinal disorders	Acute/chronic gastritis; Chronic duodenal ulcer (pain); Chronic colitis; Pelvic pain
Neurological disorders	Headache; Migraine; Trigeminal neuralgia; Post-herpetic neuralgia; Peripheral neuropathies; Intercostal neuralgia
Musculo-skeletal disorders	Tennis elbow; Frozen shoulder; Cervico-brachial syndrome; Sciatica; Low back pain; Osteoarthritis; Phantom limb pain; Fibromyalgia
Other	Dysmenorrhea; Atypical chest pain; Labor pain/stimulation of labor; Dental pain

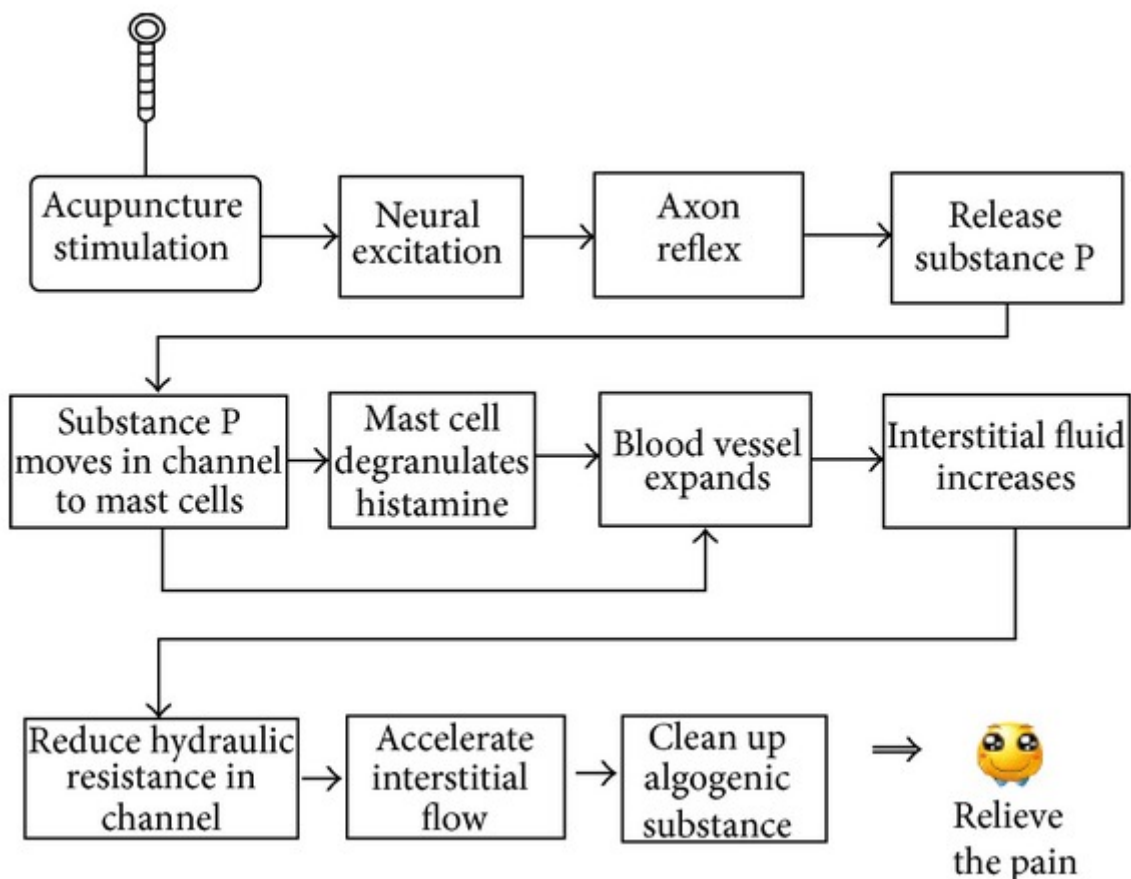


Figure 20: A mechanism of action of acupuncture in treating chronic pain

The accurate instrument of how needle therapy diminishes HR in the meridian directs requires further examination so as to be replied. Two components are engaged with the change. One is the pathway identified with the vein framework. At the point when a needle is embedded into an acupoint, the nerve terminal which typically comprises of Aδ or C filaments is energized and sends a neural heartbeat flag to the focal nerve framework. At that point, an axon reflex creates which prompts the arrival of substance P (SP) and different synthetic concoctions into the interstitial liquid around the needle. SP and different signs diffuse and relocate to pole cells adjacent through interstitial stream along meridian channels. Pole cells then degranulate and discharge histamine which will keep on moving along meridian channels. SP and histamine can make encompassing veins

grow and turn out to be increasingly penetrable enabling progressively interstitial liquid to stream outside the vessel. This quickens the stream along meridian channels and decreases the pressure driven obstruction along the channels. The lower resistance further facilitates the interstitial flow which can eliminate algogenic substances to relieve pain (Source: Zhang WB, Xu YH, Tian YY, et al. Induction of Hyperalgesia in Pigs through Blocking Low Hydraulic Resistance Channels and Reduction of the Resistance through Acupuncture: A Mechanism of Action of Acupuncture. Evid Based Complement Alternat Med. 2013; 2013:654645).

Physiotherapy

Early physical therapy appears to be associated with subsequent reductions in longer-term opioid use and lower-intensity

opioid use for all of the musculoskeletal pain regions examined [273]. Physical therapy or physiotherapy is a branch of rehabilitative medicine aimed at helping patients maintain, recover or improve their physical abilities. PTs practice in many settings, such as private-owned physical therapy clinics, outpatient clinics or offices, health and wellness clinics, rehabilitation hospitals facilities, skilled nursing facilities, extended care facilities, private homes, education and research centers, schools, hospices, industrial and this workplaces or other occupational environments, fitness centers and sports training facilities [274]. Both OT) and PT services are provided to clients/patients of all age groups, infants through older adults, from a variety of socioeconomic, cultural, and ethnic backgrounds, who possess or who are at risk for impairments, activity limitations, or participation restrictions. Both professions recognize that health and well-being are supported when individuals are able to engage in activities that promote quality of life through a healthy lifestyle [287]. The

focus of physical therapist is differential evaluation and the treatment of dysfunction rather than differential diagnosis and treatment of disease as in the case of physician [288]. Globally, physical therapy professional organizations have called for physical therapists to perform lifestyle behavior management during customary care, or health-focused care, due to increasing morbidity and mortality related to no communicable diseases. Given the potential for health-focused care to improve health outcomes, physical therapists should integrate health promotion into their daily clinical practice [289]. Physical therapists follow the Guide to Physical Therapist Practice, APTA, and state-directed practice laws in their quest to provide best care for patients. Physical therapists are also team members in a delivery model for patients with rheumatic diseases and musculoskeletal conditions. Other team members may include rheumatologists, orthopedic surgeons, nurses, occupational therapists, social workers, pharmacists, and psychologists just to name a few [290].

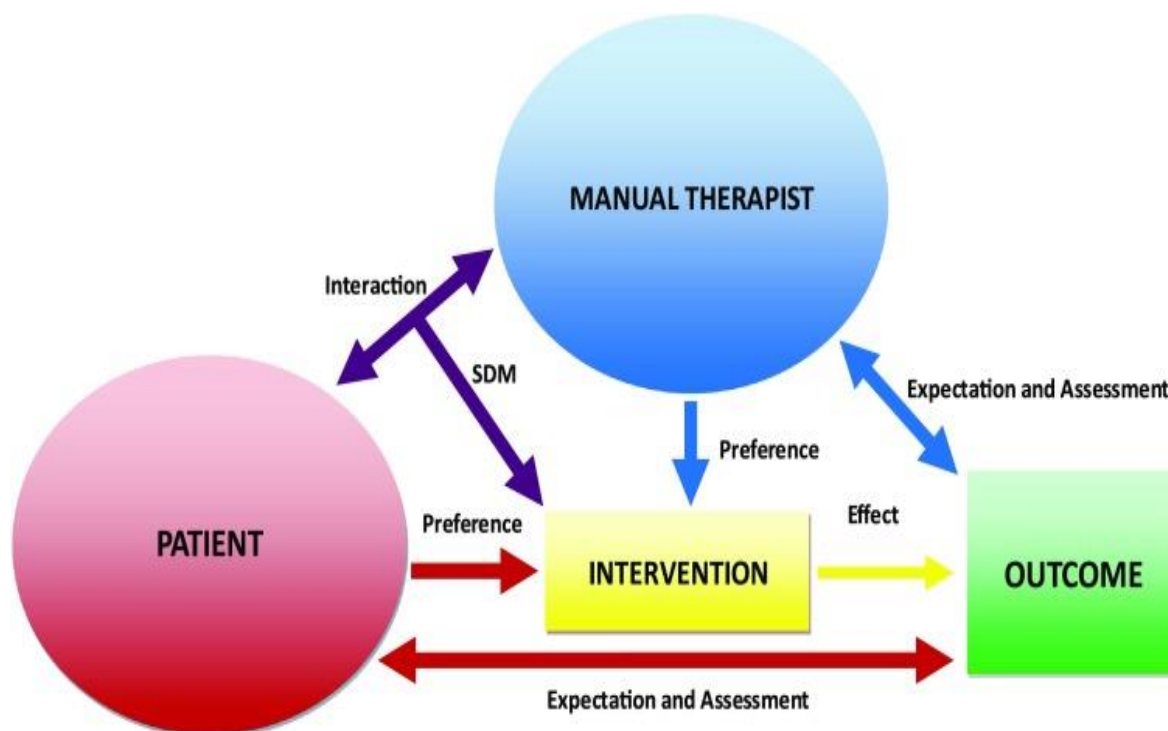


Figure 21: A comprehensive approach to manual physical therapy effectiveness accounting for interactions between patient, therapist, and intervention factors.

Examples of factors include preferences, expectations, outcome assessment, and shared decision-making (SDM). Additionally, this view acknowledges the interaction between patient and manual physical therapist, which may yield important outcome contributions, either directly (i.e. intervention selection) or indirectly (i.e. modified expectations or mood). Finally, this approach acknowledges the integration of targeted adjunct interventions such as psychosocial strategies and exercise that may (1) enhance the effectiveness of manual therapy for reducing the impact of pain, and/or (2) promote and maintain positive behavioral change (Source: Coronado RA, Bialosky JE. Manual physical therapy for chronic pain: the complex whole is greater than the sum of its parts. *J Man Manip Ther.* 2017; 25(3):115-117).

Intervention such as mirror visual feedback with a 3D augmented reality system may augment manual therapy approaches by desensitizing the person and allowing a window for inclusion of complimentary treatment strategies [276]. PT intervention appears to be an effective, cost-effective, non-pharmacological method to decrease chronic pain in PLHIV [277]. PT should strongly be considered for the management of chronic pain to gradually increase flexibility and strength, for example in knee osteoarthritis where there is demonstrated benefit [280]. Risks of PT include myocardial infarction leading to sudden death, as well as worsening pain (especially at beginning of treatment) [279]. Patients with poor experience from physical therapy ignored the prescription since they could not see the difference between PAP and physiotherapy [281]. Survivors of major burn injury are subjected to painful

physical therapy and occupational therapy that are essential for successful treatment and rehabilitation of their burns. The magnitude of the analgesic effect is clinically meaningful and is maintained with repeated use [282]. PT for primary idiopathic frozen shoulder can be useful for prescribing home exercises to increase shoulder mobility. Many physical therapies and home exercises can be used as a first-line treatment for adhesive capsulitis. PT has been shown to bring about pain relief and return of functional motion in patients with frozen shoulder [284]. An interdisciplinary management involving human embryonic stem cell (hESC) therapy along with physiotherapy as a supportive therapy offers regenerative treatment of the patients with SCI [285]. Poor adherence to physiotherapy can negatively affect outcomes and healthcare cost [286]. Taylor et al. showed the ability of the physical therapist to manage effectively and safely simple peripheral musculoskeletal injuries in the emergency department significantly reducing the length of stay, waiting and treatment time of patients [291]. An individual PT and rehabilitation program may augment improvements in patient-reported outcomes following arthroscopy for FAI syndrome, reported by FAIR trial [292]. Patients with moderate knee OA with different grades of pain can benefit from a physiotherapy rehabilitation program, which was shown to be highly effective in patients with moderate pain, although this effect might be reduced in patients with severe pain [293]. Upper limb rehabilitation technology (Armeo Spring as training tool) could hold promise for complementing traditional MS therapy. Significant gains were found in functional capacity tests. After training completion, TEMPA scores improved [294].



Figure 22: The Armeo system is for arm and hand therapy (Physiotherapy)

An exoskeleton supports the movements, while for motivation different videogames can be played. The modular "Armeo" system was specifically designed for patients, whose hand and arm function has been affected due to a neurological disorder. The robotic system includes an arm exoskeleton and software that not only provides treatment plans and documentation options but also a variety of different games. For example, patients are asked to collect coins in an underwater setting or grab specific products in a supermarket. Depending on the exercise, this trains range of motion and coordination, strength or stamina. Patients continuously and immediately receive performance feedback. Treatment progress is being recorded and measured at the same time, allowing for better assessment of the course of treatment thanks to this data. In doing so, patients always perform the appropriate and individually adapted training. (Source: Wart O. Exoskeletons, Serious Games and Co.: New Technologies in Rehabilitation. Medica Magazine 06/01/2017)

Yoga

The word "yoga" literally means "yoking", or "joining together" for a harmonious relationship between body, mind and emotions to unite individual human spirit with divine spirit or the True Self [301]. Yoga is a vast system of practices and philosophy that originate in India. Yoga can be helpful in pain management with both physical and mental benefits, but yoga is not a quick fix solution. Yoga has many of the same benefits as mindfulness practice, due to the common focus on breath, body and present moment awareness [295]. Yoga is very helpful in treating some of the mechanical aspects of pain, for example when there are tight muscles which contribute to pain. However, practiced incorrectly or without proper supervision yoga can also exacerbate your pain in the short term, despite the fact that research shows yoga is as safe as usual care and exercise [296,297]. Despite a number of reports and reviews supporting efficacy of yoga in health care, the awareness and integration of yoga in conventional healthcare remain limited [318].



Figure 23: Yoga for pain relief

Yoga can help people with arthritis, fibromyalgia, migraine, low back pain, and many other types of chronic pain conditions. A study published in *Annals of Internal Medicine* found that among 313 people with chronic low back pain, a weekly yoga class increased mobility more than standard medical care for the condition. Another study published at nearly the same time found that yoga was comparable to standard exercise therapy in relieving chronic low back pain. A meta-analysis of 17 studies that included more than 1,600 participants concluded that yoga can improve daily function among people with fibromyalgia osteoporosis-related curvature of the spine. Practicing yoga also improved mood and psychosocial well-being (Yoga for pain relief. Web Harvard Health Publishing, April, 2015)

Recent controlled studies of yoga for managing pain have been based on Hatha or Iyengar yoga. Studies that have used Hatha yoga have concentrated on relaxation techniques and gentle postures tailored to specific patient populations [306]. Integrating ancient wisdom of yoga and spirituality in the conventional palliative care setting appears to be a promising, cost-effective, and time-honored holistic approach offering a comprehensive wellness plan for patients [298]. Meditation and pranayama, along with relaxing asanas, can help individuals deal with the emotional aspects of chronic

pain, reduce anxiety and depression effectively and improve the quality of life perceived [299]. There is a need for additional high-quality research to improve confidence in estimates of effect, to evaluate long-term outcomes, and to provide additional information on comparisons between yoga and other exercise for chronic non-specific low back pain [300]. Both yoga therapy and conventional exercise therapy, with 6 months follow up resulted in significant benefits in CLBP, with the yoga intervention having the greater impact [301]. Beneficial effects of yoga could be associated with elevated serum BDNF levels and maintained serotonin levels. Lee et al. investigated the effect of yoga on pain, BDNF, and serotonin in premenopausal women with chronic low back pain. The yoga group had decreased pain, increased BDNF and unchanged serotonin [302]. Yoga is an acceptable and safe intervention, which may result in clinically relevant improvements in pain and functional outcomes associated with a range of MSCs [303]. Yoga intervention may reduce pain and catastrophizing, increase acceptance and mindfulness, and alter total cortisol levels in women with FM [304]. An 8-week Yoga of Awareness intervention may be effective for improving symptoms, functional deficits, and coping abilities in FM [305]. Yoga of Awareness” (YoA) is a mind/body program that, along with physical exercises, includes mindful meditation and

other coping tools drawn from the yoga tradition. Thus, it provides FM patients with both exercise and coping skills components of no pharmacological therapy [306]. Headache frequency and intensity were reduced more in Yoga with conventional care than the conventional care group alone. Furthermore, Yoga therapy enhanced the vagal tone and decreased the sympathetic drive, hence improving the cardiac autonomic balance [307]. In a randomized controlled trial 72 migraine without aura patients were randomly assigned yoga therapy or self-care. A significant reduction in migraine frequency was reported in the yoga versus self-care group [308]. 8 weeks of Hata yoga exercises on women with knee osteoarthritis found to be effective and it could be used as a conservative treatment besides usual treatments and medications to improve the condition of people with osteoarthritis [309]. Approximately 41.1% of males and 56.5% of females suffer from OA. Over 40% of adults between 50 and 75 years are affected with knee OA worldwide. handgrip strength is positively related to normal bone mineral density in postmenopausal women, and can be used as a screening tool for women at risk of osteoporosis [310]. In a yoga group received IAYT intervention for 1 week at yoga center, right and left handgrip strength showed improvement after 1 week IAYT intervention [311]. The practice of yoga effects on knee OA reported positive outcomes on symptoms including pain, flexibility, functional disability, anxiety, and quality of life [312]. IAYT practice showed an improvement in TUG, STS, HGS, and Goniometer test, which suggest improved muscular strength, flexibility, and functional mobility [311]. Regular yoga training is helpful in reducing knee arthritic symptoms, promoting physical function, and general wellbeing in arthritic patients [313]. Yoga has been used clinically as a therapeutic intervention for improving strength, posture, balance, and flexibility in older adults [314].

Neuroinflammation is a complex process involving both the peripheral circulation and the CNS and is considered to underlie many CNS disorders including depression, anxiety, schizophrenia, and pain. Regular practice of yoga reduces inflammatory cytokines in general and might protect the individual from inflammatory diseases (significantly reduce levels of TNF- α and IL-6). This study is particularly important because it examined how yoga influences the body's response to a stressor, in this case exercise, and found that it effectively dampened the pro-inflammatory response [315]. Raj-yoga meditation and pranayama in combination with conventional, noninvasive, treatment modalities showed promising results in MPDS patients as compared to either modalities alone [316]. In a cohort of women with chronic pelvic pain, an 8-week yoga intervention resulted in improvement in pain and quality of life scores compared to the control group that was treated with non-steroidal anti-inflammatory drugs [317]. Despite a wide range of methodological gaps and limitations, yoga interventions were shown to be beneficial and yielded positive results without any adverse outcomes. It is also recommended that cancer caregivers are trained and certified as the "yoga therapists" who have knowledge of the particular disease and understand the needs of the patients [319]. The assortment of advantages inferred, the nonappearance of reactions, and the money saving advantage proportion of restorative yoga make it an intriguing option for family doctors to recommend to their patients with malignancy [320]. Malignancy patients in customary treatment more often than not get at least one of radiotherapy, chemotherapy, careful intercession and hormone treatment. The patients utilizing yoga as a correlative treatment in grown-up malignant growth announced positive advantages regarding physical, psychological and social prosperity. The most ordinarily revealed direct advantage of yoga was its breath-related attention to

mind and body. Patients detailed partiality for yoga as a corresponding treatment, however felt at least one worries of transportation, planning, absence of time and cost were noteworthy obstructions to yoga adherence [321]. Yoga uses the model of five-dimensional perceptions. The human being is considered to experience every interaction through the

physical, vital, emotional, intellectual and spiritual perceptions simultaneously, with the physical sheath being the grossest and others progressively subtler; and the intellectual and spiritual perceptions being the subtlest. It also states that the ripples in the emotional sheath affect the grosser dimensions of vital energy flow and physical body [299].

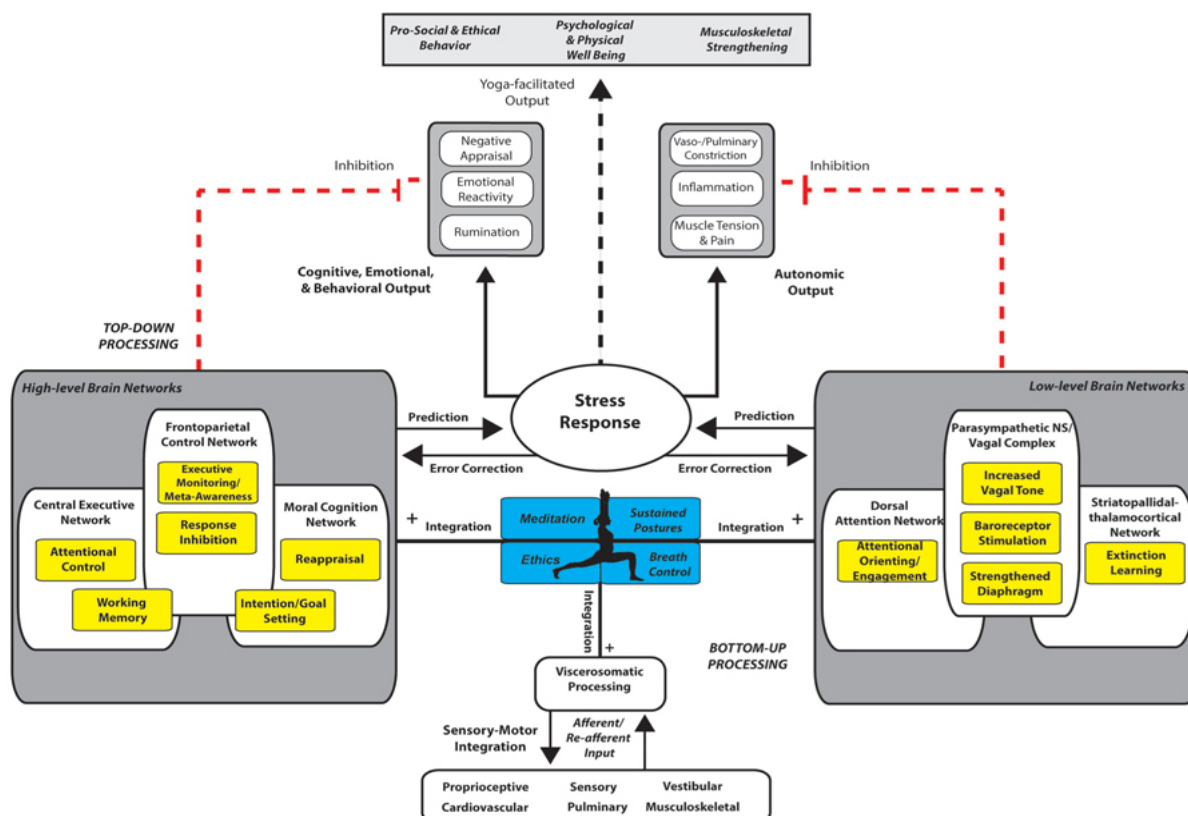


Figure 24: Systems network model of yoga for optimizing self-regulation

The real appendages of yoga are spoken to in blue boxes as a range of abilities of four procedure instruments: morals, reflection, breath guideline, and stances. Utilization of these abilities (appendages of yoga) crosswise over intellectual, emotional, social, and autonomic spaces with regards to physical and emotional stress is proposed to sum up to comparative difficulties off the yoga tangle and in regular daily existence. Together, these apparatuses of yoga improve the productivity, bidirectional criticism, and reconciliation (+ dark lines) among high- and low-level mind systems, and afferent

and re-afferent contribution from interoceptive procedures (e.g., multi-tactile, proprioceptive, vestibular, cardiovascular, pneumatic, musculoskeletal) with regards to stress. Through an accentuation on interoception and base up info, reconciliation encourages hindrance (red lines) of maladaptive types of subjective, emotional, and conduct yield just as autonomic yield related with stress. Proficiency improves the correspondence and adaptability among cerebrum and real frameworks to advise social yield. Yoga's four apparatuses are depicted to include

specific administrative procedures related with each arrangement of mind systems (demonstrated in yellow boxes). With dominance of training, administrative procedures turn out to be more automatized, requiring less exertion to start when important and end all the more quickly when never again required. A focal official system underpins top-down instruments of attentional control and working memory permitting observing for appropriate objective coordinated conduct pursued without anyone else's input remedy if necessary. A FPCN bolsters official observing, meta-mindfulness, reappraisal, and reaction hindrance instruments. An ethical comprehension organize underpins inspiration and goal setting related with self-care and prosocial conduct. The dorsal consideration arrange bolsters attentional situating, and commitment. Hypothalamic– pituitary– adrenal (HPA) pivot correspondence with brainstem vagal efferents bolster parasympathetic control and homeostasis crosswise over frameworks. A striatopallidal– thalamocortical system is in charge of encouraging termination learning and reconsolidation of maladaptive propensities into conduct that is lined up with aims and results into versatile propensities. Specked lines speak to new, versatile pathways for reacting to stress. A concentration toward base up procedures encourages a move toward perceptual deduction instead of dynamic induction, and improves forecast and blunder revision forms, in this manner supporting ideal self-guideline (Source: Gard T, Noggle JJ, Park CL, Vago DR, Wilson A. Potential self-regulatory mechanisms of yoga for psychological health. *Front Hum Neurosci.* 2014; 8:770. Published 2014 Sep 30. doi:10.3389/fnhum.2014.00770).

CONCLUSION

Pain is intricate, so is their measures. There are numerous treatment alternatives - meds, treatments, and mind-body

systems. Intense pain can last a minute; once in a while does it wind up chronic pain. Chronic pain perseveres for extensive stretches. Usually impervious to most therapeutic medicines and cause extreme issues. Once more, present day restorative framework recommends CAM and pharmacotherapy together, rather than long haul utilization of pain executioners alone. Way of life adjustment is another imperative thing to improve circumstance and continue the advantages of treatment. Pain might be situated in one piece of the body or it might be across the board. Studies propose that an individual's viewpoint and the manner in which they adapt emotionally to long haul (chronic) pain can impact their personal satisfaction. The event of pain ascends as individuals get more established, and ladies are bound to encounter pain than men. The helpless populace ought to be stayed in contact with doctors for pain the board and know about go betweens that may grant a further intensifying circumstance. Active recuperation centers around activities and stretches that assistance make the body more grounded and progressively ready to capacity and move. When the issue has been recognized, an active recuperation session could incorporate fortifying activities, low effect vigorous exercise, and pain alleviation extends. Our brains can influence how we see and experience pain. Stress and anxiety can even exacerbate chronic pain. Along these lines, body-mind treatments are valuable for helping patients better adapt to the pain and stress. Body-mind treatment works by showing patients how to deal with their feelings, musings, stress, and the body's physical reactions. There is abundant proof that stress and anxiety push the dimension of chronic pain. Serotonin and dopamine are two key synapses that influence our state of mind. Lopsided dimensions of these two synapses are connected to anxiety and depression issue. Stimulating living, grinning, watching motion pictures, delight trips, tattling, playing VDO

diversions keeps us occupied and diminish stress related rot. With regards to overseeing pain, Buddha's outstanding words composed numerous hundreds of years back as yet seem to be valid: How you consider your pain can change how you feel it, regardless. Neuroscientific thinks about have demonstrated that our minds physically change when we experience positive or negative feelings. This assumes a critical job in how well we oversee pain, particularly on an everyday premise. The brain and body are in consistent correspondence, so the manner in which we see our pain can change the manner in which we feel it. This is the reason moving our points of view about our pain is so critical—it's a viable method to control our manifestations, no medications required.

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Summary

The vast majority are eager to do pretty much anything to get away from the grasps of interminable agony. One of the primary cures offered to endless torment sufferers is prescription medications. Prescription painkillers are compelling much of the time. Be that as it may, the relief from discomfort they offer includes some major disadvantages for some. Painkillers risk getting to be addictive.

What's more, as endless news reports have appeared, the consequences of dependence on painkillers can be wrecking. Non-tranquilize therapies decline torment and can be utilized notwithstanding pharmaceuticals or in lieu of pharmaceuticals. They offer the likelihood to enhance your personal satisfaction. Similarly, as with some other treatment, every individual will react distinctively to various therapies, and there is no certification that any treatment will give total help with discomfort. Though many evidences were weaker, the researchers also found that massage therapy, spinal manipulation, and osteopathic manipulation may provide some help for back pain, fibromyalgia, osteoarthritis, cancer pain, knee replacement, migraine, frozen shoulder and chronic non-migraine headache. These data can equip providers and patients with the information they need to have informed conversations regarding non-drug approaches for treatment of specific pain conditions. It's important that continued research explore how these approaches actually work and whether these findings apply broadly in diverse clinical settings and patient populations.

Compliance with the Ethical Issues

- Ethics approval and consent to participate
Animal and Human experiment: N/A
Human Data Submission Approval: N/A
- Consent for publication
Consent to publish Individual Person's data: N/A
- Availability of data and materials
Data sharing: Data will be provided upon request.
- Competing interests
The author declares that he has no competing interest
- Funding
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- Authors' contributions
The individual contributions of authors: N/A

Abbreviations: Neuropathic Pain (NeP); Health-Related Quality Of Life (HRQoL); Health Care Resource Use (HRU); Health Care Provider (HCP); Emergency Room (ER); Non-pharmacological Pain treatment Modalities (NPMs); Post-Traumatic Stress Disorder (PTSD); Progressive muscle relaxation (PMR); Low Back Pain (LBP); Fear Avoidance Model (FAM); Cognitive-Behavioral Therapy (CBT); Antecedent-Belief-Consequence (ABC); Abdominal Aortic Aneurysm (AAA); Chronic Postsurgical Pain (CPSP); Postsurgical Pain (PSP); Complementary And Alternative Therapies (CAT); maximum heart rate (maxHR); Non-Specific Chronic Low Back Pain (NSCLBP); Osteoarthritis (OA); Randomized Clinical Trials (RCTs); Delayed-Onset Muscle Soreness (DOMS); Complementary And Integrative Medicine (CIM); Vocal Music Therapy (VMT); Focused Attention (FA), Open Monitoring (OM); Fibromyalgia (FM); Rheumatoid Arthritis (RA); Expressive Writing (EW); Breast Cancer (BC); Irritable Bowel Syndrome (IBS); Pain Assessment Screening Tool and Outcomes Registry (PASTOR); Patient-Reported Outcomes Measurement Information System (PROMIS); Completed Integrative Modalities Pain Care Team (IMPACT); Functional Restoration Program (FRP); Validation Of The Defense And Veterans Pain Rating Scale (DVPRS); Post-Traumatic Stress Disorder (PTSD); Department of Defense (DoD); Pain Interference (PI); Pain Management Task Force (PMTF); Emergency Department (ED); Animal Assisted Interventions (AAI); Animal Assisted Activities (AAA), Animal Assisted Therapy (AAT), Service Animal Programs (SAP); Chest Tube Removal (CTR); Somatosensory Cortex (SI); Anterior Cingulate Cortex (ACC); Primary Somatosensory Cortex (SI); Secondary Somatosensory Cortex (SII);

pain education (PE); Clinical Hypnosis (CH); Assisted Reproductive Technology (ART); Expressive Writing Intervention (EWI); Transcutaneous Electrical Stimulation (TENS); Transcutaneous Electrical Acupoint Stimulation (TEAS); Percutaneous Electrical Nerve Stimulation (PENS); Repetitive Transcranial Magnetic Stimulation (rTMS); High-Voltage Pulsed Current (HVPC); Interferential Current (IFC); Neuromuscular Electrical Stimulation (NMES); Pulsed Electrical Stimulation (PES); Noninvasive Interactive Neurostimulation (NIN); Implanted Peripheral Nerve Stimulator (PNS); Range Of Motion ROM); Hemiplegic Shoulder Pain (HSP); Complex Regional Pain Syndrome (CRPS); Wireless Implantable Neural Recording and Stimulation (WINeRS); Trunk Muscle Training (TMT); Postpartum LBP (PPLBP); Endometriosis-Associated Pain (EAP); Urinary Retention (UR); Traumatic Brain Injury (TBI); Neuropathic Pain (NPP); Spinal Cord Injury (SCI); Patellofemoral Pain (PFP); Spinal Cord Injury (SCI); Ankylosing Spondylitis (AS); Rolland Morris Disability Questionnaire (RMDQ); Western Ontario Macmaster (WOMAC); International Association for the Study of Pain (IASP); Electroencephalographic (EEG); Spinal Manipulative Therapy (SMT); Chronic Thoracic Pain (CTP); Vertebral Artery Dissection (VAD); Chronic Musculoskeletal Pain (CMP); Chronic Tension-Type Headache (CTTH); Family Health Team (FHT); Pain Associated With The Spine (PAWS); Standards for Reporting Interventions in Controlled Trials of Acupuncture (STRICTA); Chronic Uncomplicated Musculoskeletal Pain Associated With The Spine (CMPS); American Academy of Orthopedic Surgeons (AAOS) ; National Institute for Health and Care Excellence (NICE); Total knee arthroplasty (TKA); Ultra-restrictive Opioid Prescription Protocol for Pain (UROPP); People Living with HIV (PLHIV); Physical Therapy

(PT); Multiple Myeloma (MM); human Embryonic Stem Cell (hESC); Shared Decision-Making (SDM); Occupational Therapy (OT); American Physical Therapy Association (APTA); Flexion, Adduction, And Internal Rotation (FAIR); Femoroacetabular Impingement (FAI); Test d'Évaluation des Membres Supérieurs de Personnes Âgées (TEMPA); Multiple Sclerosis (MS); Brain Derived Neurotrophic Factor (BDNF); Yoga of Awareness (YoA); Integrated Approach Of Yoga Therapy (IAYT); Timed Up and Go Test (TUG); Sit-to-Stand (STS); Handgrip Strength (HGS); Myofascial Pain Dysfunction Syndrome (MPDS)

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