

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



# Teaching Balanced Patient Care Using Principles of Reductionism and Holism: The Example of Chronic Low Back Pain

*Alan Remde, Stephen DeTurk and Thomas Wojda*

## Abstract

This chapter explores how integrating holistic and reductionistic approaches to care may better optimize value based care. First, we define the terms ‘Holistic,’ ‘Reductionistic’ and ‘Integrative.’ Then we explore their scope in the arenas of teaching and patient care, with the advantages, disadvantages and pitfalls of each approach. We review how these styles are embedded in and interact with the cultures of medicine and western societies at large. As an example of a balanced care approach, we focus on the example of chronic low back pain (CLBP), an increasingly common and expensive medical problem. We present practical examples of teaching and practicing these different styles, Holism and Reductionism, illustrating when each may be appropriate to optimize value of patient care. Study questions are included. A list of further readings and resources is included for the interested reader.

**Keywords:** graduate medical education (GME), holism, reductionism, chronic pain, chronic low back pain (CLBP), value based care

## 1. Introduction

Present U.S. graduate medical education (GME) teaches knowledge, skills and attitudes to future providers in a health care system that spends a higher % of GDP with often poorer outcomes for chronic disease care than most other industrialized nations [1, 2]. Much of the chronic disease burden is driven by preventable risk factors such as poor diet and exercise patterns and risky behaviors such as substance abuse [3, 4]. This unsustainability is driving rapid transition to value based care, with payers demanding better outcomes for their dollars spent. Given the unsustainability and suboptimal effectiveness of our present chronic disease care, we might ask how GME needs to change in order to deliver more effective, value based care. This chapter explores how integrating holistic and reductionistic approaches to care may better optimize value based care, using as an example the dilemmas surrounding treatment of chronic low back pain (CLBP). Such integrative care may also lead to better physician satisfaction and less burn-out, as discussed later in this chapter.

## **2. Definition and descriptions of terms used in this chapter as related to healing and medical care**

### **2.1 Reductionism**

Reductionism: the practice of analyzing complex phenomenon in terms of its fundamental constituents, with the intent to manipulate these constituents to improve the whole or health. Reductionism is a style of perception, teaching and practicing medicine that focuses on addressing symptoms and proximate (and therefore more easily measurable) causes.

1. An implicit assumption of reductionism is that correcting the part will enhance wholeness. That is, that we have enough understanding of how the part relates to the whole that we can safely and effectively manipulate it to improve wholeness or health.
2. Implied in the practical application of reductionism (e.g. the use of many pharmaceuticals) is the assumption that treating symptoms of a disease is a reasonable surrogate to healing the whole person.
3. Concepts and fields of inquiry that are emphasized in a reductionistic approach to medicine focus on analysis of body structure and function, such as anatomy and physiology, and methods of manipulating these, such as with surgery or pharmaceuticals.
4. Evaluating and treating a 'part' can have many advantages. It is often more practical, expedient and parsimonious in its use of health care resources. For example, an inflamed appendix is diagnosed as the proximate cause of acute abdominal pain with a CT scan and surgically removed, or a fractured hip is diagnosed by X-ray as the proximate cause of acute hip pain and pinned. Most would agree that this 'fix it' approach makes eminent sense in these acute cases and leads to a better health outcome for these patients.
5. Our healthcare system is largely built on this reductionistic paradigm. In this paradigm, focus is on disease treatment, not wellness. The characteristic of the patient that has the disease is much less important. For example, diabetes mellitus type 2 (DM2) or chronic low back pain (CLBP) is treated more or less the same regardless of which patient has it. Likewise, 'providers' are largely interchangeable, since care algorithms are tailored to the disease rather than the patient or the patient-physician relationship. The health of the relationship between a patient and their physician is given much less importance. In these and other chronic diseases, the same approach used in acute care of treating the simple proximate cause is often taken. For example, an easily measured proximate cause of microvascular complications in DM2 is hyperglycemia, so focus is often on treating this with pharmaceuticals that lower blood sugar. While certainly worthwhile as part of a therapeutic strategy, when hyperglycemia treatment is done to the exclusion of a large number of other issues in DM2, sub-optimal outcomes may result. Examples of less easily measurable issues in DM2 include addressing habituation to highly processed 'pseudo-food' such as snacks that have manipulated fat, salt & sugar content [5], correcting the body's gut microbiome (which is altered in DM2 [6], improving vascular compliance and possibly autonomic balance [7, 8], calming chronic inflammation, reversing

hepatic metabolic derangements related to steatosis, improving insulin sensitivity [9], decreasing excess load of advanced glycation end products [10, 11] and many other less easily measurable but important aspects of DM2 treatment. Less attention to these other important factors may be one reason that present DM2 treatment algorithms have suboptimal outcomes, for example with macrovascular disease. Advice to eat right and exercise is commonly given, but very little resources or time is devoted to helping the patient actually accomplish these profound lifestyle changes in most DM2 care algorithms. Most doctors have very little training in nutrition or exercise science and thus may feel less qualified to guide the patient in these areas. A care model focusing on individual office visits is unlikely to allow delivery of the depth of lifestyle guidance actually required for significant change. If quality of care is narrowly defined by if glycemic goals are met, providers will focus on meeting this metric.

6. Many providers and patients perceive the overall approach of our present healthcare system as problematic, expressing concerns about ‘hamster wheel medicine’—attempts to treat complex issues in 15 minute slots, over focus on treating symptoms rather than underlying cause, dissatisfied patients, epidemic levels of provider burn-out and soaring health expenditures as unintended consequences of our present Healthcare model.
7. The development of reductionist approaches to medical care, with its underpinning of largely reductionistic scientific methods, has led to enormous advances. This is especially true in the areas of acute care, such as emergency medicine, critical care medicine and surgery. However, serious limitations become apparent when this same reductionistic paradigm is applied to chronic disease. The major modifiable factors driving chronic diseases, such as obesity, diabetes mellitus type 2, chronic obstructive pulmonary disease (COPD), heart disease, depression and chronic pain are related to lifestyle and/or environmental influences. Outcome studies in general show sub-optimal results when reductionistic methods, such as an over-focus on pharmaceuticals are applied to many chronic diseases. Our present reductionistic models seem impotent when faced with the rising tide of obesity, DM, depression and chronic pain. A new paradigm is needed.

## 2.2 Holism

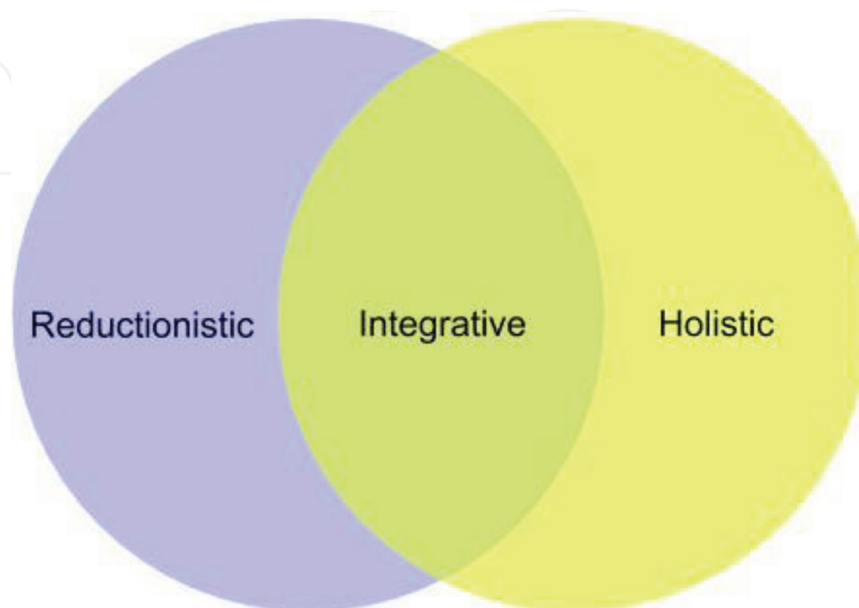
Holism: a style of perception, teaching and practice of medicine based on the axiom that the whole is irreducible and cannot be adequately understood by simply understanding the parts. MeSH Scope defines “Holistic Health” as “Health as viewed from the perspective that humans function as complete, integrated units rather than as aggregates of separate parts.”

1. The implicit assumption of a holistic approach to care is that enhancing wholeness will lead to healing of any dysfunctional parts that are manifesting as disorder or disease. This also assumes that it is within the power of the patient (with the facilitation of the healer) to enhance this restoration toward wholeness.
2. ‘Wholeness’ implies balance and integrity within the patient and in their relationships. For example, a person is more ‘whole’ if they not only have less disease symptoms, but also have maintained a sense of internal emotional integrity, life meaning, and family and social relationships.

3. The focus of holistic approaches to patient care are on overall wellness as relates to the presenting disorder of the patient, including healthy lifestyle aspects such as healthy eating, movement (exercise), rest & sleep, personal and social relationships and relationships to a higher power or intelligence.
4. Concepts and fields of inquiry that are emphasized in holistic healing include whole food plant-based approaches to eating, meditative movement to support mind/body harmony and insightful emotional processing leading to emotional/energy balance, supportive relationships, including at inter-personal, family and community levels, cultural and socioeconomic justice, environmental health and spiritual relationship.
5. The assumption that 'healing the whole will heal the part' implies placing the locus of control more on the patient than the physician. The healer is more of a 'facilitator' rather than someone who 'fixes' the patient. This fundamentally changes and makes paramount the relationship between physician and patient, and places more importance on adequate time for this relationship to develop and be maintained. It also implies that the characteristics of the patient that has the disease are equally or more important than the particulars of the disease the patient has.
6. Skill sets emphasized in holistic care include the following:
  - a. intuitive and emotional perception and processing
  - b. developing skills in listening, understanding and communication
  - c. ability to sense and find balance and harmony

### 2.3 Integrative care

Integrative care for the purpose of this chapter means an approach that attempts to balance reductionistic and holistic approaches to medical care and healing to



**Figure 1.**  
*Integrative care is the overlap between holistic and reductionistic methods.*



optimize patient outcomes. Concepts and fields of inquiry that are emphasized in integrative care include complexity and systems theory, mind/body integration related fields such as psychoneuroimmunology and an expanded biopsychosocial model that emphasizes supporting a healthy lifestyle in all its aspects. An integrative approach to care may be beneficial not only for patients but also for the physician. Integrative approaches support in depth, meaningful relationships between physician and patient and adequate time to develop these relationships, which may reduce burn-out [12] (**Figure 1**).

### 3. Balancing reductionistic with holistic aspects of care

Metaphorically, reductionism is akin to viewing electromagnetic energy such as light as a particle, holism to viewing light as a wave. Each apparently contradictory viewpoint may have validity and usefulness in different contexts. Choosing the right approach based on the needs of the situation is the goal of an integrative approach in order to optimize value based patient care. All systems of care have holistic and reductionistic aspects, though one aspect may be more emphasized. The biopsychosocial model used in primary care in Westernized medicine is more on the holistic side of the spectrum, while procedural and surgical techniques are more on the reductionistic side. Compared to many indigenous healing systems such as Traditional Chinese and Ayurvedic medicine however, Western conventional medicine tends toward a more reductionistic approach. We may be going through a stage of necessary re-balancing, with more emphasis on holistic aspects such as lifestyle medicine. However, this attempt to combine these two approaches presents its own set of new challenges.

### 4. Common misperceptions, difficulties and pitfalls in conventional and holistic medicine

#### 4.1 Cautions in initial approaches to combining healing systems

##### 4.1.1 *Simplistic, categorical descriptions of healing systems as 'reductionistic' or 'holistic' should be avoided*

All healing systems have reductionistic and holistic aspects. The practice of prescribing many supplements by some 'alternative medicine' practitioners is highly reductionistic, while a 'conventional' medical doctor empathically listening to a patient's illness story is more holistic.

##### 4.1.2 *Categorizing conventional medicine as 'scientific', while less familiar healing systems as 'unscientific' is not helpful*

This is often used to imply that only Western conventional medicine has 'validity'. All healing systems are embedded in and reflect the culture they exist in, with all that culture's strengths, limitations, blind spots and implicit assumptions. Evidence based medicine teaches us that only about 18% of conventional primary care medical practice has strong scientific support [13]. Other healing systems also have a mix of scientific and more empirical support. Thus it is not reasonable to assert a simplistic dichotomy of conventional medicine as 'scientific' and other healing systems as 'non-scientific' [14].

#### *4.1.3 Assuming one can take a healing modality out of context of the original healing system it was used in and have similar efficacy can be problematic*

An example of taking a healing modality out of context is acupuncture. While acupuncture may be useful as a 'stand alone modality,' it is quite possible that its effects in the larger context of Traditional Chinese medicine where it originated may be quite different.

### **4.2 Pitfalls in research**

#### *4.2.1 Conflating limitations in scientific methodology for lack of validity of holistic systems*

While outcome studies can assess a holistic care modality in its entirety, there are severe limitations in our present scientific methodology needed to understand whole systems in general. This lack of scientific methodology does not necessarily mean lack of validity, anymore than a lack of perspective of a person on the face of the earth means the earth is flat rather than spherical.

Conversely, the lack of a deep theoretical framework to understand holistic systems also means that their efficacy should not just be assumed. All holistic systems of care need extensive outcome studies to demonstrate efficacy.

Use of sham therapy in studies for holistic treatments (e.g. osteopathic manipulation, acupuncture, yoga) does not take into consideration the possible benefits of sham therapy, and studies showing equivocal outcomes may falsely imply the benefits of these treatments are due to placebo effects [15, 16].

#### *4.2.2 Confusing the immeasurable with the invalid*

Present research techniques emphasize quantitative approaches of what is scientifically easily measurable. While this is practical and important, it does not imply that qualitative, experiential and other approaches assessing intangible factors are less valid. Over-reliance on quantitative approaches to research is itself a distorted lens of perceiving reality. Over-reliance on measurable parameters while discounting intangible factors in healing can lead to a 'tyranny of the measurable'.

Relationship between therapist and client appear to be one of the most important aspects of outcome in psychotherapy, rather than the training or type of therapy used, even though these are more measurable than the intangibles of relationship.

#### *4.2.3 Making conclusions on whole systems based on highly reductionistic scientific studies of a part of these systems*

Scientific studies of single nutrients are often not relevant to the effects of whole foods. For example, studies on the effects of megadoses of synthetic vitamin E do little to inform us of the effects of whole foods that contain vitamin E [17]. Similarly, nutrients can have widely varying and sometimes opposite effects depending on whether the research subject is deficient or not in the nutrient. Treating nutrients as if they are pharmaceuticals, either in research or in clinical practice, often leads to spurious results and confusion.

#### *4.2.4 Assuming scientific studies on efficacy or side effects in an acute care setting apply to a chronic disease care setting*

Studies showing efficacy of opioids in acute pain were assumed to apply to chronic pain, a very different situation, with sometimes disastrous results including

contributing to the opioid epidemic [18, 19]. Similarly, the multiple side effects and disadvantages to chronic proton pump inhibitors use were not appreciated or understood by studies demonstrating their short term efficacy.

#### *4.2.5 Basing conclusions on studies limited in scope to one culture*

Cross cultural nutrition studies show much more significant and often dramatic effects of dietary patterns on chronic disease compared to comparisons of dietary patterns confined to Western societies, because the variation in eating styles in other cultures are sometimes much wider than in Western cultures. Confining nutrition research to Western eating habits can lead to a myopic view [11].

### **4.3 Approach to clinical care**

#### *4.3.1 Confusing surrogate biomarkers for the disorder, and hence mistaking correction of the surrogate biomarker for healing*

High blood pressure is an important index measure but only one aspect of hypertension, whose pathophysiology includes decreased arterial compliance, altered sympathetic – parasympathetic balance and other pathophysiological issues. Lowering blood pressure, while important per se, is only a partial correction of the pathophysiology of hypertension [20]. While lifestyle issues such as healthy diet, stress management and rest are usually mentioned, they are often given less than necessary attention. Similarly, as stated previously, hyperglycemia is an important index measure but not equivalent to diabetes. An overly pharmaceutical centered approach does little to address the underlying metabolic derangements of DM2.

#### *4.3.2 Assuming symptom suppression is equivalent to healing*

Proton pump inhibitors (PPIs) suppress acidity of gastric reflux, but do little to reduce the reflux itself or to address its underlying causes, which is often related to poor diet or eating habits, and expose the patient to a number of increase risks [21–24].

#### *4.3.3 Underestimating the resources needed for holistic healing modalities*

Many lifestyle changes and holistic care modalities require the patient to invest extensive time, attention and sustained effort. Unrealistic expectations of quick change are unfair and demoralizing for the patient and a set-up for failure. For example, changing eating habits likely requires extensive education, social support and reinforcement over many months. It is unrealistic to just tell a patient to ‘eat more healthy’ and expect much change.

#### *4.3.4 Assuming that supplements, botanical medicines or natural modalities are safer and superior (or more dangerous and inferior) to pharmaceuticals*

Such wide generalizations are neither prudent nor supported by evidence. Practitioners tend to view what they are familiar with as safer and more efficacious than less familiar approaches. Thus, conventional medicine oriented practitioners may categorize natural medicines as inferior and ‘unscientific’, while holistic oriented practitioners may assume that natural medicines must be better than pharmaceuticals. While many common natural supplements and botanicals appear relatively safe, there is no intrinsic reason that they should be worse or better than pharmaceuticals. For example, anti-HIV medications have no equivalent among botanicals and



are clearly life-saving. Gut-directed hypnotherapy and enteric coated peppermint oil are efficacious and safe for certain irritable bowel syndrome symptoms [25, 26]. NSAIDs when used chronically have significant and often under-appreciated toxicity. Some commonly used botanicals can be hazardous if not formulated correctly. Kava kava, for example, should only be used in aqueous formulations, since alcohol extracts may lead to liver toxicity [27]. Similarly, while many botanicals can be used safely with many pharmaceuticals, on occasion clinically significant interactions can occur between them. It behooves the practitioner to be aware of these interactions (can access standard references such as Natural Medicines Database) or to consult a qualified integrative medicine practitioner when needed.

## **5. Teaching balanced care using principles of reductionism and holism: the example of chronic low back pain (CLBP)**

### **5.1 Chronic pain background**

Chronic pain, and in particular chronic low back pain (non-cancer related) is chosen to illustrate an integrative model described herein because of its large burden of suffering and difficulties in treatment with present models of care. Chronic pain in general has an enormous influence on the emotional, physical and social function of patients and society at large and effects about 100 million people in the US alone [28, 29].

#### *5.1.1 Approaches to CLBP*

CLBP has a wide range of causes that may benefit from different approaches. Some cases appear caused by specific anatomic derangements such as a herniated disc pressing on a nerve root—the ‘nociceptive generator’, which lend themselves to a ‘fix it’ reductionistic approach such as epidural injections or surgery. More general approaches such as physical therapy to build core strength and control can be helpful in many cases of CLBP. Muscle tightness per se can be a nociceptive generator and will often benefit from mind/body and physical therapy approaches. However, in many cases, a specific lesion is not identifiable, and there appear to be significant psychosocial factors related to how the patient experiences pain. Statistically, the biggest predictor of chronic pain, including CLBP, is the ‘emotional charge’ surrounding the disorder—mood, meaning of the pain in the patient’s life, psychosocial consequences. Neuro-anatomic imaging of the spine (such as MRI) has variable correlation to severity and duration of chronic low back pain [30, 31]. The challenge for the GME teacher is to teach ability to discern these widely varying etiologic factors and to apply the most effective approach in each case. The efficacy of a sample of widely varying approaches is illustrated below.

#### *5.1.2 Challenges*

Chronic pain including CLBP is a highly subjective experience influenced by biological, psychological, and social factors. Alterations in central and peripheral nervous system processes add to its complexity and challenge [32]. Sleep disturbance, anxiety, and depression often accompany chronic pain [33]. These in turn may exacerbate the pain and further reduce quality of life [34]. For example, anxiety and sleep disturbance each occur in about half of people with chronic pain [35]. Depression has been linked with an increase in pain severity in 21–72% of cases [36]. The challenges of chronic pain are exemplified by returning war veterans from tours in Iraq and Afghanistan. Almost half have chronic pain [37], most which

is musculoskeletal related [38]. Prevalent among military veterans is their high incidence of comorbid post-traumatic stress disorder (PTSD) and traumatic brain injury (TBI), which likely aggravate their chronic pain syndromes [39].

## 5.2 Reductionist approaches

Reductionist treatments include pharmaceuticals and interventional treatments. Pharmacological treatment of chronic back pain does not correct the underlying cause of back pain, but instead focuses on reduction of pain allowing improvement of functionality. Interventional treatment includes nerve blocks, injections at various points (e.g. trigger point, epidural and facet joint injections), nerve ablations, or surgery. The efficacy of these various treatments is highly dependent on the etiology of the pain.

### 5.2.1 Pharmaceuticals

Pharmaceutical treatments for CLBP provide relief of symptoms, decreasing pain and improving function. However, pharmaceutical interventions in isolation do not address the origin of pain. Correcting the pathology causing pain is better accomplished with exercise, physical therapy, or spinal manipulation. Pharmaceuticals provide a supporting role in helping patients tolerate pain that may result from some of these treatments. Studies show that medication plus exercise based therapy, performs better than either in isolation [40].

Additional consideration must be given to possible side effects when prescribing medications. NSAIDs are the first line pharmaceutical treatment recommended, while tramadol and duloxetine are second line treatment options [40]. The use of opiates for treating chronic non-cancer pain including CLBP is highly problematic, with strong evidence of harm and growing evidence they are no better than non-opioid analgesics for many chronic pain syndromes, including CLBP [19].

### 5.2.2 Interventional

In cases where the etiology of back pain can be determined, treatments can be specifically targeted. Radiofrequency ablation targets sources of pain at specific anatomic sites, as determined by a diagnostic nerve block. Systematic reviews of the technique showed significant reduction in back pain over an extended period in some cases [41], however a large RCT showed radiofrequency ablation combined with exercise provided no benefit over exercise alone [42].

Surgical discectomy is superior to conservative management in the treatment of lumbar disc prolapse [43], however this treatment would not be beneficial in cases of lumbar strain. A less obvious difference in treatment outcomes can be seen with transforaminal epidural steroid injections. A review article found good evidence to support transforaminal epidural injections (steroid + local anesthetic) in cases of radiculitis secondary to disc herniation, but there was insufficient evidence in cases of less specific axial pain and post surgery syndrome [44].

## 5.3 Holistic approaches

Even in patients who have not suffered war or other physical trauma, trying emotional experiences such as interpersonal conflicts, work stress, and social rejection can strongly influence the experience of chronic pain [45, 46]. These include unresolved struggles with family members, conflicts over perfectionism, stigmatized desires that lead to shame, ambivalence toward one's children, and various other drivers of stress reactions. The main pathological process in both unresolved

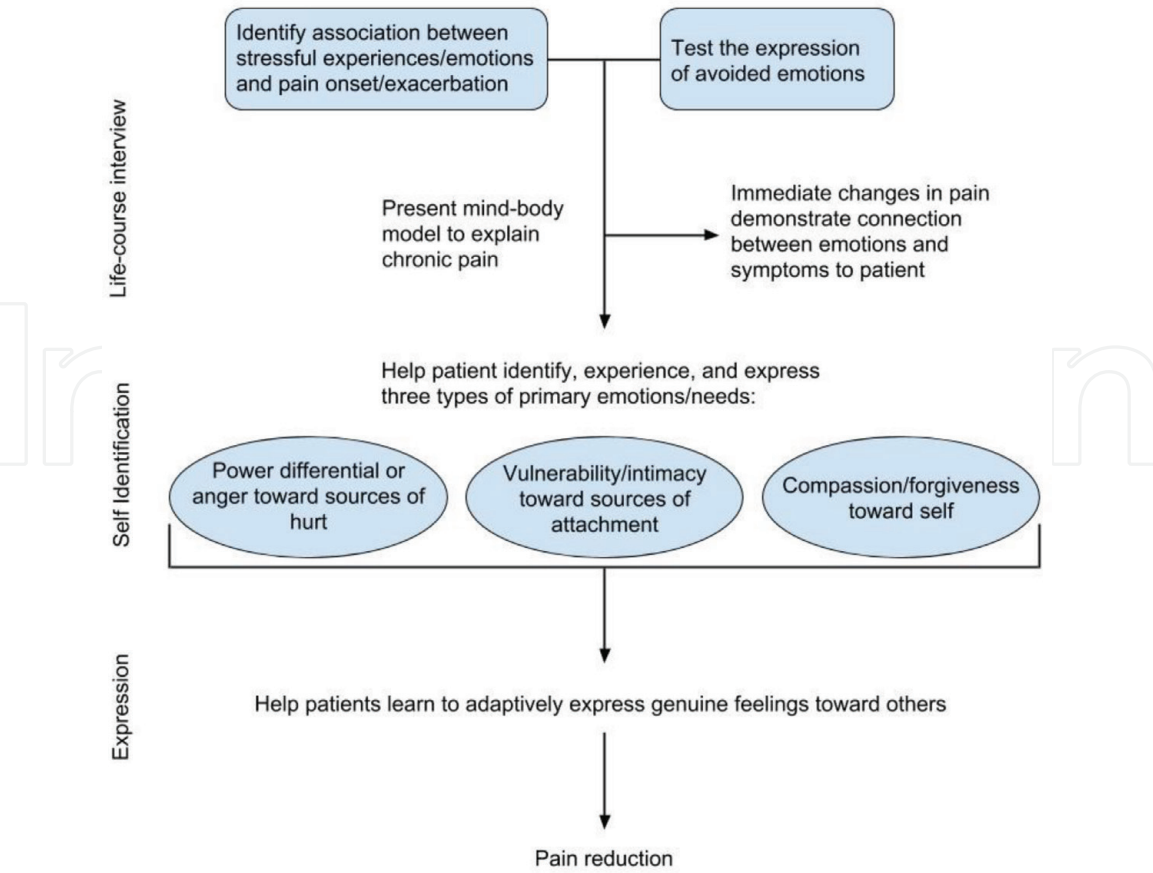
emotional trauma and internal conflict may be the evasion or concealment of emotions, which are believed to activate neural pathways that augment pain and other symptoms. Focusing on resolving these unprocessed emotions related to unresolved emotional trauma, conflict, and relational disturbances often improves chronic pain. This applies to a wide range of chronic pain syndromes including musculoskeletal pain such as CLBP, fibromyalgia, headaches, irritable bowel syndrome, and chronic pelvic pain [46–49]. **Figure 2** illustrates one possible model to address these issues.

5.3.1 Mind-body integration

In cases of nonspecific back pain, it is not possible to identify a specific nociceptive generator leading to pain. In these situations, a holistic treatment approach to the whole person instead of a lesion may be preferable. Studies have shown various holistic treatments to provide significant outcome. The MORE study evaluated the effect of mindfulness training, cognitive reappraisal, and positive emotion regulatory strategies as a combined treatment in patients with chronic pain who were taking opiates. Early results showed the combination treatment group had lower pain severity, less functional interference, and less desire for opioids compared to the standard support group treatment [51].

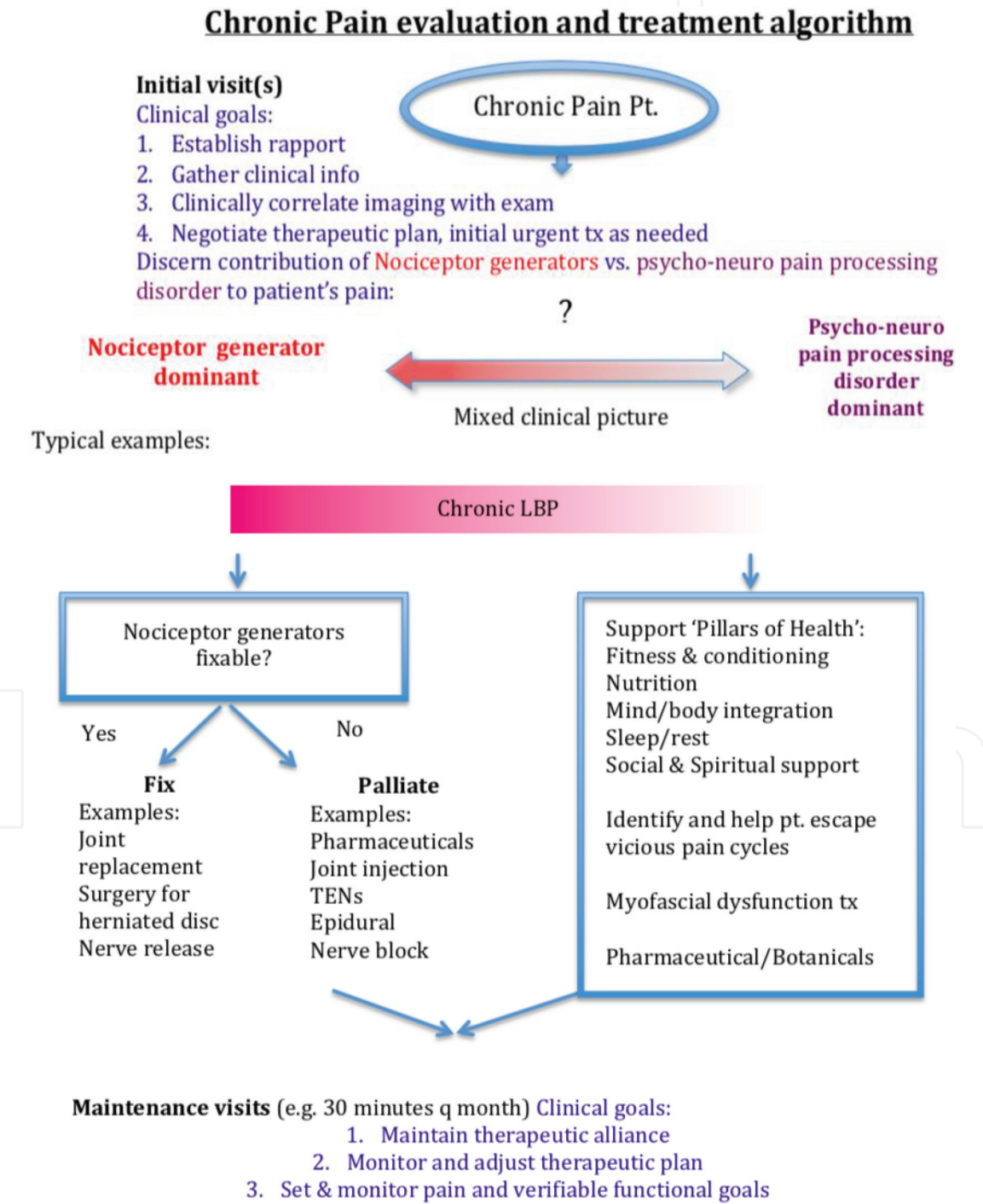
5.3.2 Exercise/rehabilitation

Exercise and yoga have been proven to be effective treatments for CLBP. GME should not only focus on teaching about the EBM supporting these treatments, but also teach about regional resources that are available to patients.



**Figure 2.** A sample of intervention technique focused on the mind-body model [50]. This model explains how chronic pain due to neural pathways formed by prior maladaptive learning and maintained by emotional avoidance can be “unlearned” with powerful corrective emotional experiences.

A systematic review examined a holistic treatment approach to chronic back pain. Multidisciplinary biopsychosocial rehabilitation (MBR) involves a combination of physical, psychological, and educational treatments usually provided by a multidisciplinary care team for the treatment of chronic back pain. The review found that MBR had moderate improvements in short and long term (1–2 years) pain intensity as well as disability compared to usual care. MBR also outperformed physical interventions (e.g. physiotherapy, exercise) in short term pain reduction, as well as short- and long-term disability. Patients receiving MBR were also twice as likely to be working after 1 year compared to physical interventions [52]. Integrating MBR into GME could be easily accomplished by having residents serve as part of the care team for select patients with uncontrolled back pain.



**Figure 3.**  
Sample schematic on approach to chronic pain and in particular CLBP that integrates both reductionistic 'fix it' and more holistic general support approaches.



### **5.3.3 Energy medicine treatments**

Acupuncture is recommended as a first line treatment option for CLBP [40]; however its basis on an unfamiliar Eastern paradigm involving energy meridians may cause some skepticism among conventional medicine doctors. Research shows that acupuncture therapy produces measurable physiologic effects [53], and randomized controlled trials demonstrate moderate improvement in function and pain reduction. Comparisons to sham acupuncture have had mixed results, but meta-analyses show small improvement. A Cochrane review of 35 RCTs of moderate quality, showed moderate lower pain & improved function vs. no acupuncture. When comparing acupuncture to other treatment modalities, there is again some inconsistency. Low quality studies showed small improvement in pain and function compared to various medications such as NSAIDs. When combined with usual care however, acupuncture and usual care outperformed usual care alone [54]. A sample schematic integrating reductionistic and holistic approaches to CLBP is noted in (Figure 3).

## **6. Teaching competencies**

Given the widely variant causes of chronic pain, including CLBP, (as well as the causes of many other chronic disease entities), the next question is, how would the GME teacher approach teaching competencies in such a wide range of skill sets? Literature searches on the topic identified articles about teaching holism and wellness to medical students for the purpose of self care. However, there was sparse literature available focused on GME approaches to teaching application of general holistic care for treating patients.

Based on the author's experience, a few examples of general principles in GME teaching of reductionistic and holistic approaches to care of chronic disease are offered below. Some of these are obvious, others not so much:

### **6.1 Teach basic precepts of reductionistic approaches**

Thorough and precise theoretical framework of body structure and function, and knowledge of and identification of specific disorders is key to successful specific treatments. Any interventional procedure skill requires ample well supervised hands on practice.

### **6.2 Teach basic precepts of holistic approaches**

Teach a theoretical framework of mind/body unity, including evidence base of such fields as psychoneuroimmunology and meditative movement therapies.

Self-regulation of affect and soma can lead to less pain and better function. Skill sets that support this process include:

1. Mindful awareness of and resolution of intra- and inter-personal unconscious and conflictual emotional processes (as exemplified in the above mind/body model)
2. Development of 'kinesthetic intelligence'—awareness and interpretation of the body's 'language' of movement patterns and holding neuromuscular tension and postures. Understand how this correlates with emotional states and musculoskeletal pain syndromes. This also requires 'hands on' experiential



practice, for example thru lessons in one of the mind/body practices such as Tai chi, Yoga, Feldenkrais or Somatics.

We suggest that much work is needed in GME education of both the reductionistic as well as the holistic skill sets listed above. Identification of teachers who can guide learners in these skill sets acquisition is important.

Any interventional procedure skill requires ample well supervised hands on practice.

### **6.3 Approaches and modalities in caring for CLBP patients (and patients in general of course) should be guided mainly by the needs of the patient**

A common tendency for us providers is to perceive the patient's disorder and needs thru the lens of our own experience and professional scope of knowledge. Hence for the same CLBP patient the primary care physician may prescribe an NSAID and back stretches, the Naturopath may include a botanical such as curcumin, the interventionalist an epidural, the chiropractic manipulation. It is obvious that this is a suboptimal approach. Ideally, a generalist with a wide range of familiarity with different reductionistic and holistic modalities would first perform a careful evaluation of the patient's individual situation. They would then develop a reasonable assessment of the causes of their symptoms, including mechanical, emotional and spiritual factors. Then they would use carefully selected tests to support or refute their clinical hypothesis. They would take into account the personality and resources of the patient themselves. Then they would synthesize all these findings into a coherent therapeutic plan, making sure the patient understands and agrees with it and can reasonably carry it out. They would refer to other providers as needed, gathering a team to help the patient. Referrals could include reputable practitioners in both more reductionistic fields such as interventional pain and surgery and more holistic oriented fields such as physical therapy, psychotherapy, acupuncturists and Tai Chi teachers. Often such a team approach is key, since very few of us have mastered the wide range of skill sets that might benefit a patient.

### **6.4 In specialties such as primary care (e.g. family medicine, internal medicine, pediatrics) in which a wide range of skill sets is expected, residencies need to identify teachers who can teach these skill sets**

For example, curriculum should include at least familiarity with holistic approaches such as mind/body medicine and acupuncture in their training. Ideally, there should be training in basic holistic techniques that can be done by the primary care physician such as stress management techniques and select natural medicine that have a good evidence base of effectiveness. Learning how to properly refer to holistic oriented practitioners such as Tai Chi, Yoga teachers and acupuncturists is important (**Table 1**).

### **6.5 Primary care residencies should also teach clear indications and evidence base for interventions and other reductionistic techniques**

### **6.6 In more narrow focused specialties such as orthopedic surgery, residents should at least be exposed to the evidence base for holistic modalities. Teach and assess competency on choosing which patients would benefit from these modalities and how to appropriately refer**

### **6.7 Reductionist and holistic CLBP competency examples**

| ACGME core competency                 | Reductionistic approaches  | Holistic approaches  |
|---------------------------------------|--|--|
| Patient care                          | Discerning and correlating exam/imaging findings to decide the contribution of neuro-anatomical derangement vs. pain-processing disorder<br>Effective pain suppression with pharmaceuticals while optimizing risk/benefit<br>Effective referrals, e.g. to PT, Pain specialists, proceduralists (e.g. for Epidural) | Guiding patients in mind/body awareness and processing of nociceptive signals, spiritual re-connection and meaning of pain experience<br>Use of simple stress management and psycho-therapeutic techniques<br>EBM supported botanicals and understanding of possible botanical-pharmaceutical interactions |
| Medical knowledge                     | Neuroanatomy of spine and spine lesions<br>Referral indications for interventionist approaches such as Epidurals, neurosurgery   | Familiarity and basic applications of Functional movement practices, Whole foods anti-inflammatory diet, Energy medicine approaches such as acupuncture  |
| Practice-based learning & improvement | QI of CLBP patients Appropriateness criteria for spine imaging   | QI of CLBP patients effectiveness of meditative movement referrals (e.g. Yoga, Somatics)   |
| Interpersonal & communication skills  | Effective communication of therapeutic assessment & plan   | Ability to facilitate mindfulness and release of blocked emotions and related muscle tension   |
| Professionalism                       | Pt. survey scores on professionalism of care   | Similar  |
| Systems-based practice                | Learner demonstrates effective referral to pain specialists  | Learner demonstrates effective referral to holistic practitioners  |

**Table 1.**  
*Example competencies for treating CLBP in primary care residency.*

7. Examples of chronic low back pain (CLBP) patients

7.1 Example 1

Mr. Smith is a 45 y/o man with CLBP ranging in severity from 3 to 8/10 for 7 months that began after a warehouse work accident in which he herniated his right L4/5 disc with sciatic symptoms down his right leg. His symptoms are aggravated by his job where he needs to lift boxes and so he was put on temporary disability. His clinical and MRI exam correlate well. He is otherwise healthy and well adjusted with no comorbidities. Physical therapy (PT) was only modestly helpful.

Study questions:

1. Would you focus on a more reductionistic ‘fix it’ approach or a more holistic approach in this case? Why?
2. What would be your next steps?
3. What pharmaceutical classes might be most useful for his pain?
4. What procedures might be most useful in this case?
5. Name 3 competencies that would be most relevant for learners in this case?
6. How would you approach teaching these 3 competencies?

Therapeutic approach and rationale: Mr. Smith has a specific lesion causing his back pain that is amenable to being 'fixed', so a reductionistic approach will likely be most helpful. An epidural markedly improved his symptoms, and he is now using occasional Naprosyn for residual pain and a course of Gabapentin if his sciatica flares. Opioids should generally be avoided since there is little evidence of benefit and much evidence of harm in treating most cases of CLBP. If his symptoms do not resolve over several months or worsen, neurosurgical intervention may be indicated.

Competencies for learners might include:

1. Appropriateness criteria for different radiologic studies in chronic low back pain
2. Indications and evidence base for different pharmaceuticals to treat somatic and neuropathic pain
3. Indications for interventions such as epidural injections and neurosurgical procedures
4. Indications and efficacy of different approaches to physical therapy

## 7.2 Example 2

Mr. Jones is a successful 45 y/o business man who c/o CLBP ranging from 3 to 8/10 for 7 months. He has no history of trauma or overuse, his back pain began insidiously at the time he was very involved in a stressful time in his business and had to work long hours in the office for several weeks. PMH is significant for obesity, gastro-esophageal reflux disease (GERD), stage 1 essential hypertension (HTN) for which he takes Lisinopril and recently diagnosed prediabetes for which he takes Metformin. His only exercise is walking on the weekends. Sleep is occasionally disturbed. He states he has a standard American 'meat & potatoes' diet and eats out often at fast food restaurants or snacks when working late in the office. Previous X-rays and MRI show several levels of mild disc bulges and mild facet arthropathy. Active range of motion (AROM) of lumbosacral (LS) spine is full and causes only minimal discomfort, inconsistent with his 5–8/10 recurrent pain experience. Para-lumbar spasm/tightness and anterior pelvic tilt is noted. He has no red flags or neurological deficits on his evaluation.

1. Would you focus on a more reductionistic 'fix it' approach or a more holistic approach in this case? Why?
2. What are some ways Mr. Jones' eating habits may be related to his CLBP?
3. How might his exercise/conditioning status affect his CLBP?
4. How would you address his paralumbar spasm/tightness and anterior pelvic tilt?
5. How would you approach his request for a pill to help his pain? What might you choose first line?
6. Name 3 competencies that would be most relevant to learners in this case?
7. What would be general strategies in teaching these 3 competencies?

Therapeutic program & rationale: Mr. Jones has the common pattern of impending 'diabesity' (central obesity with metabolic syndrome spectrum of derangements), which is associated in studies with about a double risk of chronic pain. Stress likely worsens his pain. Deconditioning with core spine stabilizer muscle deficits and resultant reactive chronic para-lumbar and other related muscle tension may be a main driver of his pain. Poor correlation between spine imaging lesions and clinical symptoms makes a reductionistic 'fix it' approach to back care less likely to be successful.

A more holistic and lifestyle medicine approach with graduated exercise focusing on core strength and control and posture supported by PT, plant-based whole foods diet to reduce body inflammation, Somatics or similar modality to 're-connect' mind/body control of paralumbar spasm to help relax these muscles and a comprehensive stress management/emotional support program are more likely to be beneficial. Natural botanicals that reduce inflammation such as Curcumin and/or Boswellia may be useful to reduce inflammation and help prevent progression of prediabetes to DM2 and would not have clinically significant interactions with his present pharmaceutical regimen. NSAIDs would likely have an unacceptable risk/benefit ratio by worsening GERD and HTN. Opioids generally have an unfavorable risk/benefit ratio for non-specific CLBP and should be avoided.

Competencies for learners in this case might include:

1. Understanding correlations between nutrition, obesity, DM2 and chronic pain and ability to communicate these risks and how to reverse them effectively to patients.
2. Familiarity with basic principles of both PT and mind/body modalities such as Somatics in treating CLBP and how to refer to specialists in these areas
3. Ability to guide patients on simple techniques to reduce stress, such as breathwork, progressive relaxation, meditation. Experiencing some of these techniques themselves may be a more useful learning approach than limiting to didactic knowledge.
4. Motivational interview skills to support lifestyle change
5. Basic knowledge and use of evidence-based botanical medicines for chronic pain

### 7.3 Example 3

Mrs. Patel is a 45 y/o second generation American with Asian Indian ancestry with CLBP ranging from 3 to 8/10 for 7 months. The back pain started after she made a left turn and an oncoming car hit her at about 20 mph. She has no sciatica or red flag symptoms or findings. An X-ray done in the ER after the accident showed mild degenerative disc disease and spondylosis. Labs done in the ER were unremarkable except for mild elevated AST and an elevated MCV on CBC. Other health issues include migraines and irritable bowel syndrome and insomnia. She denies smoking or illicit drug use and states she drinks a 'nightcap' regularly to help with her sleep and pain. She struggles with marital difficulties with her Indian husband. She is sedentary, appears deconditioned and mildly centrally obese. She prefers not to exercise or move much because she fears it will worsen her back pain. Evaluation of the LS spine shows mild ache on flexion and far extension and some para-lumbar spasm and tenderness. No red flag findings.



Study questions:

1. Would you focus on a more reductionistic 'fix it' approach or a more holistic approach in this case? Why?
2. How do Mrs. Patel's co-morbidities inform your evaluation of the causes and solutions to her CLBP?
3. To what degree would you estimate Mrs. Patel's spine x-ray correlates with her clinical findings?
4. How would you approach Mrs. Patel's fear of movement?
5. How might concerns regarding the likely or possible cause of Mrs. Patel's car accident, elevated AST & MCV and self-treatments for pain inform your therapeutic approach?
6. Name 3 key competencies for learners in this case, using a reductionistic approach
7. Name 3 key competencies for learners in this case, from a holistic perspective
8. What would be key strategies in teaching each of these competencies?

Therapeutic program & rationale: Ms. Patel would likely benefit from re-conditioning with PT to help her confidently establish healthy movement patterns. She needs education that chronic pain does not equal tissue damage in her case, and it is safe to move. NSAIDs, while possibly useful at least for a limited time, may have unacceptable risks with her possible alcohol abuse. Stress and related back muscle tension is a likely contributor to her pain and might be addressed by a combination of marital/psychotherapy, Somatics or similar approaches. She needs evaluation for possible alcohol dependency, anxiety and mood disorders. Magnesium and other nutritional deficiencies may aggravate her chronic pain, and she may benefit from supplementation.

Competencies for learners in this case might include:

1. Understanding early symptoms and signs of alcohol abuse (which is a major factor in motor vehicle accidents) and evaluation for same. Learning how to communicate concerns about substance abuse and facilitate steps toward change and how to refer.
2. Ability to analyze risk/benefit of NSAIDs and other pain medications.
3. Diagnosis and treatment of mood disorders and anxiety and effective referral for different types of counseling.
4. Teaching patients difference between acute and chronic pain, and how chronic pain does not equate with tissue damage. Effectively encouraging movement and exercise in chronic pain patients.
5. Cultural competency in relating to patients from different backgrounds.



## 8. Conclusion

Chronic low back pain serves in this chapter as an example of the wide range of competencies along the reductionistic-holistic spectrum that may be needed in treating patients. Flexibility of therapeutic approach to match needs of the patient may improve outcomes. Although there is some evidence of better outcomes and value with such an integrative approach [55], more research is needed to test this hypothesis. Similarly, an integrative approach may help physicians reconnect with their reasons for going into medicine and their role as a healer. ‘Walking the walk’ by modeling a healthy lifestyle can restore their own health and reduce burn-out. There is little research on effective GME methods of teaching learners to balance reductionistic and holistic approaches to care, so present approaches are largely guided by experience. Given the expense and burden of suffering of chronic disease, this should be a priority area of research in GME.

## Acknowledgements

We would like to recognize the Staff and Faculty at the St. Luke’s Coventry Family Medicine Residency Program as well as the St. Luke’s Post-doctorate research fellowship program for their ongoing support.

## Conflict of interest

No conflicts of interests.

## Author details

Alan Remde\*, Stephen DeTurk and Thomas Wojda  
SLUHN FMR-Warren, Phillipsburg, NJ, USA

\*Address all correspondence to: [alan.remde@sluhn.org](mailto:alan.remde@sluhn.org)

## IntechOpen

© 2018 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

## References

- [1] Reinhardt UE, Hussey PS, Anderson GF. U.S. health care spending in an international context. *Health Affairs (Project Hope)*. 2004;**23**(3):10-25
- [2] Martin BI, Deyo RA, Mirza SK, Turner JA, Comstock BA, Hollingworth W, et al. Expenditures and health status among adults with back and neck problems. *Journal of the American Medical Association*. 2008;**299**(6):656-664
- [3] Services UDoHaH. *Healthy People 2020 Leading Health Indicators: Progress Update*. 2014
- [4] Collaborators USBoD. The state of US health, 1990-2010: Burden of diseases, injuries, and risk factors. *Journal of the American Medical Association*. 2013;**310**(6):591-606
- [5] Gearhardt AN, Corbin WR, Brownell KD. Food addiction: An examination of the diagnostic criteria for dependence. *Journal of Addiction Medicine*. 2009;**3**(1):1-7
- [6] Komaroff AL. The microbiome and risk for obesity and diabetes. *Journal of the American Medical Association*. 2017;**317**(4):355-356
- [7] Kreier F, Yilmaz A, Kalsbeek A, Romijn JA, Sauerwein HP, Fliers E, et al. Hypothesis: Shifting the equilibrium from activity to food leads to autonomic unbalance and the metabolic syndrome. *Diabetes*. 2003;**52**(11):2652-2656
- [8] Komaroff AL. The microbiome and risk for atherosclerosis. *Journal of the American Medical Association*. 2018;**319**(23):2381-2
- [9] Ludwig DS, Ebbeling CB. The carbohydrate-insulin model of obesity: Beyond “calories in, calories out”. *JAMA Internal Medicine*. 2018;**178**(8):1098-1103
- [10] Uribarri J, Woodruff S, Goodman S, Cai W, Chen X, Pyzik R, et al. Advanced glycation end products in foods and a practical guide to their reduction in the diet. *Journal of the American Dietetic Association*. 2010;**110**(6):911-916 e12
- [11] Campbell TC, Junshi C. Diet and chronic degenerative diseases: Perspectives from China. *The American Journal of Clinical Nutrition*. 1994;**59**(5):1153S-1161S
- [12] Krasner MS, Epstein RM, Beckman H, Suchman AL, Chapman B, Mooney CJ, et al. Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. *Journal of the American Medical Association*. 2009;**302**(12):1284-1293
- [13] Ebell MH, Sokol R, Lee A, Simons C, Early J. How good is the evidence to support primary care practice? *BMJ Evidence-Based Medicine*. 2017;**22**(3):88-92
- [14] Kumar S, Nash DB. Health care myth busters: Is there a high degree of scientific certainty in modern medicine? *Two Doctors Take on the Health Care System in a New Book that Aims to Arm People with Information*. Scientific American. 2011
- [15] MacPherson H, Hammerschlag R. Acupuncture and the emerging evidence base: Contrived controversy and rational debate. *Journal of Acupuncture and Meridian Studies*. 2012;**5**(4):141-147
- [16] Ning Z, Lao L. Acupuncture for pain management in evidence-based medicine. *Journal of Acupuncture and Meridian Studies*. 2015;**8**(5):270-273
- [17] Ross AC, Caballero B, Cousins RJ, Tucker KL, Ziegler TR. *Modern Nutrition in Health and Disease*. Lippincott Williams & Wilkins; 2014

- [18] Franklin GM. Opioids for chronic noncancer pain. A position paper of the American Academy of Neurology. 2014;**83**(14):1277-1284
- [19] Krebs EE, Gravelly A, Nugent S, Jensen AC, DeRonne B, Goldsmith ES, et al. Effect of opioid vs nonopioid medications on pain-related function in patients with chronic back pain or hip or knee osteoarthritis pain: The SPACE randomized clinical trial. *Journal of the American Medical Association*. 2018;**319**(9):872-882
- [20] Giles TD, Berk BC, Black HR, Cohn JN, Kostis JB, Izzo JL Jr, et al. Expanding the definition and classification of hypertension. *Journal of Clinical Hypertension (Greenwich, Conn)*. 2005;**7**(9):505-512
- [21] Boghossian TA, Rashid FJ, Thompson W, Welch V, Moayyedi P, Rojas-Fernandez C, et al. Deprescribing versus continuation of chronic proton pump inhibitor use in adults. *The Cochrane Database of Systematic Reviews*. 2017;**3**:Cd011969
- [22] Pappas M, Jolly S, Vijan S. Defining appropriate use of proton-pump inhibitors among medical inpatients. *Journal of General Internal Medicine*. 2016;**31**(4):364-371
- [23] Reimer C, Sondergaard B, Hilsted L, Bytzer P. Proton-pump inhibitor therapy induces acid-related symptoms in healthy volunteers after withdrawal of therapy. *Gastroenterology*. 2009;**137**(1):80-87 7.e1
- [24] Vaishnav B, Bamanikar A, Maske P, Reddy A, Dasgupta S. Gastroesophageal reflux disease and its association with body mass index: Clinical and endoscopic study. *Journal of Clinical and Diagnostic Research*. 2017;**11**(4):OC01-OOC4
- [25] Khanna R, MacDonald JK, Levesque BG. Peppermint oil for the treatment of irritable bowel syndrome: A systematic review and meta-analysis. *Journal of Clinical Gastroenterology*. 2014;**48**(6):505-512
- [26] Lindfors P, Unger P, Arvidsson P, Nyhlin H, Björnsson E, Abrahamsson H, et al. Effects of gut-directed hypnotherapy on IBS in different clinical settings—Results from two randomized, controlled trials. *The American Journal of Gastroenterology*. 2012;**107**(2):276
- [27] Whitton PA, Lau A, Salisbury A, Whitehouse J, Evans CS. Kava lactones and the kava-kava controversy. *Phytochemistry*. 2003;**64**(3):673-679
- [28] Breivik H, Eisenberg E, O'Brien T. The individual and societal burden of chronic pain in Europe: The case for strategic prioritisation and action to improve knowledge and availability of appropriate care. *BMC Public Health*. 2013;**13**(1):1229
- [29] Simon LS. Relieving pain in America: A blueprint for transforming prevention, care, education, and research. *Journal of Pain & Palliative Care Pharmacotherapy*. 2012;**26**(2):197-198
- [30] Janardhana AP, Rajagopal SR, Kamath A. Correlation between clinical features and magnetic resonance imaging findings in lumbar disc prolapse. *Indian Journal of Orthopaedics*. 2010;**44**(3):263
- [31] Tonosu J, Oka H, Matsudaira K, Higashikawa A, Okazaki H, Tanaka S. The relationship between findings on magnetic resonance imaging and previous history of low back pain. *Journal of Pain Research*. 2017;**10**:47
- [32] Merskey HE. Classification of chronic pain: Descriptions of chronic pain syndromes and definitions of pain terms. *Pain*. 1986

- [33] Attal N, Lanteri-Minet M, Laurent B, Fermanian J, Bouhassira D. The specific disease burden of neuropathic pain: Results of a French nationwide survey. *Pain*. 2011;**152**(12):2836-2843
- [34] Bair MJ, Robinson RL, Katon W, Kroenke K. Depression and pain comorbidity: A literature review. *Archives of Internal Medicine*. 2003;**163**(20):2433-2445
- [35] Kroenke K, Outcalt S, Krebs E, Bair MJ, Wu J, Chumbler N, et al. Association between anxiety, health-related quality of life and functional impairment in primary care patients with chronic pain. *General Hospital Psychiatry*. 2013;**35**(4):359-365
- [36] McWilliams LA, Goodwin RD, Cox BJ. Depression and anxiety associated with three pain conditions: Results from a nationally representative sample. *Pain*. 2004;**111**(1-2):77-83
- [37] Girona RJ, Clark ME, Massengale JP, Walker RL. Pain among veterans of operations enduring freedom and Iraqi freedom. *Pain Medicine*. 2006;**7**(4):339-343
- [38] Higgins DM, Kerns RD, Brandt CA, Haskell SG, Bathulapalli H, Gilliam W, et al. Persistent pain and comorbidity among operation enduring freedom/operation Iraqi freedom/new dawn veterans. *Pain Medicine*. 2014;**15**(5):782-790
- [39] Lew HL, Otis JD, Tun C, Kerns RD, Clark ME, Cifu DX. Prevalence of chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms in OIF/OEF veterans: Polytrauma clinical triad. *Journal of Rehabilitation Research & Development*. 2009;**46**(6)
- [40] Qaseem A, Wilt TJ, McLean RM, Forciea MA. Clinical Guidelines Committee of the American College of Physicians. Noninvasive treatments for acute, subacute, and chronic low back pain: A clinical practice guideline from the American College of Physicians. *Annals of Internal Medicine*. 2017;**166**(7):514-530
- [41] Lee CH, Chung CK, Kim CH. The efficacy of conventional radiofrequency denervation in patients with chronic low back pain originating from the facet joints: A meta-analysis of randomized controlled trials. *The Spine Journal*. 2017;**17**(11):1770-1780
- [42] Juch JNS, Maas ET, Ostelo R, Groeneweg JG, Kallewaard JW, Koes BW, et al. Effect of radiofrequency denervation on pain intensity among patients with chronic low back pain: The mint randomized clinical trials. *Journal of the American Medical Association*. 2017;**318**(1):68-81
- [43] Gibson JNA, Waddell G. Surgical interventions for lumbar disc prolapse. *Cochrane Database of Systematic Reviews*. 2007;**2**(1):CD001350. DOI: 10.1002/14651858.CD001350.pub3
- [44] Conn A, Buenaventura RM, Datta S, Abdi S, Diwan S. Systematic review of caudal epidural injections in the management of chronic low back pain. *Pain Physician*. 2009;**12**(1):109-135
- [45] Afari N, Ahumada SM, Wright LJ, Mostoufi S, Golnari G, Reis V, et al. Psychological trauma and functional somatic syndromes: A systematic review and meta-analysis. *Psychosomatic Medicine*. 2014;**76**(1):2
- [46] Lumley MA, Cohen JL, Borszcz GS, Cano A, Radcliffe AM, Porter LS, et al. Pain and emotion: A biopsychosocial review of recent research. *Journal of Clinical Psychology*. 2011;**67**(9):942-968
- [47] Hsu MC, Schubiner H, Lumley MA, Stracks JS, Clauw DJ, Williams DA. Sustained pain reduction through affective self-awareness in fibromyalgia:



A randomized controlled trial.  
*Journal of General Internal Medicine.*  
2010;**25**(10):1064-1070

Cochrane Database of Systematic  
Reviews. 2005;(1):CD001351. DOI:  
10.1002/14651858.CD001351.pub2

[48] Lumley MA, Sklar ER, Carty JN.  
Emotional disclosure interventions  
for chronic pain: From the laboratory  
to the clinic. *Translational Behavioral  
Medicine.* 2011;**2**(1):73-81

[55] Sundberg T, Petzold M, Kohls  
N, Falkenberg T. Opposite drug  
prescription and cost trajectories  
following integrative and conventional  
care for pain—A case-control study.  
*PLoS One.* 2014;**9**(5):e96717

[49] Slavin-Spenny O, Lumley MA,  
Thakur ER, Nevedal DC, Hijazi AM.  
Effects of anger awareness and  
expression training versus relaxation  
training on headaches: A randomized  
trial. *Annals of Behavioral Medicine.*  
2013;**46**(2):181-192

[50] Lumley MA, Schubiner H, Carty  
JN, Ziadni MS. Beyond traumatic  
events and chronic low back pain:  
Assessment and treatment implications  
of avoided emotional experiences. *Pain.*  
2015;**156**(4):565

[51] Garland EL, Manusov EG, Froeliger  
B, Kelly A, Williams JM, Howard  
MO. Mindfulness-oriented recovery  
enhancement for chronic pain and  
prescription opioid misuse: Results from  
an early-stage randomized controlled  
trial. *Journal of Consulting and Clinical  
Psychology.* 2014;**82**(3):448-459

[52] Kamper SJ, Apeldoorn AT, Chiarotto  
A, Smeets RJ, Ostelo RWJG, Guzman J,  
et al. Multidisciplinary biopsychosocial  
rehabilitation for chronic low back  
pain. *Cochrane Database of Systematic  
Reviews.* 2014;**9**:CD000963. DOI:  
10.1002/14651858.CD000963.pub3

[53] Han DJ-S. Physiology of  
acupuncture: Review of thirty years  
of research. *The Journal of Alternative  
and Complementary Medicine.*  
1997;**3**(Suppl. 1): s-101-s-8

[54] Furlan AD, van Tulder MW,  
Cherkin D, Tsukayama H, Lao L,  
Koes BW, et al. Acupuncture and  
dry-needling for low back pain.