

The Challenge

Of total healthcare costs in the United States, more than 75% is due to chronic conditions.¹ In 2008, the U.S. spent 16.2% of its GDP (\$2.3 trillion) on health care.² This exceeded the combined federal expenditures for national defense, homeland security, education, and welfare. By 2023, if we don't change how we confront this challenge, **annual** healthcare costs in the U.S. will rise to over \$4 trillion,^{3,4} the equivalent—in a single year—of four Iraq wars, making the cost of care using the current model economically unsustainable. If our health outcomes were commensurate with such costs, we might decide they were worth it. Unfortunately, the U.S. spends twice the median per-capita costs of other industrialized countries, as calculated by the Organization for Economic Cooperation and Development (OECD),⁵ but has extraordinarily poor outcomes for such a massive investment.⁶

Our current healthcare model fails to confront both the causes of and solutions for chronic disease and must be replaced with a model of comprehensive care geared to effectively treating and reversing this escalating crisis. This transformation requires something different than is usually available in our very expensive healthcare system.⁷

A Contributing Factor—Outdated Clinical Model

Despite notable advances in treating and preventing infectious disease and trauma, the acute-care model that dominated 20th century medicine has not been effective in treating and preventing chronic disease.

The primary driver of chronic disease is the interaction among genes, activities of daily living (lifestyle), and the environment.^{9,10,11}

Adopting a new operating system for 21st century medicine requires that we:

- Recognize and validate more appropriate and successful clinical models
- Re-shape the education and clinical practices of health professionals to help them achieve proficiency in the assessment, treatment, and prevention of chronic disease
- Reimburse equitably for lifestyle medicine and expanded preventive strategies, acknowledging that the greatest health threats now arise from how we live, work, eat, play, and move

Why doesn't the old model work?

Because chronic disease is a food- and lifestyle-driven, environment- and genetics-influenced phenomenon.

It won't be conquered with drugs and surgery, however helpful those tools may be in managing acute signs and symptoms. It won't be conquered by adding new or unconventional tools (e.g., botanical medicine, acupuncture) to a failing model. It won't be conquered by pharmacogenomics (although advances in that discipline should help reduce deaths from appropriately prescribed medication—estimated to be the 4th leading cause of hospital deaths¹²). The costly riddle of chronic disease can only be solved by shifting our focus from suppression and management of symptoms to addressing their underlying causes. Specifically, we must integrate what we know about how the

human body works with individualized, patient-centered, science-based care that addresses the causes of complex, chronic disease, which are rooted in lifestyle choices, environmental exposures, and genetic influences.

This perspective is completely congruent with what we might call the “omics” revolution. Formerly, scientists believed that once we deciphered the human genome we would be able to answer almost all the questions about the origins of disease. What we actually learned, however, is that human biology is far more complex than that. In fact, humans are not genetically hardwired for most diseases; instead, gene **expression** is altered by myriad influences, including environment, lifestyle, diet, activity patterns, psycho-social-spiritual factors, and stress. These lifestyle choices and environmental exposures can push us toward (or away from) disease by turning on—or off—certain genes. That insight has helped to fuel the global interest in Functional Medicine, which has that principle at its very core.

A Strategic Response

Functional Medicine **directly** addresses the underlying causes of disease by using a systems-oriented approach with transformative clinical concepts, original tools, and an advanced process of care [see below] and by engaging both patient and practitioner in a therapeutic partnership.

ELEMENTS OF FUNCTIONAL MEDICINE

Functional Medicine Matrix, including:

- Antecedents-Triggers-Mediators (ATMs) of disease
- Core Clinical Imbalances (interconnected physiological nodes that help clinicians detect common pathways and causes of dysfunction)
- Modifiable Lifestyle Factors

Process of Care

- Timeline (shows relationship of dysfunction to ATMs)
- GOTOIT System (describes the sequence and procedures of FM care)
- Therapeutic partnership

Comprehensive Tool Kit

- Surveys, questionnaires
- Forms
- Functional Nutrition tools

Functional Medicine practitioners look closely at the myriad interactions among genetic, environmental, and lifestyle factors that can influence long-term health and complex, chronic disease (*see Figure 1*). A major premise of Functional Medicine is that, with science, clinical wisdom, and innovative tools, we can identify many of the underlying causes of chronic disease and intervene to remediate the clinical imbalances, even before overt disease is present.

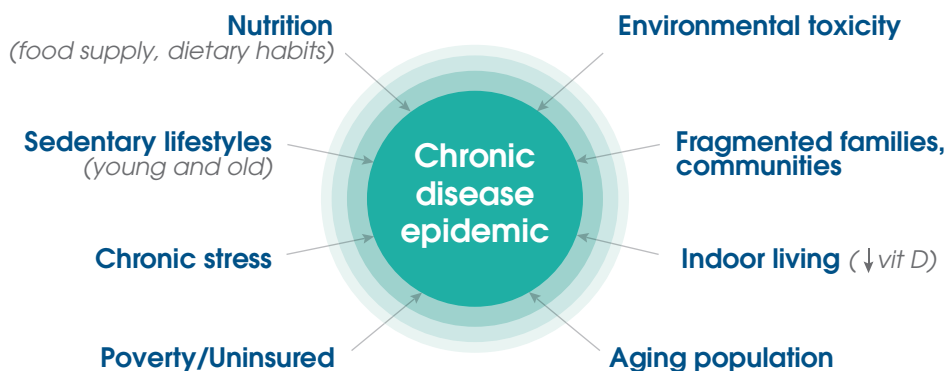


Figure 1. Major Influences Contributing to the Epidemic of Chronic Disease

Functional Medicine exemplifies just the kind of systems-oriented, personalized medicine that is needed to transform clinical practice. The Functional Medicine model of comprehensive care and primary prevention for complex, chronic illnesses is grounded in both science (evidence about common underlying mechanisms and pathways of disease; evidence about the contributions of environmental and lifestyle factors to disease) and art (the healing partnership and the search for insight in the therapeutic encounter).

What is Functional Medicine?

Functional Medicine is an approach to health care that conceptualizes health and illness as part of a continuum in which all components of the human biological system interact dynamically with the environment, producing patterns and effects that change over time. **Functional Medicine helps clinicians identify and ameliorate dysfunctions in the physiology and biochemistry of the human body as a primary method of improving patient health.** Functional Medicine is often described as the clinical application of systems biology.

Chronic disease is almost always preceded by a period of declining function in one or more of the body's systems. Restoring health requires reversing (or substantially improving) the specific dysfunctions that have contributed to the disease state. Each patient represents a unique, complex, and interwoven set of environmental and lifestyle influences on intrinsic functionality (their genetic vulnerabilities) that have set the stage for the development of disease or the maintenance of health.

To manage the complexity inherent in this approach, IFM has created practical models for obtaining and evaluating clinical information that lead to individualized, patient-centered therapies. Functional Medicine concepts, practices, and tools have evolved considerably over a thirty-year period, reflecting the dramatic growth in the evidence base concerning the key common pathways to disease (e.g., inflammation, GI dysfunction, oxidative stress); the role of diet, stress, and physical activity; the emerging sciences of genomics, proteomics, and metabolomics; and the effects of environmental degradation (air, water, soil) on health.

Elements of Functional Medicine

The knowledge base—or “footprint”—of Functional Medicine is shaped by **seven core principles**:

- Acknowledging the **biochemical individuality** of each human being, based on concepts of genetic and environmental uniqueness
- Incorporating a **patient-centered** rather than a disease-centered approach to treatment
- Seeking a **dynamic balance** among the internal and external factors in a patient’s body, mind, and spirit
- Addressing the **web-like interconnections** of internal physiological factors
- Identifying **health as a positive vitality**—not merely the absence of disease—and emphasizing those factors that encourage a vigorous physiology
- **Promoting organ reserve** as a means of enhancing the health span, not just the life span, of each patient
- Functional Medicine is a **science-using profession**

To assist clinicians in understanding and applying Functional Medicine, IFM has created a highly innovative way of representing the patient’s signs, symptoms, and common pathways of disease. Adapting, organizing, and integrating into the Functional Medicine Matrix the seven biological systems in which **core clinical imbalances** are found actually creates an intellectual bridge between the rich basic science literature concerning physiological mechanisms of disease (first two years of medical training) and the clinical studies, clinical experience, and clinical diagnoses of the second two years of medical training. These core clinical imbalances serve to marry the mechanisms of disease with the manifestations and diagnoses of disease.

- **Assimilation:** digestion, absorption, microbiota/GI, respiration
- **Defense and repair:** immune, inflammation, infection/microbiota
- **Energy:** energy regulation, mitochondrial function
- **Biotransformation and elimination:** toxicity, detoxification
- **Transport:** cardiovascular and lymphatic systems
- **Communication:** endocrine, neurotransmitters, immune messengers
- **Structural integrity:** subcellular membranes to musculoskeletal integrity

Using this construct, it is possible to see that one disease/condition may have multiple causes (i.e., multiple clinical imbalances), just as one fundamental imbalance may be at the root of many seemingly disparate conditions (see Figure 2).

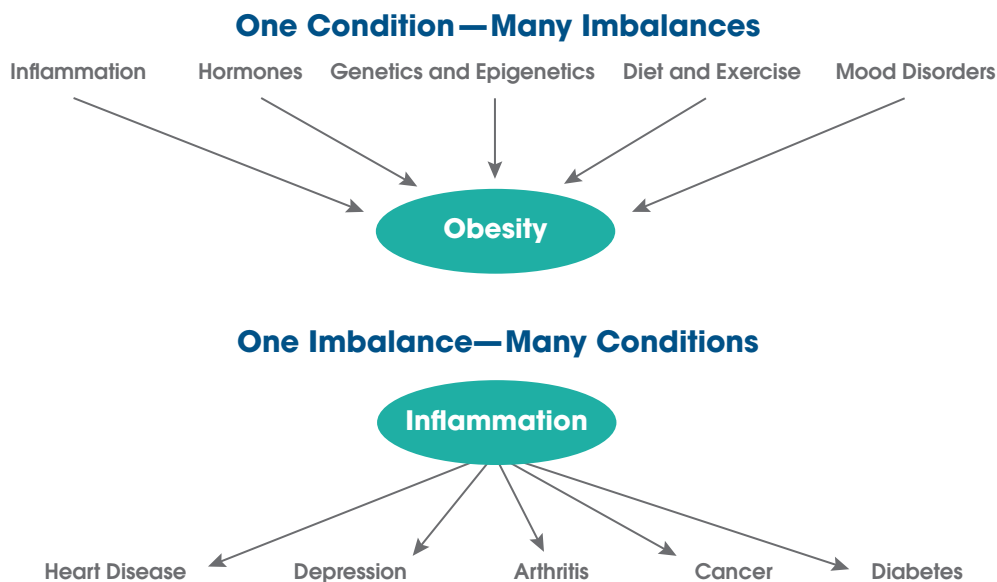


Figure 2. Core Clinical Imbalances—Multiple Influences

The most important precept to remember about Functional Medicine is that restoring balance—in the patient’s environmental inputs and in the body’s fundamental physiological processes—is the key to restoring health.

Constructing the Model and Putting it into Practice

The scientific community has made incredible strides in helping practitioners understand how environment and lifestyle, interacting continuously through an individual’s genetic heritage, psychosocial experiences, and personal beliefs, can impair certain biological functions (assimilation, defense and repair, energy production, biotransformation and elimination, communication, transport, and structural integrity—the seven core clinical imbalances).

IFM has developed concepts and tools that help to collect, organize, and make sense of the data gathered from an expanded history, physical exam, and laboratory tests, including:

- The GOTOIT system, which presents a logical process for eliciting the patient’s whole story and ensuring that assessment and treatment are in accord with that story:
 - G = Gather Information
 - O = Organization Information
 - T = Tell the Complete Story Back to the Patient
 - O = Order and Prioritize
 - I = Initiate Treatment
 - T = Track Outcomes
- The Functional Medicine Timeline, which helps to connect key events in the patient’s life with the onset of symptoms of dysfunction
- The Functional Medicine Matrix, which provides a unique and succinct way to organize and analyze all of a patient’s health data in the context of the seven areas of clinical imbalance (*see Figure 3*)

The patient’s lifestyle influences are entered across the bottom of the Matrix, and the antecedents, triggers, and mediators of disease/dysfunction are entered in the upper left corner. The centrality of the patient’s mind, spirit, and emotions, with which all other elements interact, is clearly shown in the figure. Using this information architecture, the clinician can create a comprehensive snapshot of the patient’s story and visualize the most important clinical elements of Functional Medicine:

1. identifying each patient’s antecedents, triggers, and mediators of disease and dysfunction;
2. discovering the factors in the patient’s lifestyle and environment that influence the expression of health or disease;
3. applying all the data collected about a patient to a matrix of biological systems, within which disturbances in function originate and are expressed; and
4. integrating all this information to create a comprehensive picture of what is causing the patient’s problems, where they are originating, what has influenced their development, and—as a result of this critical analysis—where to intervene to begin reversing the disease process.

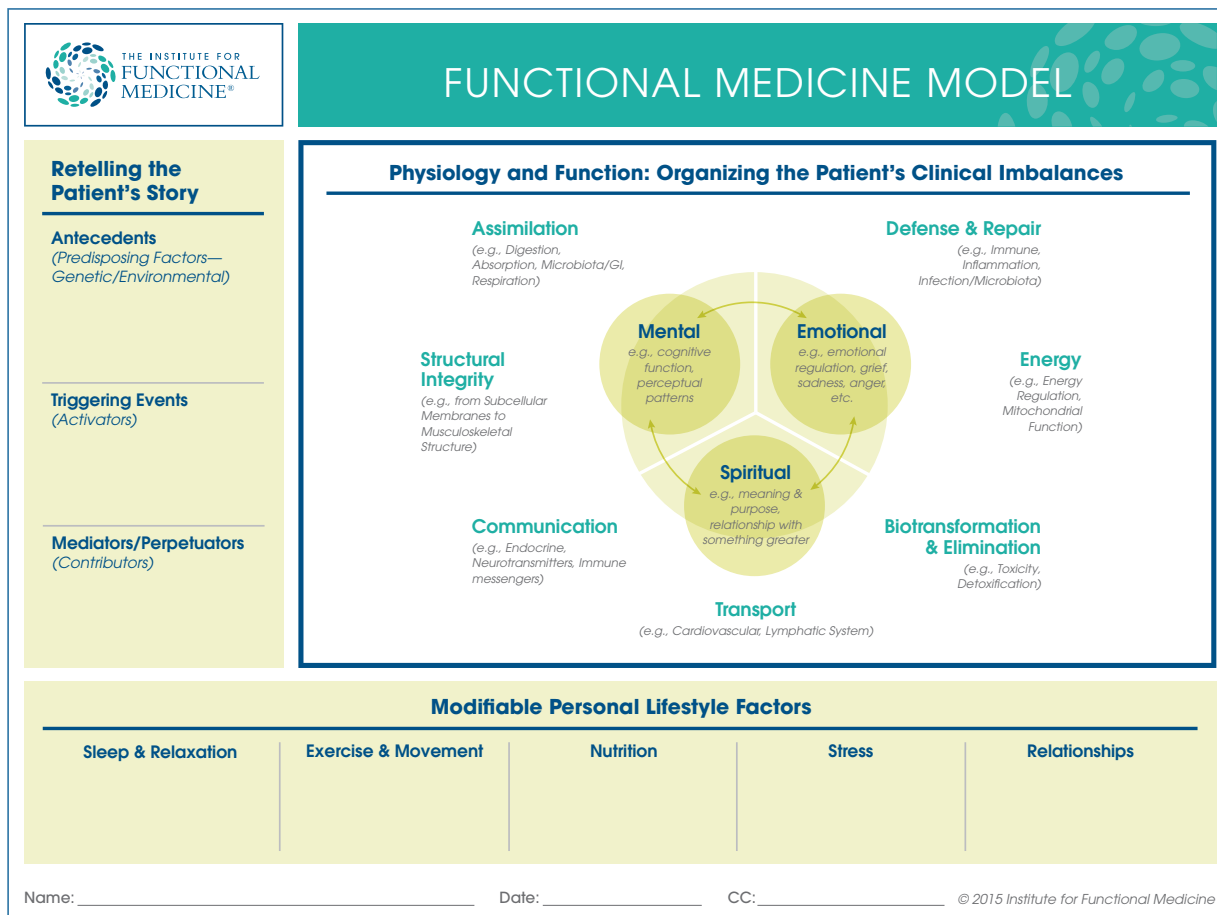


Figure 3. The Functional Medicine Matrix

A Functional Medicine treatment plan may involve one or more of a broad range of therapies, including many different dietary interventions (e.g., elimination diet, anti-inflammation diet, low glycemic-index diet), nutraceuticals (e.g., vitamins, minerals, essential fatty acids, botanicals), and lifestyle changes (e.g., improving sleep quality/quantity, increasing physical activity, decreasing stress and learning stress management techniques, quitting smoking). In fact, so vital is nutrition to the practice of Functional Medicine that IFM has established a core emphasis on Functional Nutrition and has funded the development of a set of unique, innovative tools for developing and applying dietary recommendations.

Scientific support for the Functional Medicine approach to treatment can be found in a large and rapidly expanding evidence base about the therapeutic effects of **nutrition** (including both dietary choices and the clinical use of vitamins, minerals, and other nutrients such as fish oils);^{13,15,15} **botanicals**;^{16,17,18} **exercise**¹⁹ (aerobics, strength training, flexibility); **stress management**;²⁰ detoxification;^{21,22,23} **acupuncture**;^{24,25,26} **manual medicine** (massage, manipulation);^{27,28,29} and **mind/body techniques**^{30,31,32} such as meditation, guided imagery, and biofeedback.

All of this work is done within the context of a therapeutic partnership. The practitioner engages the patient in a collaborative relationship, respecting the patient's role and knowledge of self, and ensuring that the patient learns to take responsibility for his/her own choices and for complying with the recommended interventions. Learning to assess a patient's readiness to change and then providing the necessary guidance, training, and support are just as important as ordering the right lab tests and prescribing the right therapies.

Summary

The practice of Functional Medicine involves four essential components: (1) eliciting the **patient's complete story** during the Functional Medicine intake; (2) identifying and addressing the challenges of the patient's **modifiable lifestyle factors and environmental exposures**; (3) organizing the patient's clinical imbalances by underlying causes of disease in a **systems biology matrix** framework, and (4) establishing an **effective therapeutic partnership** between practitioner and patient.

A great strength of Functional Medicine is its relevance to all healthcare disciplines and medical specialties, any of which can—to the degree allowed by their training and licensure—could apply a Functional Medicine approach, including using the Matrix as a basic template for organizing and coupling knowledge and data. In addition to providing a more effective approach to preventing, treating, and reversing complex chronic disease, Functional Medicine can also provide a common language and a unified model that can be applied across a wide variety of health professions to facilitate integrated care.

Functional Medicine is playing a key role in the effort to solve the modern epidemic of chronic disease that is creating a health crisis both nationally and globally. Because chronic disease is a food- and lifestyle-driven, environment- and genetics-influenced phenomenon, we must have an approach to care that integrates all these elements in the context of the patient's complete story. Functional Medicine does just that and provides an original and creative approach to the collection and analysis of this broad array of information. Using all the concepts and tools that IFM has developed, Functional Medicine practitioners contribute vital skills for treating and reversing complex, chronic disease.

References

- ¹ Centers for Disease Control. Accessed June 6, 2010 at <http://www.cdc.gov/chronicdisease/resources/publications/AAG/chronic.htm>
- ² Centers for Medicare & Medicaid Services. NHE Fact Sheet. Downloaded from http://www.cms.hhs.gov/NationalhealthExpendData/25_NHE_Fact_Sheet.asp on February 14, 2010
- ³ Estimate from the Millken Institute report: *An Unhealthy America: The Economic Impact of Chronic Disease*, <http://www.chronicdiseaseimpact.com/>
- ⁴ Bodenheimer T, Chen E, Bennett H. Confronting the growing burden of chronic disease: can the U.S. health care workforce do the job? *Health Affairs*. 2009;28(1):64-74.
- ⁵ Bureau of Labor Education, University of Maine. The U.S. Health Care System: Best in the world, or just the most expensive? Summer, 2001.
- ⁶ The Commonwealth Fund Commission on a High Performance Health System. Why Not the Best? Results from the national scorecard on U.S. health system performance, July 2008.
- ⁷ Jones DS, Hofmann L, Quinn S. *21st Century Medicine: A New Model for Medical Education and Practice*. Gig Harbor, WA: The Institute for Functional Medicine, 2010 (rev 2011).
- ⁸ Jones DS, Hofmann L, Quinn S. *21st Century Medicine: A New Model for Medical Education and Practice*. The Institute for Functional Medicine: Gig Harbor, WA, 2009.
- ⁹ Willett WC. Balancing life-style and genomics research for disease prevention. *Science*. 2002; 296:695-97.
- ¹⁰ Thorpe KE, Florence CS, Howard H, Joski P. The rising prevalence of treated disease: effects on private health insurance spending. *Health Affairs*, Web exclusive, June 27, 2005.
- ¹¹ Heaney RP. Long-latency deficiency disease: insights from calcium and vitamin D. *Am J Clin Nutr* 2003;78:912-9.
- ¹² Lazarou J, Pomeranz BH, Corey PN. Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. *JAMA*. 1998;279:1200-1205
- ¹³ Ames BN, et al. High-dose vitamin therapy stimulates variant enzymes with decreased coenzyme binding affinity (increased Km. *Am J Clin Nutr*. 2002;75:616-58
- ¹⁴ Lands B. Prevent the cause, not just the symptoms. *Prostaglandins Other Lipid Mediat*. 2011 Jul 30. [Epub ahead of print]
- ¹⁵ Sofi F, Abbate R, Gensini GF, Casini A. Accruing evidence on benefits of adherence to the Mediterranean diet on health: an updated systematic review and meta-analysis. *Am J Clin Nutr*. 2010 Nov;92(5):1189-96. Epub 2010 Sep 1.
- ¹⁶ Agency for Healthcare Research and Quality. *Milk Thistle: Effects on Liver Disease and Cirrhosis and Clinical Adverse Effects*. Evidence Report/Technology Assessment no. 21. Rockville, MD: Agency for Healthcare Research and Quality; 2000. AHRQ publication no. 01-E025.
- ¹⁷ <http://nccam.nih.gov/health/greentea/>
- ¹⁸ <http://nccam.nih.gov/health/stjohnswort/ataglance.htm>
- ¹⁹ McArdle WD, Katch EI, Katch VL. *Exercise Physiology: Energy, Nutrition, and Human Performance*. Philadelphia: Lippincott Williams and Wilkins, 2001.
- ²⁰ McCraty R. Coherence: Bridging personal, social and global health. *Altern Therapies*. 2010;16(4): 10-24.
- ²¹ Yi B, Kasai H, Lee HS, Kang Y, Park JY, Yang M. Inhibition by wheat sprout (*Triticum aestivum*) juice of bisphenol A-induced oxidative stress in young women. *Mutat Res*. 2011 Sep 18;724(1-2):64-8. Epub 2011 Jun 28.
- ²² Johnson CH, Patterson AD, Idle JR, Gonzalez FJ. Xenobiotic Metabolomics: Major Impact on the Metabolome. *Annu Rev Pharmacol Toxicol*. 2011 Jul 6. [Epub ahead of print]
- ²³ Scapagnini G, Caruso C, Calabrese V. Therapeutic Potential of Dietary Polyphenols against Brain Ageing and Neurodegenerative Disorders. *Adv Exp Med Biol*. 2011;698:27-35.
- ²⁴ Colak MC, Kavakli A, Kiliç A, Rahman A. Postoperative pain and respiratory function in patients treated with electroacupuncture following coronary surgery. *Neurosciences (Riyadh)*. 2010 Jan;15(1):7-10.
- ²⁵ Cao H, Pan X, Li H, Liu J. Acupuncture for treatment of insomnia: a systematic review of randomized controlled trials. *J Altern Complement Med*. 2009 Nov;15(11):1171-86.
- ²⁶ Lee A, Fan LT. Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting. *Cochrane Database Syst Rev*. 2009 Apr 15;(2):CD003281.
- ²⁷ Rubinstein SM, Leboeuf-Yde C, Knol DL, de Koekkoek TE, Pfeifle CE, van Tulder MW. The benefits outweigh the risks for patients undergoing chiropractic care for neck pain: a prospective, multicenter, cohort study. *J Manipulative Physiol Ther*. 2007 Jul-Aug;30(6):408-18.
- ²⁸ Beyerman KL, Palmerino MB, Zohn LE, Kane GM, Foster KA. Efficacy of treating low back pain and dysfunction secondary to osteoarthritis: chiropractic care compared with moist heat alone. *J Manipulative Physiol Ther*. 2006 Feb;29(2):107-14.
- ²⁹ Kshetry VR, Carole LF, Henly SJ, Sendelbach S, Kummer B. Complementary alternative medical therapies for heart surgery patients: feasibility, safety, and impact. *Ann Thorac Surg*. 2006 Jan;81(1):201-5.
- ³⁰ Ornish D, et al. Changes in prostate gene expression in men undergoing an intensive nutrition and lifestyle intervention. *PNAS*. 2008;105(24):8369-8374 www.pnas.org/cgi/doi/10.1073/pnas.0803080105
- ³¹ Xiong GL, Doraiswamy PM. Does meditation enhance cognition and brain plasticity? *Ann NY Acad Sci*. 2009;1172:63-9.
- ³² Hölzel BK, et al. Mindfulness practice leads to increases in regional brain gray matter density. *Psychiatry* 2011; 30;191(1):36-43. Epub 2010 Nov 10.



THE INSTITUTE FOR
FUNCTIONAL
MEDICINE®

The global leader in Functional Medicine

505 S 336th, Suite 600 ■ Federal Way, WA 98003
800 228 0622 ■ functionalmedicine.org