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seen as intractable, even the most effective drugs will not work if physi cians fail to prescribe them and if patients fail to take them. Although the dominant forms of investigation in medicine seek cellular or molecular therapeutic targets to modify disease, behavioral sciences have revealed cognitive pathways that operate nearly as predictably as the genetic code. The opportunity for behavioral economics to improve health and health care delivery derives from its recognition of these behavioral pathways and the growing empirical evidence about how to best make use of them.

■ ■FURTHER READING Asch DA et al: Automated hovering in health care—Watching over the 5000 hours. N Engl J Med 367:1, 2012. Chater N, Loewenstein G: The i-frame and the s-frame: How focus ing on individual-level solutions has led behavioral public policy astray. Behav Brain Sci 46:e147, 2023. Loewenstein G et al: Asymmetric paternalism to improve health behaviors. JAMA 298:2415, 2007. Thaler RH et al: Choice architecture, in The Behavioral Foundations of Public Policy, E. Shafir (ed). Princeton, NJ, Princeton University Press, 2013, pp 428–439. Volpp KG et al: Financial incentive-based approaches for weight loss: A randomized trial. JAMA 300:2631, 2008. Helene M. Langevin

Complementary and

Integrative Therapies

and Practices PART 20 Emerging Topics in Clinical Medicine The search for health and improved well-being includes many treatments, practices, and systems of care that may have originated

outside conven tional medicine but are gradually being folded into mainstream health care. The current health care system is fragmented, often emphasizing the pharmacologic treatment of disease alone, while often neglect ing the promotion, support, and, importantly, restoration of health. Though the disease-focused model is dominant in our research and health care ecosystem, there has been a longstanding awareness that many chronic diseases, including pain conditions, can be prevented or better managed by incorporating nonpharmacologic interventions such as nutrition, exercise, and stress management into care, with an emphasis on understanding the person as a whole. Many complemen tary practices follow this model, and there is preliminary evidence indicating that these approaches lead to improved self-care, a better personal sense of well-being, and a greater commitment to a healthy lifestyle. Integrative health emphasizes not only the integration of complementary and conventional care but also an integrative approach to treatment of the whole person. This includes expanding our under standing of how physiologic systems interact with one another and of the connections between physical, psychological, and social aspects of health. Integrative health also includes striving for a better understand ing of "salutogenesis" or pathogenesis in reverse, meaning the process by which health is restored when recovering from an injury, acute ill ness, or the exacerbation of a chronic disease, or when a "predisease" condition such as prediabetes or prehypertension is reversed through changes in behavior rather than pharmacologic treatment. DEFINITIONS AND SCOPE Complementary health therapies and practices include a broad range of practices, interventions, and natural products that are not typically part of conventional medical care (Table 495-1). The term complementary

refers to the use of these practices together with conventional therapies and is increasingly preferred to the term alternative, which denotes usage as a substitute for standard care. The term integrative health care refers to conventional and comple mentary therapies and practices used together in a coordinated way. Integrative health also emphasizes care of the whole person that aims to improve health in multiple interconnected domains: social, psychologi cal, and physical, including multiple organs and systems. The term whole person health involves looking at the whole person— not just separate organs or body systems—and considering multiple factors that promote either health or disease. It means helping and empowering individuals, families, communities, and populations to improve their health in multiple interconnected biological, behavioral, social, and environmental areas. Instead of treating a specific disease, whole person health focuses on restoring health, promoting resilience, and preventing diseases across a lifespan. The use of integrative approaches to health and well-being has grown within care settings across the United States. Researchers are currently exploring the potential benefits of integrative health in a variety of situations, including pain management for military person nel and veterans, relief of symptoms in cancer patients and survivors, and programs to promote healthy behaviors. Although complementary therapies and practices vary widely, it is useful to classify them by their primary therapeutic input, which may be dietary (e.g., diet, herbs), psychological (e.g., meditation), physical (e.g., massage, acupuncture), or the combination of psychological and physi cal (e.g., yoga, tai chi). Although some complementary health practices are recommended or provided by a physician or a complementary health care provider such as a chiropractor, acupuncturist, or naturo pathic practitioner, many of these practices are undertaken as "selfcare." Although some are reimbursed, most are paid for out of pocket. PATTERNS OF USE The first large survey of use of complementary health practices was performed by David Eisenberg and associates in 1993. It surprised the medical community by showing that >30% of Americans use complementary health products and practices. Many surveys since that time have extended those conclusions. The

National Health Interview Survey (NHIS), a large, national household survey in which thousands of Americans are interviewed about their health- and illness-related experiences, is conducted annually by the National Center for Health Statistics, a component of the Centers for Disease Control and Preven tion. This survey, which addressed the use of complementary health practices in 2002, 2007, 2012, 2017, and 2022 uses methods that create a nationally representative sample and has a sample size large enough to permit valid estimates about some subgroups. An analysis of data from 27,651 adults in the most recent survey, which was conducted in 2022, evaluated changes in the U.S. adult use of seven complementary health therapies and practices over a 20-year period (from 2002 to 2022): yoga, meditation, massage therapy, chiro practic care, acupuncture, naturopathy, and guided imagery/progressive muscle relaxation. Over 20 years, U.S. adults not only increased their overall use of complementary health approaches but were also more likely to use them specifically for managing pain. In 2022, 36.7% of people used at least one of the seven approaches, compared to 19.2% in 2002. Use of yoga, meditation, and massage therapy increased the most from 2002 to 2022. Use of yoga increased from 5% in 2002 to 15.8% in 2022, rising from the fifth to the second most-used practice. Medita tion increased from 7.5% in 2002 to 17.3% in 2022, and it remained the most-used complementary health practice over the 20 years. The 2012 survey, for which there are data about use of natural products, yielded the estimate that nonvitamin, nonmineral dietary supplements are used by ~18% of adults and 5% of children. Americans often pay out-of-pocket for complementary health products and practices; the estimated out-of-pocket expenditure for complementary health practices in 2012 was $30.2 billion ($28.3 bil lion for adults and $1.9 billion for children), representing 1.1% of total health expenditures and 9.2% of out-of-pocket costs. On visits to com plementary practitioners, Americans spent $14.7 billion out of pocket,

TABLE 495-1 Glossary of Complementary and Integrative Health Therapies and Practices Acupuncture A family of procedures involving stimulation of defined anatomic points, a component of the major Asian medical traditions; most common application involves penetrating the skin with thin, solid, metallic needles that are manipulated by the hands or by electrical stimulation Ayurvedic medicine The major East Indian traditional medicine system; treatment combines products (mainly derived from plants, but may also include animal, metal, and mineral), diet, exercise, and lifestyle Biofeedback The use of electronic devices to help people learn to consciously control body functions such as breathing or heart rate Chiropractic Chiropractic care involves the adjustment of the spine and joints to influence the body’s nervous system and natural defense mechanisms to alleviate pain and improve general health; primarily used to treat back problems, headaches, nerve inflammation, muscle spasms, and other injuries and traumas Dietary supplement A product that is intended to supplement the diet, is taken by mouth, contains one or more dietary ingredients (including vitamins, minerals, herbs, amino acids, or certain other substances), and is labeled as being a dietary supplement Homeopathy A medical system with origins in Germany that is based on a core belief in the theory of “like cures like”—compounds that produce certain syndromes, if administered in very diluted solutions, will be curative Hypnosis The induction of an altered state of consciousness characterized by increased responsiveness to suggestion Massage Manual therapies that manipulate muscle and connective tissues to enhance the function of those tissues and promote muscle relaxation and well-being Meditation A group of practices, largely based in Eastern spiritual traditions, intended to focus or control attention and obtain greater awareness of the present moment, or mindfulness Mind and body practices A large and diverse group of procedures or techniques that are administered or taught by a trained

practitioner or teacher; examples include acupuncture, massage therapy, meditation, relaxation techniques, spinal manipulation, tai chi, and yoga Natural products A variety of products such as herbs (also known as botanicals), vitamins and minerals, and probiotics, which are widely marketed, readily available to consumers, and often sold as dietary supplements Naturopathy A clinical discipline that emphasizes a holistic approach to the patient, herbal medications, diet, and exercise; practitioners have degrees as doctors of naturopathy Osteopathy A clinical discipline, now incorporated into mainstream medicine, that historically emphasized spinal manipulative techniques to relieve pain, restore function, and promote overall health Qigong A mind and body practice originating in China that involves using exercises to optimize energy within the body, mind, and spirit, with the goal of improving and maintaining health and well-being Relaxation techniques A number of practices such as progressive relaxation, guided imagery, biofeedback, self-hypnosis, and deep breathing exercises, with the goal of producing the body's natural relaxation response, characterized by slower breathing, lower blood pressure, and a feeling of increased well-being Spinal manipulation, osteopathic manipulation A technique where practitioners use their hands or a device to apply a controlled thrust (i.e., a force of a specific magnitude or degree in a specific direction) to a joint of the spine Tai chi A mind and body practice originating in China that involves slow, gentle movements and sometimes is described as "moving meditation" Traditional Chinese medicine A medical system that uses acupuncture, herbal mixtures, massage, exercise, and diet which is almost 30% of what they spent out of pocket on services by conventional physicians ($49.6 billion). On natural products, such as dietary supplements, Americans spent $12.8 billion out of pocket, which was about one-quarter (24%) of what they spent out of pocket on prescription drugs ($54.1 billion). Trends are even more striking for pain conditions. According to the NHIS surveys, painful conditions are the most common reasons why American adults use complementary health products and practices. About 40 million American adults experience severe pain in any given year, and they spend >$14 billion out of pocket on complementary therapies to manage their pain. A recent analysis of NHIS data showed a notable rise in the proportion of U.S. adults using complementary health approaches specifically for pain management. Among participants using any of the complementary health approaches, the percentage reporting use for pain management increased from 42.3% in 2002 to 49.2% in 2022. Some patients seek out complementary health practitioners because they offer greater personal attention. For others, therapies and prac tices perceived as outside the mainstream reflect a "self-help" approach to health and well-being or satisfy a search for "natural" or less invasive alternatives. Since dietary supplements are labeled as "natural," they are often believed, incorrectly, to be inherently healthy. CATEGORIES OF COMPLEMENTARY AND INTEGRATIVE HEALTH THERAPIES AND PRACTICES BASED ON PRIMARY THERAPEUTIC INPUT ■ ■PRIMARY DIETARY INPUT Natural products, including plant and animal products, have a long and impressive history as sources of medicine and as important resources

for biologic research. Whether as herbal supplements or as part of a diet, natural products are frequently consumed as a complex mixture of substances. This complexity can be further amplified by potential interactions with endogenous metabolic pathways, including those associated with the microbiome. The result is a collection of natural products and their metabolites that, individually and/or collectively, are associated with a network of biologic activity. Importantly, in addi tion to direct action on biologic targets, the activity of natural products can be influenced by an individual's diet, health, and metagenomic background. Although much remains to be understood

about mecha nisms of action, results of research on some natural products for a few conditions appear promising. In addition, in the 2012 NHIS, users of natural product supplements were twice as likely to report taking the natural product for a general well-being reason than for treatment of a specific health condition (88.9 vs 44.9%, respectively). Although to date, research on natural products has focused on their use for specific diseases as outlined below, a better understanding is needed about how natural products, including food, can be used most effectively to sup port health. Cannabinoids An increasing amount of attention has been given recently to the nonpsychogenic effects of cannabinoids, such as can nabidiol (CBD), and terpenes found in the cannabis plant on chronic pain, particularly neuropathic pain; studies have found some limited evidence that these medicines produced better pain relief than place bos. Cannabinoids (cannabis extract, synthetic tetrahydrocannabinol [THC]) have been studied for therapeutic effects in multiple sclerosis (MS) and may relieve spasticity as well as pain in people with MS; how ever, no marijuana-derived medications are approved by the U.S. Food and Drug Administration (FDA) to treat MS. Sativex, an oral mucosal spray containing a mixture of THC and CBD, has received regulatory

approval in >25 countries outside the United States for the treatment of spasticity (muscle stiffness/spasm) due to MS. Sativex is currently licensed in the United Kingdom for use as an add-on treatment for MS-related spasticity when people have shown inadequate response to other symptomatic treatments. Importantly, the psychoactive prop erties and other potential adverse effects of preparations containing cannabinoids need to be considered, including interactions with other medications and natural products; more research is needed in this area.

Melatonin Melatonin has been shown to help reduce anxiety in patients who are about to have surgery and may be as effective as standard treatment with midazolam in reducing preoperative anxiety. Findings from clinical trials support the use of melatonin supplements for sleep problems caused by shift work or jet lag and for improving sleep-onset latency and daytime sleepiness in people with insomnia. However, there are safety concerns about the use of melatonin by chil dren and teenagers. U.S. sales of melatonin increased by about 150% during the COVID-19 pandemic, and the number of reports to U.S. poison control centers about pediatric melatonin ingestion increased from 8337 in 2012 to 52,563 in 2021. Further, according to a study pub lished in JAMA, a majority of melatonin “gummy” products were inac curately labeled, with most products exceeding the declared amount of melatonin and CBD. Omega-3 Fatty Acids Clinical trials on rheumatoid arthritis (RA) have found that fish oil supplements can help alleviate tender joints and morning stiffness and reduce the daily nonsteroidal anti-inflammatory drug (NSAID) requirement of RA patients; however, data are not as definitive for other pain conditions. Gamma-linolenic acid (GLA) is an omega-6 fatty acid found in the oils from some plants, including evening primrose (Oenothera biennis), borage (Borago officinalis), and black currant (Ribes nigrum). Although oils containing GLA may have some benefit in relieving RA symptoms, only a few studies have been conducted on each of the oils. At present, it is uncertain whether omega-3 fatty acid supplementation is useful for depression. Some studies have shown small effects in adjunctive therapy in patients with a diagnosis of major depressive disorder (MDD) and in depres sive patients without a diagnosis of MDD; however, most trials have been adjunctive studies. Controlled trials of omega-3 fatty acids as monotherapy are inconclusive compared to standard antidepressant medicines, and it remains unclear whether a mechanism is present to suggest that a pharmacologic or biologic antidepressant effect exists. Furthermore, there is evidence that a high dosage of fish oil supple mentation is associated with a significant increased risk of atrial fibril lation (AF) compared with

placebo. PART 20 Emerging Topics in Clinical Medicine Antioxidants Findings from the Age-Related Eye Disease Studies (AREDS and AREDS2) suggest that dietary supplementation with antioxidant vitamins may slow the progression of age-related macular degeneration (AMD). Compared to the original AREDS formulation, the AREDS2 formulation replaced beta-carotene with lutein and zea xanthin due to increased risk of cancer in smokers taking high dose beta-carotene. Of note, in AREDS2, supplementation with lutein/ zeaxanthin only appeared to be beneficial in participants with low dietary lutein and zeaxanthin. In a similar vein, a study using baseline data from the AREDS cohort reported that individuals eating healthier diets, characterized by higher intake of vegetables, whole grains, and seafoods, compared to those eating less healthy “Western” diets, were less likely to show signs of early AMD. It is therefore unclear at present whether the AREDS formula should be recommended for the general population regardless of diet. Challenges of Research on Natural Products One challenge in this area is the extremely varied doses of natural products that are sold over the counter and used without much guidance or evidence of effi cacy. We also know from research on vitamins that “more is not neces sarily better” and that taking a “natural” substance such as a vitamin in quantities that greatly exceed what is found in food can be harmful. Additional challenges in the assessment of plant products include their complexity and variability, including possible instability of active

components or the presence of impurities, conflicting or unreliable conclusions in the literature, and low statistical power of studies. Fur ther, there is a paucity of data on the safety of many products, including the safety of their use in a twenty-first-century context (e.g., if taken with modern prescription drugs) and their appropriate use in the con text of traditional or indigenous practices. Regulation There is an important distinction between natural products sold as dietary supplements and drugs developed from natural sources that are used to treat specific diseases. The Dietary Supplement Health and Education Act (DSHEA), passed in 1994, gives authority to the FDA to regulate dietary supplements, but with expecta tions that differ in many respects from the regulation of drugs or food additives. Purveyors of dietary supplements cannot claim that they prevent or treat any disease. They can, however, claim that they main tain “normal structure and function” of body systems. For example, a product cannot claim to treat arthritis, but it can claim to maintain “normal joint health.” Homeopathic products predate FDA drug regulations and are sold with no requirement that they be proved effective. Although homeo pathic products are widely believed to be safe because they are highly dilute, one product, a nasal spray called Zicam, was withdrawn from the market when it was found to produce anosmia, probably because of significant zinc content. In January 2017, the FDA warned consumers about homeopathic teething tablets containing belladonna that pose a serious risk to infants and children. Regulation of advertising and marketing claims is the purview of the Federal Trade Commission (FTC). The FTC does take legal action against promoters or websites that advertise or sell dietary supplements with false or deceptive statements. Misleading marketing of dietary supplements, homeopathic products, and indeed other complementary health products and practices contributes to the very significant risk that individuals will use them instead of effective conventional modali ties. For example, in April 2020, the FTC sent warning letters to several companies allegedly selling unapproved products—some of which included high-dose dietary supplements—that may violate federal law by making deceptive or scientifically unsupported claims about their ability to treat or cure COVID-19. Inherent Toxicity Although the public may believe that “natu ral” equates with “safe,” it is abundantly clear that natural products can be toxic. Misidentification of medicinal mushrooms has led to liver failure. Contamination of tryptophan supplements caused the eosinophilia-myalgia

syndrome. Herbal products containing particular species of Aristolochia were associated with genitourinary malignan cies and interstitial nephritis. In 2013, dietary supplements containing 1,3-dimethylamylamine (DMAA), often touted as a “natural” stimu lant, led to cardiovascular problems, including heart attacks. Among the most controversial dietary supplements is Ephedra sinica, or ma huang, a product used in traditional Chinese medicine for short-term treatment of asthma and bronchial congestion. The scientific basis for these indications was revealed when ephedra was shown to contain ephedrine alkaloids, especially ephedrine and pseudoephedrine. With the promulgation of the DSHEA regulations, supplements containing ephedra and herbs rich in caffeine sold widely in the U.S. marketplace because of their claims to promote weight loss and enhance athletic performance. Reports of severe and fatal adverse events associated with use of ephedra-containing products led to an evidence-based review of the data surrounding them, and in 2004, the FDA banned their sale in the United States. A major current concern with dietary supplements is adulteration with pharmacologically active compounds. Multi-ingredient products marketed for weight loss, bodybuilding, “sexual health,” and athletic performance are of particular concern. Recent FDA recalls have involved contamination with steroids, diuretics, stimulants, and phos phodiesterase type 5 inhibitors. Herb-Drug Interactions A number of natural products have potential impacts on the metabolism of drugs. This effect was illustrated most compellingly with the demonstration in 2000 that consumption

TABLE 495-2 Resources for Dietary Supplement–Drug Interactions National Institutes of Health National Center for Complementary and Integrative Health (NCCIH) https://www.nccih.nih.gov/health/know-science/how-medications-supplements-

interact The National Institutes of Health NCCIH Know the Science initiative provides information for patients about complex scientific health topics such as drugsupplement interactions. Medscape http://www.medscape.com/druginfo/druginterchecker?cid=med This website is maintained by WebMD and includes a free drug interaction checker tool that provides information on interactions between two or more drugs, herbals, and/or dietary supplements. NatMed https://naturalmedicines.therapeuticresearch.com/tools/interaction-checker.aspx This website provides an interactive natural product–drug interaction checker tool that identifies interactions between drugs and natural products, including herbals and dietary supplements. This service is available by subscription. of St. John’s wort interferes with the bioavailability of the HIV protease inhibitor indinavir. Later studies showed its similar interference with metabolism of topoisomerase inhibitors such as irinotecan and with cyclosporine and many other drugs. The breadth of interference stems from the ability of hyperforin in St. John’s wort to upregulate expression of the pregnane X receptor, a promiscuous nuclear regulatory factor that promotes the expression of many hepatic oxidative, conjugative, and efflux enzymes involved in drug and food metabolism. Because of the large number of compounds that alter drug metabo lism and the large number of agents some patients are taking, identifi cation of all potential interactions can be a daunting task. Several useful Web resources are available as information sources (Table 495-2). Clearly, attention to this problem is particularly important with drugs with a narrow therapeutic index, such as anticoagulants, antiseizure medications, antibiotics, immunosuppressants, and cancer chemo therapeutic agents. Although there are many examples of substances of natural origin successfully used as pharmaceutical drugs, in general, natural products ingested as food or herbal teas, rather than concen trated extracts, are less likely to cause harm. ■ ■PRIMARY PSYCHOLOGICAL INPUT Therapies and practices whose primary therapeutic input is predomi nantly mental include

conventional types of psychotherapy, such as cognitive behavioral therapy (CBT), and complementary practices, such as meditation and mindfulness-based stress reduction (MBSR). Relaxation techniques, including biofeedback-assisted relaxation, also fall into this category. The boundary between conventional and com plementary can be blurred, as CBT programs, for example, frequently incorporate elements of MBSR and relaxation techniques. These therapies and practices are being gradually integrated into aspects of conventional care, such as cardiac rehabilitation programs, and are playing an increasingly recognized role in the management of pain, as well as stress and sleep disturbances. Cognitive Behavioral Therapy (CBT) The American College of Physicians practice guidelines (2016) strongly recommend the use of CBT for insomnia (also called CBT-I) as the initial treatment for chronic insomnia. Although CBT-I often includes relaxation tech niques, it is not clear whether relaxation alone is beneficial. Various online applications are increasing the accessibility of these techniques at low cost. Mindfulness-Based Stress Reduction (MBSR) Mindfulness meditation has been found to significantly reduce pain in experimen tal and clinical settings and to improve a wide spectrum of clinically relevant cognitive and health outcomes, including low-back pain and fibromyalgia. Recent findings from neuroimaging and randomized controlled trials confirm that mindfulness meditation reduces pain by engaging multiple, unique, nonopioidergic mechanisms that are

distinct from placebo and that vary across meditative training level. There is some growing evidence that mindfulness meditation can have a beneficial effect on anxiety and help people recover from substance use disorders.

Hypnosis Findings from a few studies have demonstrated that train ing patients in the use of self-hypnosis significantly reduced their need for sedatives and analgesia when undergoing interventional radiologic procedures. Some studies also have suggested that hypnosis may be help ful for anxiety and health-related quality of life in people with irritable bowel syndrome (IBS). There is some evidence to suggest that hypno therapy may improve smoking cessation, but data are not definitive. Relaxation Techniques Relaxation techniques, including biofeed back and progressive muscle relaxation, may be helpful in managing a variety of stress-related health conditions, including anxiety associated with ongoing health problems and in those who are having medical procedures. Diaphragmatic breathing exercises may modestly lower blood pressure, reduce levels of cortisol, and reduce glycemia in people with type 2 diabetes. The efficacy of biofeedback has been evaluated in numerous studies for tension headaches, with positive results. Several studies have shown that biofeedback decreased the frequency of both pediatric and adult migraines, with some showing an effect lasting over an average follow-up phase of 17 months. Evidence suggests that relaxation techniques may also provide some benefit for symptoms of posttraumatic stress disorder and help reduce occupational stress in health care workers. Clinical practice guidelines issued by the Ameri can Cancer Society on the evidence-based use of integrative therapies during and after breast cancer treatment recommend yoga for anxiety and stress reduction. For some of these conditions, relaxation tech niques are used as an adjunct to other forms of treatment.
CHAPTER 495 ■ ■PRIMARY PHYSICAL INPUT A physical therapeutic input can be delivered manually (e.g., massage) or using a device (e.g., acupuncture) or can be generated by the patient (e.g., exercise). Complementary and Integrative Therapies and Practices
Acupuncture The role of acupuncture in pain management has been controversial for decades, with critics pointing out its “prescien tific” theoretical basis, and indeed, the rationale for the use of specific “acupuncture points” remains to be established. However, recent largescale meta-analyses

have demonstrated acupuncture to be superior to both usual care and sham acupuncture for chronic musculoskeletal pain, headache, and osteoarthritis (OA), with beneficial treatment effects persisting for up to 12 months. Clinical practice guidelines issued by the American College of Rheumatology and the Arthritis Foundation conditionally recommend acupuncture for knee, hip, and/ or hand OA. The most recent (2017) American College of Physicians clinical guidelines recommend acupuncture as one of the initial treat ment options for patients with acute, subacute, and chronic low-back pain. Acupuncture may provide a modest reduction in symptoms of depression, particularly when compared with no treatment or a con trol. Acupuncture or electroacupuncture may be an appropriate addi tion to drug treatment for managing chemotherapy-induced nausea and vomiting in patients with cancer. Clinical guidelines issued by the Society for Integrative Oncology and the American Society of Clinical Oncology in 2022 found intermediate level of evidence (with moderate strength) to recommend that acupuncture, reflexology, acupressure, or massage may help relieve pain in people with cancer. Acupuncture may relieve symptoms of allergic rhinitis. Clinical practice guidelines from the American Academy of Otolaryngology–Head and Neck Surgery include acupuncture among the options that health care providers may offer to interested patients with allergic rhinitis. Spinal Manipulation The role of both osteopathic and chiroprac tic spinal manipulative therapies (SMTs) in management of low-back pain also has been the subject of a number of carefully performed tri als and many systematic reviews. Conclusions are not consistent, but the American College of Physicians guidelines conclude that spinal manipulation has a small effect on improving function and pain com pared with control—either a sham manipulation or an inert treatment.

Although evidence for spinal manipulation for chronic low-back pain is graded as low quality, the recommendation for consideration of nonpharmacologic treatment including spinal manipulation is graded as a strong recommendation, reflecting increasing concern with the impact of chronic opioid use for low-back pain. The evidence of benefit of spinal manipulation for neck pain is not as extensive, and continued concern that cervical manipulation may occasionally precipitate vascu lar injury clouds a contentious debate.

Massage Low- to moderate-quality evidence suggests that massage therapy is superior to nonactive therapies in reducing arthritis pain and improving functional outcomes. Massage may provide short-term relief from low-back pain, but the evidence is not of high quality. There is some evidence that massage has a positive effect on migraine, tension headaches, and neck pain. ■ ■COMBINED PSYCHOLOGICAL AND

PHYSICAL INPUT The primary therapeutic input for other mind and body practices is a combination of physical and psychological. Examples of practices in this category include yoga and tai chi, which combine movement, physical postures, and meditation. Yoga Yoga can be beneficial for patients with fibromyalgia or chronic low-back pain, and yoga compared to nonexercise controls results in small to moderate improvements in back-related function at 3 and 6 months. There is overall evidence that yoga benefits people’s general well-being by relieving stress, supporting good health habits, and improving mental/emotional health and sleep. Yoga can also help with quitting smoking, anxiety or depressive symptoms associated with dif ficult life situations, and quality of life for people with chronic diseases. PART 20 Emerging Topics in Clinical Medicine Tai Chi Clinical practice guidelines issued by the American College of Rheumatology and the Arthritis Foundation strongly recommend tai chi, along with other nondrug approaches such as self-management

programs, for managing knee and/or hip OA. Tai chi has been shown to improve overall motor function, including balance and stability in older adults. Tai chi may help improve sleep quality in individuals with mild insomnia. Tai chi also has been shown to improve quality of life in people with heart disease, cancer, and other chronic illnesses. MULTICOMPONENT THERAPIES

AND SYSTEMS Multicomponent approaches to health comprise two or more interven tions such as lifestyle changes, physical rehabilitation, psychotherapy complementary health practices, and conventional medicine in various combinations, with an emphasis on whole person health. Complemen tary health therapies and practices are often multicomponent in nature, both in traditional health systems (e.g., traditional Chinese medicine, naturopathy) and in modern integrative practice. The U.S. Veterans Health Administration uses a multicomponent model of pain care that emphasizes nonpharmacologic methods, both conventional (e.g., physi cal therapy, CBT) and complementary (e.g., yoga, acupuncture), and may also include nutrition consultations. Several medical systems, such as chiropractic, osteopathy, naturopathy, and homeopathy, that arose in the late nineteenth century continue to be practiced today. Osteopathic medicine is mostly integrated into conventional medicine, with the addi tion of specific osteopathic musculoskeletal manipulation techniques. While homeopathy and naturopathy have remained largely separate from mainstream medicine, chiropractic care is increasingly available in some conventional care settings. A number of multicomponent systems, often called “whole health” systems, such as traditional Chinese medicine, Ayurveda, and homeopathy, use a diagnostic and therapeutic framework that is different from that of conventional medicine, which has posed additional challenges to their rigorous investigation. Naturopathy Naturopathy, or naturopathic medicine, is a multi component therapeutic system based on philosophical principles that guide practice. Naturopaths prescribe conventional and unconven tional diagnostic tests and medications, with an emphasis on relatively low doses of drugs, herbal medicines, healthy diet, and exercise.

Chiropractic The practice of chiropractic care, founded by David Palmer in 1895, is the most widespread practitioner-based comple mentary health practice in the United States. Although the scope of practice varies widely, chiropractic practice emphasizes manual thera pies for treatment of musculoskeletal complaints. Osteopathic Medicine Founded in 1892 by the physician Andrew Taylor Still, osteopathic medicine was originally based on the belief that manipulation of soft tissue and bone can correct a wide range of diseases of the musculoskeletal and other organ systems. Over the ensuing century, the osteopathic profession has welcomed increasing integration with conventional medicine. Today, the postgraduate train ing, practice, credentialing, and licensure of osteopathic physicians are virtually indistinguishable from those of allopathic physicians. Osteo pathic medical schools, however, include training in manual therapies, particularly spinal manipulation, as well as diagnostic methods based on palpation of musculoskeletal tissues that are not part of conven tional medical education. Homeopathy The theoretical framework of homeopathy is based on two unconventional principles: “like cures like,” the notion that a disease can be cured by a substance that produces similar symptoms in healthy people; and the “law of minimum dose,” the notion that the lower the dose of the medication, the greater its effectiveness. Although the current lack of biologic underpinning for these prin ciples has seriously limited the rationale for their use, the diagnostic framework of homeopathy could be the source of new insights that could be explored. As previously discussed, the regulatory framework for homeopathic remedies differs from that for dietary supplements, in that homeopathic products are regulated as drugs under the Federal Food, Drug, and Cosmetic Act and are subject to the same require ments

related to approval, adulteration, and misbranding as other drug products. There are currently no homeopathic products approved by the FDA. Homeopathic remedies are widely available and commonly recommended by naturopathic physicians, chiropractors, and other licensed and unlicensed practitioners. Challenges of Clinical Research on Multicomponent Therapies and Systems Classic randomized controlled trial (RCT) designs may not be well suited for research on multicomponent complemen tary interventions and systems such as naturopathy and Ayurvedic medicine. The dynamic relationships among an array of factors that affect health and well-being is inherent to the philosophy of these systems of care and poses methodologic challenges to the effec tive application of conventional RCT design. Pragmatic comparative effectiveness designs with “usual care” comparators are widely used to study these types of interventions, and trials may need to take into account the individualization of interventions and the underlying theories of these multicomponent systems. Thus, a key component of research on multicomponent therapeutic systems is the development of validated and reproducible “manualized” treatment protocols allowing for some flexibility and individual patient care. Pragmatic studies that compare multicomponent treatments with usual care cannot determine which treatment components are responsible for benefits, but other kinds of translational studies can address this issue. THERAPEUTIC OUTPUT—SYSTEMS IMPACTED AND CHALLENGES OF MECHANISTIC RESEARCH Complementary and integrative interventions whose therapeutic input is dietary, psychological, and/or physical may exert their effects, or therapeutic output, through a variety of mechanisms and physiologic systems. For example, peppermint oil may relieve pain associated with IBS by directly relaxing gastrointestinal smooth muscle, probiotics may have effects on the nervous system as well as the gut, and some components of traditional Chinese medicine, as well as omega-3 fatty acids and their derivatives, have immune-mediated anti-inflammatory effects. Multicomponent interventions with psychological and/or phys ical therapeutic input such as meditation and acupuncture can have effects on the nervous system and may also target other body systems

affected by the pain condition; for example, tai chi may improve bal ance and stability by increasing flexibility and core strength, and the stretching involved in yoga may improve low-back pain by reducing connective tissue inflammation. For all types of therapeutic input, biopsychosocial interactions also may be important; for example, par ticipation in an integrative group therapy pain management program may provide tools to help relieve symptoms of anxiety and depression as well as pain. Deepening the scientific understanding of the connections that exist across domains of human health is important to better understand how conditions interrelate, identify multicomponent interventions that address these problems, and increase the support of patients through the full continuum of their health experience, including the return to health. Studies of multicomponent interventions often require multi disciplinary expertise and use state-of-the-art techniques in areas such as neuroscience, immunology, pharmacognosy, proteomics, genetics, and epigenomics. Further, there are limited preclinical models for some complementary health interventions (e.g., no relevant animal model for meditative movement practices such as yoga or tai chi). Objective, validated measurement tools are essential, as are processes and proce dures to ensure quality control, whether the intervention is a mind and body practice or a natural product. PATIENT AND PROVIDER RESOURCES Physicians regularly face difficult challenges in providing patients with advice and education about complementary health therapies and prac tices. Of particular concern to all physicians are practices of uncertain safety and practices that raise inappropriate hopes. Cancer therapies, antiaging regimens, weight-loss programs, and products

that claim to improve sexual function or athletic performance are frequently targeted for excessive claims and irresponsible marketing. A number of Internet resources provide critical tools for patient education (Table 495-3). TABLE 495-3 Internet Resources on Complementary and Integrative Health Approaches The Cochrane Collaboration Complementary Medicine Reviews This website offers rigorous systematic reviews of mainstream and complementary health interventions using standardized methods. It includes

> 800 reviews of complementary health practices. Complete reviews require institutional or individual subscription, but summaries are available to the public. http://www.cochrane.org/evidence MedlinePlus All Herbs and Supplements, A–Z List MedlinePlus Complementary and Integrative Medicine MedlinePlus Dietary Supplements These National Library of Medicine (NLM) Web pages provide an A–Z database of science-based information on herbal and dietary supplements; basic facts about complementary and integrative health practices; and federal government sources on information about using natural products, dietary supplements, medicinal plants, and other complementary health modalities. http://www.nlm.nih.gov/medlineplus/druginfo/herb_All.html https://medlineplus.gov/complementaryandintegrativemedicine.html http://www.nlm.nih.gov/medlineplus/dietarysupplements.html National Institutes of Health National Center for Complementary and Integrative Health (NCCIH) This National Institutes of Health NCCIH website contains information for consumers and health care providers on many aspects of complementary and integrative health products and practices. Downloadable information sheets include short summaries of complementary health approaches, uses and risks of herbal therapies, and advice on wise use of dietary supplements. http://www.nccih.nih.gov Resources for Health Care Providers: http://www.nccih.nih.gov/health/providers NCCIH Clinical Digest e-Newsletter: http://www.nccih.nih.gov/health/providers/ digest Continuing medical education lectures: http://www.nccih.nih.gov/training/ videolectures Herbs at a Glance fact sheets: https://www.nccih.nih.gov/health/herbsataglance

Because many complementary health products and practices are used as self-care and because many patients research these interventions extensively on the Internet, directing patients to responsible websites can often be very helpful.

The scientific evidence regarding complementary therapies is frag mentary and incomplete. Nonetheless, in some areas, particularly pain management, it is increasingly possible to perform the kind of rigorous systematic reviews of complementary health therapies and practices that are the cornerstone of evidence-based medicine. A particularly valuable resource in this respect is the Cochrane Collaboration, which has performed >800 systematic reviews of complementary health prac tices. Practitioners will find this a valuable resource to answer patient questions. Practice guidelines, particularly for pain management, are also available from several professional organizations. Links to these resources are provided in Table 495-3. SUMMARY The frequent use of complementary and integrative health therapies and practices reflects an active interest among the public in improving health and well-being of the whole person. The current health care system

is fragmented, with diseases and comorbid conditions mostly treated separately, sometimes with drugs that interact with one another. An important step in whole person health care is considering health and disease not as separate states but as a bidirectional continuum and understanding how complementary and integrative therapies and prac tices, which are often multicomponent in nature, consider a patient’s long-term recovery and overall health. CHAPTER 495 Acknowledgment Dr. Josephine Briggs contributed to this chapter in prior editions and some material from prior edition chapters has been retained here. ■ ■FURTHER READING Black LI et al: Use of complementary health approaches among children Complementary and Integrative Therapies and Practices

aged 4–17 years in the United States: National Health Interview Survey, 2007-2012. National health statistics reports; no 78. Hyattsville, MD, National Center for Health Statistics, 2015. Eisenberg DM et al: Trends in alternative medicine use in the United States, 1990–1997: Results of a follow-up national survey. JAMA 280:1569, 1998. Gaston TE et al: “Natural” is not synonymous with “safe”: Toxicity of natural products alone and in combination with pharmaceutical agents. Regul Toxicol Pharmacol 113:104642, 2020. Ijaz N et al: Whole systems research methods in health care: A scoping review. J Altern Complement Med 25:S21, 2019. Nahin RL et al: Expenditures on complementary health approaches: United States, 2012. Natl Health Stat Rep 95:1, 2016. Nahin RL et al: Use of complementary health approaches overall and for pain management by US adults. JAMA 331:613, 2024. Paige NM et al: Association of spinal manipulative therapy with clini cal benefit and harm for acute low back pain: Systematic review and meta-analysis. JAMA 317:1451, 2017. Qaseem A et al: Noninvasive treatments for acute, subacute, and chronic low back pain: A clinical practice guideline from the American College of Physicians. Ann Intern Med 166:514, 2017. Skelly AC et al: Noninvasive nonpharmacological treatment for chronic pain: A systematic review up-date. Comparative Effective ness Review No. 227. AHRQ Publication No. 20-EHC009. Rockville, MD, Agency for Healthcare Research and Quality; April 2020. Vickers AJ et al: Acupuncture for chronic pain: Update of an indi vidual patient data meta-analysis. J Pain 19:455, 2018.

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