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Overview

Many Americans, nearly 40%, use health-care approaches outside of mainstream Western, or conventional, medicine to treat specific conditions, treat side effects of conventional medicine, and improve health or overall well-being [1–3]. It has been estimated that two-thirds of individuals that suffer from arthritis and other musculoskeletal disorders have used complementary and alternative treatments to control their symptoms [4].

The terms “complementary” and “alternative” can be defined in a variety of ways. For example, definitions offered by the National Center for Complementary and Integrative Health (NCCIH) (formerly National Center for Complementary and Alternative Medicine) are as follows:

“Complementary” generally refers to using a non-mainstream approach **together with** conventional medicine.

“Alternative” refers to using a non-mainstream approach **in place of** conventional medicine.

Complementary, alternative, and integrative therapies best describe the practices reviewed in this chapter. The modalities that are being described

may be a complement to health care or they may also be an alternative. The alternative may not be “nonmainstream,” just as an injection or surgery may be considered an alternative. “Alternative” in complementary and alternative medicine (CAM) may imply a “nonmainstream” treatment, used in place of conventional medicine, but often the therapies described in this chapter are not “instead of,” but are “along with.” Other terms that are used to describe this approach are complementary and integrative medicine and active self-care [3, 5].

For the purposes of this review, practices will be divided into **alternative medical systems** (e.g., traditional Chinese medicine, homeopathy, ayurvedic medicine), **mind-body interventions** (mindfulness, yoga, Qigong, Tai qi), **energy-based therapies** (e.g., healing touch, therapeutic touch, Reiki), and **biologically based therapies** (e.g., herbs, foods). Manipulative methods (e.g., osteopathy) are addressed in this chapter.

The quality of research on CAIT varies considerably and is somewhat limited. The National Institutes of Health (NIH) set up the National Center for Complementary and Integrative Health specifically “to define, through rigorous scientific investigation, the usefulness and safety of complementary health approaches and their roles in improving health care. NCCIH’s vision is that scientific evidence will inform decision-making by the public, by health-care professionals, and by health policymakers regarding the use and integration of complementary health approaches.” The amount of research on mind and body

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approaches varies widely depending on the practice. For example, acupuncture, yoga, spinal manipulation, and meditation have had many studies, and some of these practices appear to hold promise in pain management, whereas other practices have had little research to date [6–10].

The purpose of this chapter is to provide a brief overview of commonly used complementary, alternative, and integrative health approaches. Given the vast array of therapies and approaches available, only the most common have been included in this review.

Alternative Medical Systems

- **Traditional Chinese medicine**
- **Shiatsu**
- **Homeopathy**
- **Ayurvedic medicine**

Traditional Chinese Medicine

Traditional Chinese medicine (TCM) includes acupuncture and Chinese herbal medicine. These may be used in conjunction or as separate therapies. TCM may also include the use of Qigong or Tai Chi, but these will be described in the section Mind-body Interventions.

Based on thousands of years of practice, the premise of Chinese medicine is that when healthy and abundant supply of **qi** (pronounced chee) or “life energy” flows through the body’s meridians (a network of defined yet invisible channels through the body). If the flow of qi in the meridians becomes blocked or there is an inadequate supply of qi, then the body fails to maintain harmony, balance, and order, and disease, illness, or pain can ensue.

Acupuncture has also been shown to have an effect on endogenous opioid and peptide systems. Acupuncture plays a modulatory effect on neurotransmitters involved in nociception such as serotonin, norepinephrine, beta-endorphin, enkephalin, substance P, and others thus leading to analgesia. Functional imaging of the central nervous system indicates that acupuncture may work on the descending inhibitory system [4, 11, 12].

The practitioner of Chinese medicine formulates a Chinese medicine diagnosis and a treatment plan that will restore the flow of qi. This can be accomplished with Chinese herbal formulations and or needling of specific acupuncture points. Acupuncture technique may also include the use of moxibustion or percutaneous electrical nerve stimulation (PENS). Chinese herbal formulations will be discussed in this subheading, rather than in the “herbal remedies” section.

It is difficult to study the efficacy of acupuncture or Chinese herbs in reference to Western medical diagnoses, since Chinese medicine diagnoses are not categorized in the same way. Benefit has been found for treating back and neck pain, headache, myofascial pain, and a variety of other pain conditions (dysmenorrhea, osteoarthritis, postoperative pain, epicondylitis).

Complications and risks are very rare, but can include infection, pneumothorax, syncope or vagal reaction, retained needles, contact dermatitis, organ puncture, bruising, compartment syndrome, and temporary exacerbation of symptoms.

Side effects of acupuncture can include lightheadedness, anxiety, agitation, tearfulness, and fatigue.

Precaution must be taken to avoid electrical stimulation in patients with pacemakers. The use of certain points in pregnancy can stimulate uterine contractions.

Chinese herbal medications can be associated with drug interactions and allergic reactions and affect blood pressure, coagulation, and other physiologic effects. For example, the Chinese herb ephedra (ma huang) has been linked to heart attack and stroke. In 2004, the FDA banned the sale of ephedra-containing dietary supplements, but the ban does not apply to TCM remedies. There are reports of contamination of Chinese herbs with drugs, toxins, or heavy metals or that they may not contain the listed ingredients [4, 9, 10, 12–18].

Homeopathy

Homeopathy is based on two main principles, the law of similar and that highly diluted remedies (diluted natural substances) can be effective even

though they are unlikely to contain a single molecule of the original substance. A remedy is chosen individually for a sick person based on its capacity to cause, if given in overdose, physical and psychological symptoms similar to those a patient is experiencing. The meta-analysis of randomized or placebo control studies indicates that clinical effects are not entirely due to placebo. There is some evidence that homeopathy can be effective for treatment of rheumatoid arthritis and osteoarthritis. Homeopathy, given that very dilute substances are administered, is considered as safe as placebo. The use of arnica to treat myalgias is an example of a homeopathic remedy [3, 4].

Ayurvedic Medicine

Ayurvedic medicine has been practiced in India for more than 5000 years. The premise of this practice is that illness is a state of imbalance among body systems. This imbalance can be detected through diagnostic procedures such as reading the pulse and observing the tongue. Treatment of disease and restoration of balance involve incorporating nutritional counseling, massage, natural medications, meditation, and other modalities. Ayurvedic medicine is used to treat pain and there is some research to support its use in osteoarthritis [3, 19, 20].

Mind-Body Interventions

- Mindfulness-based interventions
- Qigong
- Tai qi
- Yoga

Mindfulness-Based Interventions

Mindfulness-based interventions (MBIs) “can be described as the ability to observe the experience of the present moment with openness and curiosity and without judgment” [21].

MBIs distill the use of meditative practices from Eastern traditions, while omitting original religious, ideological, and cultural constructs. The

goal of MBI is to teach individuals techniques, which enhance one’s ability to be mindful such as sitting and walking meditation, guided meditation, mindful movement, and other exercises. It has been increasingly incorporated into Western medicine to help with stress reduction and to serve as an intervention for the management of a variety of conditions including pain, depression, PTSD, and anxiety. There are studies that show that mindfulness-based interventions are associated with significant changes in brain function and architecture with subsequent effects on improving attention, memory, executive functions, improved sleep, and decreased emotional reactivity.

MBI can help patients to relate to their pain differently. In learning mindfulness, patients learn to experience body sensations, thoughts, emotions, and impulses without having to change them, avoid them, or suppress them. Patients are able to observe their pain, describe pain, and notice how pain and related emotions may change from moment to moment. They can separate the observation of the pain from the sensation of pain. MBIs are not necessarily associated with a decrease in pain, but can change the experience of pain.

Mindfulness can increase pain, depression, or anxiety within the first few weeks of incorporation. Some mindfulness programs indicate that this practice may not be recommended for all individuals. This may include a history of substance or alcohol abuse (with recent sobriety), suicidal attempts or ideation, recent or unresolved trauma, or being in the midst of major life changes.

[17, 21–24]

Qigong

Qigong (chi-kung) is a practice that has existed for thousands of years. There are many different forms of Qigong, which incorporate traditional Chinese energy exercises or therapies. The word “Qigong” means skill or cultivation of vital energy (qi). Qigong is also considered to be a form of traditional Chinese medicine. In TCM, good health is the result of a free-flowing, well-balanced *qi* (bio-energy) system, while sickness, pain, or physical disorders occur when there is a blockage or

imbalance of qi. Qigong practice refers to the mind-body movements, skills, or processes that integrate the adjustments of body, mind, and breath to stimulate and balance the flow of qi (chi), or vital energy, along the acupuncture meridians, or energy pathways. Qigong is used to reduce stress, improve blood circulation, enhance immune function, and treat a variety of health conditions [25].

Tai Chi

Tai Chi is a mind and body practice that originated in China as a martial art. Tai Chi is sometimes referred to as “moving meditation.” Practitioners move their bodies slowly, gently, and with awareness, while breathing deeply circulating their qi or life force. The highly disciplined movements and forms are thought to unite the body and mind and to bring balance to the individual’s life. Tai Chi has been used as part of treatment for pain but may also be helpful due to an effect on increasing range of motion, improving strength and balance, and creating a sense of well-being [25, 26].

Qigong and Tai Chi are considered to be safe practices. They involve gentle movements and have been used to relieve chronic pain. Research regarding efficacy for pain is limited but points toward benefit from their use.

Yoga

The word “yoga” comes from the Sanskrit root yuj, which means “to join” or “union.” It is a practice that seeks to **join** the body and mind, using a system of techniques. There are many types of yoga and practices. It is suggested that yoga creates inner, physical, and emotional balance using postures and breathing techniques. Proposed mechanisms as to how yoga can affect pain include increased release of enkephalins and endorphins, increased tissue flexibility and oxygenation, relaxation effects, decreased sympathetic activity, and decrease in inflammatory markers. Yoga can also have positive psychological effects including increased mind-body awareness, improved outlook, and sense of empowerment in self-care. There is evidence that

yoga alleviates pain, but research varies in terms of quality and strength of results obtained. Some studies have shown, for example, moderate evidence for long-term effectiveness for low back pain. Potential risks include injury and increased pain [10, 27, 28].

Energy-Based Therapies

- **Healing touch, therapeutic touch, Reiki**

The premise behind energy healing is that when energy paths of the body are blocked or disturbed, a disruption occurs in a person’s “holistic harmony.” This balance of energy and sustained flow of energy is needed to maintain health, and imbalance may result in disease, weakness, pain, illness, or psychological issues. Practitioners of energy-based therapy use direct or noncontact touch to influence the human energy field.

There is limited research evidence in terms of robust studies to show that Reiki is effective in healing or decreasing pain. Some research has shown decreased opioid requirements in patients receiving energy-based therapies.

Reiki is being used increasingly though in traditional health-care environments such as hospitals, hospice care settings, nursing homes, and other health-care settings. Reports of outcome include relaxation, decreased anxiety, and pain relief. Healing touch and Reiki are considered to be safe with negligible side effects. In studies of Reiki, side effects were no more common among participants who received Reiki than among those who did not receive it [17, 29–31].

Biologically Based Therapies

- **Chinese herbal medicine (see above)**
- **Herbal supplements**
- **Food as medicine**

Herbal Supplements

Many herbal medicines minimize pain via an anti-inflammatory effect. **Table 111.1** provides a

Table 111.1 Commonly used herbs to treat pain

Herb	Conditions treated	Mechanism of action	Risks/side effects/drug interactions
Devil's claw (harpagoside)	Osteoarthritis (hip, knee, spine), back pain	Anti-inflammatory and analgesic effect	<ul style="list-style-type: none"> Diarrhea, possible bradycardia, dyspepsia Contraindicated in pregnancy Can interact with antacids/H2 antagonists, beta-blockers/digoxin, anticoagulants, cytochrome P450 enzymes
Turmeric (<i>Curcuma longa</i>)	Rheumatoid arthritis, osteoarthritis	Anti-inflammatory (decreases COX ₂ and lipoxigenase activity, inhibits production of inflammatory cytokines)	<ul style="list-style-type: none"> Considered safe for most adults High doses or long-term use of turmeric may cause indigestion, nausea, or diarrhea May exacerbate cholecystitis or cholelithiasis May interact with many drugs including anticoagulants/antiplatelet drugs, chemotherapeutic drugs, drugs metabolized by CYP3A4, CYP1A2, and CYP2A6 enzymes, midazolam, acetaminophen, ibuprofen, aspirin
Willow bark	Arthritis, Headache, Inflammation	Contains salicin	<ul style="list-style-type: none"> Contraindicated if allergic or sensitive to salicylates GI distress, allergic reaction, erythema, pruritus, bleeding complications Increase risk of bleeding with warfarin or other anticoagulants
Avocado-soybean unsaponifiables (ASUs)	Osteoarthritis	Anti-inflammatory effect (inhibits interleukin-1 synthesis)	
Ginger	Osteoarthritis, Low back pain	Anti-inflammatory effect (inhibits thromboxane formation and platelet aggregation)	<p>SE: flatulence, bloating, heartburn, and nausea</p> <ul style="list-style-type: none"> Avoid during pregnancy or lactation Interaction with NSAIDs, anticoagulants, antiplatelet drugs, hypoglycemic agents, insulin, some chemotherapeutic agents
Phytodolor (<i>Populus tremula</i> , <i>Fraxinus excelsior</i> , <i>Solidago virgaurea</i>)	Osteoarthritis, rheumatoid arthritis	Anti-inflammatory effect	Rare allergic reactions
Rose hip	Osteoarthritis	Anti-inflammatory effect	
Boswellia (<i>Boswellia serrata</i>)	Osteoarthritis	Anti-inflammatory effect (5-lipoxygenase inhibitor)	<ul style="list-style-type: none"> Fewer adverse effects than steroids and NSAID
Capicum	Muscle soreness, Arthritis (topical formulations), Neuropathic pain	Capsaicin is active ingredient, causes initial release, subsequent depletion of substance P	<ul style="list-style-type: none"> External application can lead to blister and ulcer formation Can irritate mucous membranes, the eyes, and broken skin Unclear if long-term topical use is skin carcinogenic Increases pain with initial use

(continued)

Table 111.1 (continued)

Herb	Conditions treated	Mechanism of action	Risks/side effects/drug interactions
Butterbur	Migraine	Blocks leukotriene activity	<ul style="list-style-type: none"> – Raw, unprocessed plant contains pyrrolizidine alkaloids (PAs), which can cause liver damage – Limit use to products that are labeled or certified as PA-free – PA-free products are safe and well tolerated when used in recommended doses for up to 12 to 16 weeks. Safety of longer-term use is not established – SE: headache, ocular pruritus, GI distress, asthma, fatigue, drowsiness, eructation – May cause allergic reactions in those with sensitivities to ragweed, chrysanthemums, marigolds, and daisies
Feverfew	Migraine	<ul style="list-style-type: none"> – Blocks transcription of inflammatory proteins and decreases platelet activity 	<ul style="list-style-type: none"> – SE: canker sores, swelling and irritation of the lips and tongue, loss of taste, nausea, indigestion, and bloating – After stopping long-term use: insomnia, headaches, joint pain, anxiety, myalgias – Contraindicated in pregnancy – If allergic to members of the daisy family, more likely to be allergic to feverfew – Drug interactions with cytochrome P450 3A4 substrates, anticoagulants, antiplatelet drugs
St. John's wort	Depression		<ul style="list-style-type: none"> – Many drug interactions but most significant concern in pain management is the risk of serotonin syndrome if taken with SSRIs, monoamine oxidase inhibitors (MAOIs), SNRIs, Serzone, dextromethorphan, triptans – Photosensitivity
Thunder god vine	Rheumatoid arthritis		<ul style="list-style-type: none"> – Severe SE if not carefully extracted from the skinned root – leaves, flowers, and skin of the root are highly poisonous and can cause death – SE: diarrhea, indigestion, nausea, hair loss, headache, menstrual changes, rash – Increased risk of osteoporosis with use greater than 5 years – Decreases male fertility via effect on sperm

summary of more commonly used herbs to treat pain. Patients should be queried as to their use of herbs, since many patients are involved in active self-care. The list included in this review is not exhaustive and resources are provided to enable the practitioner to further investigate herbs that patients are taking. The table also summarizes side effects and possible drug interactions. Herbs are regulated by the FDA and fall under the category of “dietary supplements.” It is not required that manufacturers have FDA approval before an herbal supplement goes on the market. Manufacturers can make claims as far as efficacy if there is supporting research and they provided a disclaimer that the FDA has not evaluated the claim. Herbal supplement manufacturers do need to meet certain quality standards in the USA, and foreign manufacturers must register their products with the FDA in order to sell them in the USA. The manufacture of herbal medicines in most countries is unregulated raising concerns regarding contamination with toxic substances, adulteration, and suboptimal quality. Patients who are taking conventional over-the-counter and prescribed substances may also be taking self-prescribed herbal supplements. This can lead to potential adverse herb-drug interactions [4, 9, 15–17, 32–39].

Food as Medicine

Food can contain substances that may have an effect on pain (see Table 111.2). Certain diets have also been identified as anti-inflammatory and may have an effect on pain including diets free of foods from the nightshade family or the Mediterranean diet. Research is limited but in practice one may have patients who are engaged in active self-care and utilizing diet to affect their pain. Many of the substances in food attributed to decreasing pain may do so by an effect on the inflammatory process. Some examples of foods that contain substances that have an anti-inflammatory effect are listed in table form below. This is not intended to be an exhaustive list; the entire topic of food as medicine is too broad a scope to be covered in this review [40–44].

Table 111.2 Foods that may have anti-inflammatory properties

Food	Active compound
Cherries, berries, black currants, eggplant, red and black grapes, and plums	Anthocyanins
Red and black grapes and plums	Anthocyanins
Green tea	Epigallocatechin-3-gallate (EGCG)
Salmon, herring, mackerel (not king), sardines, anchovies, rainbow trout, Pacific oysters, flaxseeds (ground and oil), chia, walnuts	Omega-3 fatty acids
Olive oil	Oleocanthal

Complementary, alternative, and integrative therapies (CAIT) are increasingly becoming a part of the Western medical landscape. Complementary, alternative, and integrative therapies are being incorporated into pain management programs and cancer treatment centers not only for the potential for decreasing pain but also for the improvements seen in mood and a sense of well-being [45]. Patient’s use of CAIT in self-care is becoming more prevalent. Most have few risks. Most CAIT is not covered by insurance and cost varies. Evidence for efficacy is promising, but more robust research is needed.

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