

Acupuncture: A Clinical Review

Victor S. Sierpina, MD; Moshe A. Frenkel, MD
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Abstract and Introduction

Abstract

This article summarizes the research base, probable mechanism of actions, and clinical applications of acupuncture. It offers the clinician a deeper understanding of appropriate conditions for which acupuncture may be useful, outlines how to integrate acupuncture into a clinical practice, and describes referral and training issues.

Introduction

Acupuncture is among the best known of complementary and alternative therapies. Acupuncture is a treatment method that originated more than 3,000 years ago in China and is practiced in most of the world. The method is commonly practiced as a routine treatment in China, Japan, Korea, and Taiwan, and since the late 1970s has gained popularity in the United States as well as other parts of the Western world.^[1] Its application in humans and for a wide array of clinical conditions requires explanation. This review will provide the busy clinician with a short summary of the history of acupuncture, models of its imputed mechanism of action, evidence base for effectiveness, and resources for further information about acupuncture. Primarily though, we provide a summary of the kinds of clinical applications for which acupuncture can be considered and a model for how to integrate a referral for acupuncture into the medical setting.

The practice of acupuncture consists of inserting fine, solid needles (usually 32 to 36 gauge) into selected body locations (acupuncture points). Classic texts describe 365 points located in systematic fashion on meridians or channels of energy flow that are mapped onto the surface of the body. Key principles in traditional Chinese medicine (TCM) are that both wellness and illness result from an imbalance of *yin* and *yang*. Yin refers to the feminine aspect of life: nourishing, lower, cool, deficient, inside, receptive, protective, soft, yielding. Yang is the male counterpoint: hard, dominant, energetic, upper, hot, excessive, outside, creative. The movement between these opposite forces, named *Qi*, is considered to be the essential element in the healing system of TCM. It is best thought of as energy becoming manifest, a vitalistic force that flows ceaselessly through the meridians, or energy channels of the body.

Although a discussion of the diagnostic and pathophysiologic metaphors of TCM is beyond the scope of this article, suffice it to say that it remains an internally coherent set of correlations based on close clinical observation, which are expressed in symbology existing for millennia. If, to our contemporary minds, such terms may seem quaint, dated, or even naïve, they are highly useful in the context of TCM.

Imbalances in the flow of *Qi* among the meridians, organs, and five elements is the cause of disease, pain, and susceptibility to illness. Balancing such factors as heat, cold, dampness, dryness, in both exterior and interior domains is done by TCM practitioners as well as medical acupuncturists using needles inserted at key points along these meridians. Other practices included in the TCM system include dietary approaches, herbalism, cupping, moxibustion (the heating of an acupuncture point or needle with a smoldering herb), massage (Tui Na), Tai Chi exercise, and meditation.^[2-4]

Mechanism of Action

Perhaps the most puzzling aspect of acupuncture to both the lay person and physician with a knowledge of anatomy, neuroanatomy, and physiology is how an unmedicated needle, inserted at a site remote from its desired application can work, eg, a point on the lower leg affecting gastric function, or a point on the hand affecting headache.

Skeptics maintain that acupuncture has basically a placebo effect, since the acupuncture meridians and their energy or chi (Qi) as described in TCM cannot be directly observed, dissected, or measured with standard anatomic approaches or physiologic instrumentation. The acupoints are located at sites that have a high density of neurovascular structures and are generally between or at the edges of muscle groups.^[5] These locations, curiously, are less painful than random needle sticks into a muscle group. An interesting study demonstrating the map of a meridian pathway involved the injection of Technetium99, a radioactive tracer, into both true and sham acupoints.^[6] The scan of the injection sites showed random diffusion of the tracer around the sham point but rapid progression of the tracer along the meridian at a rate that was inconsistent with either lymphatic/vascular flow or nerve conduction. Another study demonstrated that needling a point on the lower leg traditionally associated with the eye activated the occipital cortex of the brain as detected by functional magnetic resonance imaging.^[7]

Opium addicts who underwent acupuncture analgesia for surgery were noted not to go through narcotic withdrawal compared with similar patients who received conventional anesthesia. This gave birth to the endorphin hypothesis, which has been explored as one of the mechanisms of action of acupuncture. Needling affects cerebrospinal fluid levels of endorphin and enkephalin, and such effects can be blocked by the opiate antagonist naloxone. A number of other imputed mechanisms of action have used the model of the acupuncture needle as an electrode, which activates changes in the ionic milieu of the interstitial fluid, these changes being rapidly conducted along the fascial lamellar planes by the highly conductive electrolyte medium. Because nociceptive stimulation, such as with a transcutaneous electrical nerve stimulation unit, is known to block pain perception, the neurogate theory has also been suggested as a mechanism of action for acupuncture.^[8]

The presence of a foreign body (the needle) may act to stimulate vascular and immunomodulatory factors, including locally occurring mediators of inflammation. Measurements of adrenocorticotrophic hormone (ACTH) have been demonstrated to be elevated after acupuncture treatments, suggesting that adrenal activation and release of endogenous corticosteroids may also result from acupuncture. Various physics concepts such as quantum physics, electromagnetic force field changes, and wave phenomena have been proffered to explain the nonlocal effects of acupuncture.^[9,10]

Explanation of the TCM system of medicine, including the effects of acupuncture, is rich with metaphor and allegory.^[11] Such explanations refer to different kinds of Qi, the influence and interaction of the five elements (fire, earth, metal, water, and wood), yin and yang, and other terminology that requires contemplation and long study of a culturally distinct system. It is a model so different from the standard medical model that we advise Western-trained physicians and students to hold a temporary suspension of disbelief to nonjudgmentally approach learning about it as a system of medicine, and, if interested, to review the topic in more depth in some of the references listed.^[2,3,5,10] It is probably best to tell patients, students, and colleagues, in answer to the question of how acupuncture works, that the conclusive answer is yet to be determined, though research has given us some windows of insight into possible mechanisms of action.^[5,8-10,12-14]

Scientific Evidence for Clinical Application

Given the popularity and wide usage of acupuncture, patients self-refer to acupuncturists for a variety of indications. Trained physicians need to become familiar with when and how they might refer their patients to an acupuncturist. To inform clinicians and researchers, the National Institutes of Health (NIH) convened a consensus panel to review the available literature about acupuncture.^[15] They wished to assess not only clinical efficacy and effectiveness but also biological effects, implications on the healthcare system, and the need for further research. Because much acupuncture research has been done by enthusiastic practitioners rather than trained researchers, the quality of many studies was poor. Because of this, the NIH Consensus Panel concluded that acupuncture was proven to be evidence-based for only two indications: dental pain and nausea (postsurgical, chemotherapy induced, or nausea related to pregnancy). Their panel concluded that it was time to take acupuncture seriously and that their systematic review of the literature indicated that it might also be useful for a longer list of indications (see [Table 1](#)), but that better-designed studies were needed to confirm its utility in these areas. These include investigations of the basic science of acupuncture and appropriate sham needle approaches for the placebo arm.^[16]

Further acupuncture research trials have been funded by the NIH/National Center for Complementary and Alternative Medicine (NCCAM) and other agencies. Examples of recent NCCAM-supported projects include:

- Studying the safety and effectiveness of acupuncture treatment for osteoarthritis of the knee
- Investigating whether electroacupuncture works for chronic pain and inflammation
- Finding out how acupuncture affects the nervous system by using magnetic resonance imaging technology
- Looking at the effectiveness of acupuncture for treating high blood pressure
- Studying the effects of acupuncture on the symptoms of advanced colorectal cancer
- Testing the safety and effectiveness^[17] of acupuncture

Other organizations have also addressed the potential benefits of acupuncture. Their recommendations are derived by consensus panels as well as current standards of practice and common clinical applications rather than through rigorous, evidence-based review of the literature. The World Health Organization has identified more than 40 medical conditions effectively treated with acupuncture ([Table 2](#)).^[18] The American Academy of Medical Acupuncture has suggested a listing for use by hospital credentialing committees in which the matter of medical acupuncture privileges are considered ([Table 3](#)).^[19] Although there is some overlap in these categories, they are by no means identical. It is curious that the NIH consensus panel findings on the efficacy of acupuncture for nausea and vomiting do not appear explicitly in the other lists, emphasizing the rather subjective and consensus nature of these tables of indications.

Overall, in the United States, acute and chronic musculoskeletal indications for acupuncture treatments have found greatest acceptance. Although traditional usage and consensus recommendations encompass many conditions, a number of limitations must be noted. Limited benefit can be expected when using acupuncture for spinal cord injuries, cerebrovascular accidents, neurodegenerative diseases, thalamically mediated pain, severe and chronic inflammatory and immune-mediated disorders, especially those having progressed to requiring corticosteroid usage, or as a primary treatment for human immunodeficiency virus infection, malignancy, or chronic fatigue states.^[10] It may, however, serve an important adjunctive role in several of these conditions by improving quality of life, reducing pain, and potentially improving immune status. Acupuncture treatment may be useful in difficult conditions such as asthenic states (tired all the time, low energy), autonomic dysregulation disorders (anxiety, sleep disturbance, bowel dysfunction), and immune dysregulation disorders (recurrent infections and inflammations).^[10]

Practical Implications for Referrals and Follow-Up

In many contemporary acupuncture practices, the most common indication is for chronic pain unresponsive to standard therapy. By and large, physicians will exhaust their range of options for chronic pain management with standard treatments including medication, surgery, nerve blocks, physical therapy, psychologic therapy, pain clinics, or other specialty referrals. Because evidence for the effectiveness of acupuncture in pain management is inconclusive by the standards of best evidence as adopted by the NIH Consensus Panel and others using a purely evidence-based medicine standard, the referring physician often sees it as the last resort for patients. This places the acupuncturist at the unenviable end of a long chain of evaluations, consultations, treatments, and procedures before the patient is finally referred for acupuncture. It also creates an adverse selection bias, leaving acupuncture as an option only for those patients who fail to respond to all other methods, and sometimes creates unrealistic expectations for patients.

A more rational approach would be to recognize the potential role of acupuncture earlier in the treatment of potentially disabling and chronic illnesses. An example would be its use earlier in the treatment of low back pain, perhaps at the critical juncture of between 6 and 8 weeks, when acute back pain often starts to convert to chronic back pain. Starting earlier in the chain of treatment may reduce the cost of expensive evaluations, can lower the burden of patient suffering, and might improve back-to-work statistics. More extensive outcome studies are needed in evaluating the role of acupuncture in low back pain before it can be recommended as the standard of care, though certain patients may clearly benefit.

Because of the popularity of complementary and alternative medicine (CAM)-with estimates of popular use in the US adult population exceeding 40%,^[20]-physicians ought to expect to receive questions from patients regarding the integration of acupuncture in their health care. On the other hand, the physician can be proactive in searching for other care options when conventional treatments are ineffective or there is a high probability of risk or complications from conventional therapies, for example, possible gastrointestinal side effects from nonsteroidal anti-inflammatory drugs for the chronic pain patient. Given patients' demands and utilization of CAM therapies, despite the lack of strong evidence, there is an increasing need to address how CAM therapies can be integrated into conventional medical systems.^[21]

As a first step in integrating acupuncture into medical care and the referral process, physicians must learn the most common indications (see [Table 1](#), [Table 2](#), and [Table 3](#)) or search MEDLINE or other online sources for information (<http://cam.utmb.edu>).^[22] In this search, the physician can look for available studies on safety and efficacy. After assessing the risk compared with the benefit, one can consider the referral. A mutual discussion with patient and family is necessary, along with documentation of such a conversation.

After referring the patient, one has the continuing responsibility of monitoring the patient for benefit, adverse reactions, or failure to respond. If the patient does not respond to treatment in 4 to 10 treatment sessions, he or she should be advised to consider changing to another therapeutic approach.

Although busy physicians may not take such a systematic approach, the fact is that most practices have a relatively narrow band of indications for acupuncture, for example, chronic musculoskeletal pain, back pain, or headache, which can be mastered rather quickly.

Whenever the conventional standard of care is not effective, acceptable to the patient, or has intolerable side effects, acupuncture may be considered as one option in an integrative care plan. Although not a panacea, it is often an option physicians consider seldom or too late.

Safety and Adverse Effects

As an invasive technique, acupuncture has some risks, which include organ puncture, for example, pneumothorax, cardiac tamponade, damage to neural and vascular structures, infection, metal allergy, local pain, bruising, bleeding, or hematoma formation.^[1,23,24] Serious injury is extremely rare, given the millions of acupuncture needles placed annually worldwide.^[25]

A well-trained practitioner can prevent most such problems. Most of the case reports of adverse infectious effects published in the literature were preventable by using the introduction of safe needle technique with single-use, sterilized, disposable needles, and with such techniques, the risk of cross-transmission of HIV, hepatitis, or other infectious disease can be essentially eliminated. Perhaps the most common potential complication is a mild but alarming syncope or presyncope, the so-called needle shock reaction, in which the patient feels faint and diaphoretic. Removing the needles and administering smelling salts is adequate to terminate this reaction. It is more frequent on the first visit but can be minimized by close observation of the patient and performing the treatment in a recumbent rather than sitting position. Local bruising or hematoma formation may occur, though bleeding is not common with acupuncture. Delaying of conventional diagnosis and treatment when using acupuncture as part of a complete medical system (TCM) is another potential risk, as the diagnostic and therapeutic methods of TCM have not been validated by scientific studies.^[1]

Contraindications

Some patients do not tolerate acupuncture either because of a needle phobia or the inability to remain in a comfortable position for treatment. Septic or extremely weakened patients, those who are uncooperative because of delusions, hallucinations, or paranoia, are likewise unsuitable. Local infections such as cellulitis or loss of skin integrity from burns or ulcerations may preclude certain local treatments. Electroacupuncture should not be applied over the heart or brain or in the region of an implanted electrical device such as a pacemaker or medication pump. Hemophiliacs and others with severe bleeding disorders should be excluded from acupuncture treatment.^[1]

Relative Contraindications

Acupuncture during pregnancy is not contraindicated, but an acupuncturist must be well trained and must avoid using points that can stimulate uterine contractility. In the peripartum period, acupuncture may be desirable for either pain control or stimulation of labor. Acupuncture and acupressure can be useful for nausea during pregnancy without involving such forbidden points. Other points such as the umbilicus, nipple, points over major vessels, or over an infant's fontanelles are likewise forbidden by both contemporary and classic acupuncture texts. Acupuncture during menses is relatively contraindicated, as it may not be as effective during this period. Initiating acupuncture while a patient is taking medication, particularly corticosteroids, benzodiazepines, and narcotics, may reduce its effectiveness. Practically speaking, however, many patients come to the acupuncturist while taking these medications and tapering them while acupuncture treatments take effect is the most realistic course. Patients with allergy to metal, patients taking anticoagulant drugs, and those with certain bleeding disorders must be considered on a case-by-case basis.^[6]

The Practitioner and Training

There are approximately 17,000 acupuncturists in the United States, with most having been trained as Oriental Medical Doctors, Doctors of Oriental Medicine, or Licensed Acupuncturists. The National Certification Commission of Acupuncture and Oriental Medicine (NCCAOM) maintains a database of 13,000 practitioners distributed in every state in the United States who

have completed their certification process (<http://www.nccaom.com>).^[26] Training here and abroad is usually a 3- to 4-year process, including all aspects of TCM, which includes not only acupuncture but also herbalism, massage, dietary therapy, and exercise programs such as tai chi and qi gong. The herbalism aspect of these programs is intense, since TCM formulas are often a mixture of 9 to 12 herbs and other substances meant to balance the system in a complex way. Most schools provide 500 hours or more of Western medical science focusing primarily on identifying conditions, which need referral to a medical doctor, for example, myocardial infarction, cancer, or significant weight loss. They also teach familiarity with biomedical terminology, the referral and consultation process, and the diagnostic and therapeutic tools of Western physicians.

Physicians may elect a different pathway of acupuncture training. Although weekend courses and CMEs may offer some limited training for physicians, the most long-established course is that offered by the University of California at Los Angeles and the Helms Institute, which includes approximately 300 hours of training in medical acupuncture. Nearly 4,000 physicians in the United States have been trained as acupuncturists, and more courses are now available. Because of their medical background, courses designed for these MD or DO physicians are abbreviated from the lengthy TCM training. These medical acupuncture courses do not include learning or prescribing the extensive pharmacopoeia of Chinese medicine. The training is scheduled to accommodate the practicing physician's needs with an initial introductory weekend, several months of review of books and training videotapes, and a 10-day, intensive seminar on point location and therapeutics. This training is typically aimed at primary care physicians, anesthesiologists, and pain management specialists and is considered adequate by the majority of state medical boards. Despite its shorter period of training compared with other schools of acupuncture, medical practitioners with this degree of training are quite competent to perform safe and effective acupuncture for most indications. Physicians practice acupuncture under the scope of their medical license. They should inform their insurance carrier that they perform acupuncture, though this does not generally involve any change in risk and rate of insurance. The American Academy of Medical Acupuncture (AAMA) is the professional association that supports physicians doing medical acupuncture with CME, research, publications, and lobbying, as some nonphysician acupuncture organizations seek to limit the extent of practice of physicians trained in acupuncture. They also provide a list of physician acupuncturists by region, which is available at (www.medicalacupuncture.org),^[19] along with pertinent rules and regulations and training information. This organization also sponsors a national certifying board examination for physician acupuncturists.

What the Patient Can Expect

An initial consultation with the medical acupuncture practitioner might not include needle treatment. Depending on the complexity of the problem, this initial consultation may be devoted to history and physical examination and review of the medical records. Additional diagnostic studies such as laboratory or radiologic examinations may be requested. This evaluation is necessary in the Western model to determine the full spectrum of the patient's treatment options, to confirm preceding diagnostic impressions, and to decide if acupuncture is likely to be helpful in this case. In the case of the Oriental Medical Doctor or Licensed Acupuncturist, the history will include a detailed inquiry into diet and lifestyle and familial and personal factors such as taste, color, and seasonal preferences, not usually included in the routine medical history. The tongue, pulses, and ear will be closely examined in addition to standard physical examination. Chinese herbal mixtures may be offered as part of the treatment plan, and although these are a significant part of classic TCM practice, patients must be aware that contaminants, pharmaceuticals, heavy metals, and other impurities have been reported in Chinese herbs and that standardization and dosage is imprecise and unregulated.^[27]

Patients should inquire into the practitioner's training, certification by the NCCAOM, state licensure, whether sterile, single-use needles are to be used, and the expected number and cost of treatments. Although some patients are intolerant of needles, most feel little if any discomfort

besides a slight aching sensation at the site of insertion. Despite usual apprehension about pain, needle treatments are comfortable and relaxing for most patients. The patient typically lies on an examination or massage-type table while as few as one needle but occasionally up to 30 needles are commonly inserted on the extremities, trunk, ear, or other selected points. These needles are then either manually manipulated, heated with an herb called moxa (*Artemisia vulgaris*), or stimulated with an electrical device powered by a 9 V battery, similar to a typical transcutaneous electrical nerve stimulation unit. A typical treatment session is 20 to 40 minutes. Some styles of treatment use fewer needles for shorter periods and do not use the electrical stimulation. Imbedded tacks are sometimes left in place for a few days, particularly in the ear. Visits typically start at weekly intervals or more often and as improvement occurs are spaced further apart.

Patients may experience a mild euphoria or drowsiness, especially after the first treatment, and should be advised not to drive or operate machinery immediately after the treatment. Bleeding or bruising, pain on needling, and aggravation of symptoms occur in 1 to 3% of patients. Patients are also advised to avoid strenuous physical activity, heavy meals, alcohol intake, or sexual activity for up to 8 hours after a treatment. This is thought to improve the take or effectiveness of the treatment.

Acupuncture costs \$50 to 100 per treatment, plus the additional cost of the initial evaluation. For physician acupuncturists, the initial evaluation, not including the acupuncture treatment, can generally be billed as a consultation visit or standard E & M code. Inpatient acupuncture can also be provided as a consultation service.^[28] A series of 4 to 10 sessions is generally considered an adequate initial trial of therapy. Nonresponders can be referred for other treatment modalities. In the United States, some health maintenance organizations and major insurance plans including Worker's Compensation do cover acupuncture, but this remains a minority. Medicare and Medicaid do not currently cover acupuncture.

Summary

The ancient method of acupuncture has gained significant popularity in our era, particularly among non-Asian populations. Because of its long history of use, safety, and reports of efficacy, more patients select acupuncture as part of their therapeutic plan. Although thorough clinical trials of the reported benefits of acupuncture as well as understanding of its mechanism of action lag behind its widespread use, physicians ought to become familiar with its potential applications for their patients. Some physicians may wish to expand the scope of his or her practice by taking additional training to administer acupuncture. However, even if one does not add this training, knowing how to refer to credible, well-trained acupuncturists and for what indications is increasingly important in the evolving model of integrative medicine, combining the best of both scientific medicine and traditional systems of care.

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