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The State of 21st Century Acupuncture in the United States

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Abstract

The term “acupuncture” commonly refers to a non-pharmacologic therapy that is increasingly employed by diverse segments of the population for a wide variety of complaints including pain, insomnia, anxiety, depression, frozen shoulder, and other issues. The term is also used as a shorthand for the wider medical system from which the placement of needles into the skin for therapeutic benefit and related techniques evolved. Thus “acupuncture” refers both to the therapeutic technique and the therapeutic system of Acupuncture and Herbal Medicine (AHM). The other modalities included within AHM include a wide variety of physical and mechanical manipulations, herbal medicines, dietary recommendations, and lifestyle modifications. Clinically, acupuncture is increasingly offered in a variety of conventional medical settings such as hospitals, medical school clinics, veterans’ healthcare centers, oncology facilities, and rehabilitation centers, and its safety profile is excellent overall. Barriers to further incorporation of acupuncture into biomedical sites include insurance coverage of acupuncture, education of conventional medical practitioners and other stakeholders about the utility, efficacy, and evidence

base of acupuncture. Acupuncturists in the United States are skilled practitioners who are highly educated in the complex therapeutic system from which acupuncture arose and in the technical aspects of its utility as a treatment modality. The training, certification, licensure, and regulation of acupuncturists is similar to that of conventional providers such as physician's assistants, advanced practice nurses, and medical and osteopathic doctors. While clinical use and acceptance of acupuncture continues to grow, there is to date no definitive composite document explaining the utility of acupuncture in various healthcare settings, the current understanding of how acupuncture works, and the training, professional regulation, and certification of acupuncture practitioners. This article will address these topics and strive to create a reference for practitioners, administrators, legislators, insurance providers, patients and their families, and other stakeholders.

Keywords: acupuncture, herbal medicine, traditional Chinese medicine, integrative medicine, integrative health, medical policy

Plain Language Summary

Acupuncture refers to the placement of thin, sterile needles into the skin to stimulate healing effects, and, in the United States, it also refers to the medical system from which the technique of acupuncture evolved. That system, Acupuncture and Herbal Medicine (AHM), uses acupuncture, dietary and lifestyle advice, herbal medicines, and other therapies to facilitate health and healing. Acupuncture is increasingly being used for a wide variety of medical problems including pain, difficulty sleeping, mental health concerns, and other issues in a wide variety of settings and is supported by a growing scientific basis for understanding why and how it works. Training and licensure of acupuncturists are similar to many conventional practitioners, and the process is accredited and overseen by various governmental and regulatory bodies. This paper aims to provide an overview of the use of acupuncture in the United States, the scientific basis for acupuncture, the training and licensure of acupuncturists, and the ways in which acupuncture is and might be incorporated into conventional medical settings.

Introduction

The term “acupuncture” commonly refers to a non-pharmacologic therapy that is increasingly employed by diverse segments of the population for a wide variety of complaints including pain, insomnia, anxiety, depression, frozen shoulder, and other issues.¹ The term is also used as a short-hand for the wider medical system from which the placement of needles into the skin for therapeutic benefit and related techniques evolved. Thus “acupuncture” refers to both the therapeutic technique and the broader system of Acupuncture and Herbal Medicine (AHM). The other modalities included within AHM include a wide variety of physical and mechanical manipulations, herbal medicines, dietary recommendations, and lifestyle modifications.

Clinically, acupuncture is increasingly offered in a variety of conventional medical settings such as hospitals, medical school clinics, veterans' healthcare centers, oncology facilities, and rehabilitation centers, and its safety profile is excellent overall. Barriers to further incorporation of acupuncture into biomedical sites include insurance coverage of acupuncture and education of conventional medical practitioners and other stakeholders about the utility, efficacy, and evidence base of acupuncture.

Physiological and Anatomical Effects of Acupuncture

Scientific progress from over fifty years of research conducted primarily in Asia, Europe, and the United States provides supporting evidence of significant physiological effects of acupuncture. These effects span from changes in fibroblasts in the connective tissue to modulatory neural effects in the brain.

Upon insertion into the skin, acupuncture needles affect numerous structural and biochemical changes to connective tissue and fascia. When the inserted needle is manually stimulated by twirling and thrusting, these effects are enhanced.^{20,21} In these and other studies, acupuncture has been shown to change gene transcription and translation,⁹⁴⁻⁹⁷ reduce peripheral inflammation,⁹⁸⁻¹⁰⁰ influence autonomic function,¹⁰¹⁻¹⁰³ increase blood flow,^{104,105} and alter the biochemical environment of tissues surrounding the needle.¹⁰⁶ In addition, acupuncture has been shown to change the concentrations of various peripheral neurotransmitters,^{107,108} modulating the excitability of peripheral nerve cells that carry information from the rest of the body to the central nervous system. One of the most well studied actions of acupuncture is its ability to activate the body's own innate pain-relieving mechanism, the endogenous opioid system.¹⁰⁹⁻¹¹⁵ Human neuroimaging studies have demonstrated that acupuncture can reverse maladaptive neuroplasticity in the brain.¹¹⁶

While current research is exploring how acupuncture works to engage such changes, more than 100 functional magnetic resonance imaging (fMRI) studies evaluating evoked brain response to real vs sham acupuncture needling have now been published. A recent meta-analysis of fMRI literature demonstrated that while both real and sham acupuncture engage somatosensory (ie touch) processing brain areas such as the thalamus and secondary somatosensory cortex, acupuncture needling more readily deactivates affect/emotion processing areas such as the amygdala.²⁷ Such evoked responses, if entrained over time, may hold the key to how acupuncture can successfully improve symptoms associated with chronic pain such as depression and anxiety. Furthermore, the widespread brain response noted by acupuncture fMRI studies may underlie the broad clinical applications explored by clinical research.

Auricular acupuncture has been shown to affect vagal activity of the autonomic nervous system including cardiovascular, respiratory, and gastrointestinal functions.¹¹⁷ Afferent projections from

the auricular branch of the vagus nerve (ABVN) to the nucleus of the solitary tract (NTS) seem to form--at least in part--the anatomical basis for the vagal regulation of auricular acupuncture. The mechanisms of action of other microsystems, such as hand acupuncture (identified by Korean acupuncturist Yu Tae-u in the 1970's)¹¹⁸ scalp acupuncture, and abdominal acupuncture (commonly used in Japan),¹¹⁹ are still not fully elucidated in the English language literature.

The systemic effects of acupuncture treatments and the potential mechanism behind these complex actions are under investigation as well, such as a convergence of the neurophysiology model, the connective tissue model, and the growth control model.^{120,121} Because the mechanisms behind both sham and verum acupuncture treatments appear at multiple levels in the nervous system as well as in peripheral tissue at the segmental and central levels,¹²² accurate understanding and assessment requires a holistic view of acupuncture's multiple mechanisms.¹²³

More recent and ongoing studies are gathering mechanistic information necessary to understand the biological basis of acupoints. One is the Topological Atlas and Repository for Acupoint research (*TARA*) project, currently funded by the NIH (5U24AT012560-02). The TARA project brings together AHM theory and practice with modern biomedical information, anatomy, and physiology into a searchable database.¹²⁴

While the reductionistic analytic approach of biomedicine provides a level of specificity for the lens through which the holistic patterns of AHM may be viewed, this holistic view should also incorporate non-needling context effects of acupuncture, such as the patient-acupuncturist therapeutic interaction, which has been mechanistically assessed with a social neuroscience brain imaging approach.^{125,126}

Scope of Acupuncture Efficacy

Recent analytical review of large databases comprised of 17 studies support the cost-effectiveness of acupuncture across any health condition, including allergies, digestive complaints, insomnia, infertility, women's health, etc.,¹²⁷⁻¹²⁹ with newer studies continuing to support acupuncture's effectiveness in the treatment of health conditions such as stroke, irritable bowel syndrome, xerostomia, combat-related posttraumatic stress disorder, depression, Parkinson's, and insomnia.¹³⁰⁻¹³⁶ While many published studies support acupuncture's effectiveness in relieving various types of acute and cancer treatment-related pain¹³⁷⁻¹⁴³ and improving function,^{144,145} the most substantial and conclusive body of evidence regarding the clinical effectiveness of acupuncture is in the treatment of chronic pain.¹⁴⁶ Two seminal meta-analyses of individual patient raw-data (20,827 patients from 39 trials published until 2015)^{7,8} conducted by Acupuncture Trialists' Collaboration--A group of trialists, statisticians and other researchers--indicate that acupuncture is clearly effective for the treatment of chronic musculoskeletal, headache, and osteoarthritis pain. Furthermore, the treatment effects of

acupuncture cannot be explained solely in terms of placebo effects and persist over time.¹⁴⁷ The authors indicate that referral for a course of acupuncture treatment is a reasonable option for a patient with chronic pain.⁸ Acupuncture has been of interest to military health scientists since the mid-1960's, and today is an established form of treatment in the military, particularly for pain and pain-related dysfunction.¹⁴⁸

According to the National Cancer Institute (NCI), acupuncture is used to manage cancer-related symptoms^{149,150} such as cancer pain,^{142,143,151-154} chemotherapy-induced nausea and vomiting,^{155,156} and other symptoms that affect quality of life including weight loss, anxiety, depression, insomnia, poor appetite, fatigue, xerostomia, hot flashes, chemotherapy-induced peripheral neuropathy, joint pain, gastrointestinal symptoms (constipation and diarrhea), and postoperative ileus.^{130,157-165} Among NCI-designated comprehensive cancer centers, 89% recommend the use of acupuncture for symptom management in cancer patients. A recent retrospective analysis of 375 cancer survivors who received acupuncture treatments indicates that patients experienced short- and long-term improvements in multiple symptoms including hot flashes, fatigue, numbness, tingling, and nausea.¹⁶⁶ Cancer patients are receptive to receiving acupuncture for symptom control^{152,159} and pain management.¹⁵³ Acupuncture is both acceptable and safe for children and adolescents undergoing oncologic treatments.^{85,167-169}

Preliminary evaluation of auricular acupuncture indicates that it provides significant reduction in musculoskeletal pain in adults,¹⁷⁰ as well as management of pain in military veterans;¹⁷¹ primary headaches in an emergency department;¹⁷² post-traumatic stress disorder,¹⁷³ and chronic migraines.¹⁷⁴ The research literature on Korean hand acupuncture in English language databases is scarce, but it appears promising in managing chronic pain and improving activities of daily living (ADL's) in elderly patients.^{175,176}

Mechanisms of Acupuncture for Pain Management

Pain in AHM typically results from a stagnation of Qi and/or stasis of Blood, which are commonly--but not exclusively--the result of trauma and/or inflammation. An AHM therapy seeks to resolve lack of flow of Qi and Blood by stimulating the body's healing mechanisms. As these treatments work with the body's biological systems, they are both systemic in nature and localized by appropriate needle insertions. While it is outside of the scope of this paper to summarize the effects of acupuncture for all clinical conditions, symptoms and pathology, it is possible to map with certainty many of the pain-modulating mechanisms of acupuncture to elucidate its clinical effect on the management of pain.

Research indicates that acupuncture stimulation inhibits pain by activating a variety of bioactive chemicals throughout all levels of the nervous system including peripheral, spinal, and supraspinal mechanisms. These activations cause the release of endogenous cannabinoids, β -endorphin, dynorphins, serotonin, enkephalins, and gamma-aminobutyric acid (GABA),

norepinephrine, and dopamine.^{122,177–180} Furthermore, the analgesic effects of an acupuncture treatment have been linked to the release of endogenous opioid peptides (EOPs), which are found in blood plasma and cerebrospinal fluid within 15–20 minutes into the treatment and seem to correlate with the longer lasting effects of the treatment,¹⁰⁹ providing pain relief up to a year in some cases.¹⁸¹ Deeper acupuncture needling seems to impact sensory neurons in deep fascial tissues,^{21,182} while superficial needling stimulates the dense neural network found in the epidermis.¹⁸³ Both can modulate painful sensations and may help to elucidate why both superficial and deep needling can be effective for pain control.

The immediate pain relief from acupuncture has also been linked to counter-irritation or conditioned pain modulation (CPM), which in animal models is known as diffuse noxious inhibitory controls (DNIC). In this model, stimulation has been shown to induce immediate suppression of pain transmission in nociceptive neurons.¹⁸⁴ A 2021 study reported by a research team in Harvard Medical School suggested that anti-inflammatory effects of acupuncture likely occur via activation of the autonomic nervous system including the vagal-adrenal axis,⁹⁹ reinforcing earlier studies demonstrating similar autonomic responses to acupuncture stimulation.^{101,103} Further, analgesic effects may be augmented with needle retention when compared to quick “in-and-out” styles of acupuncture.^{185,186} Studies also suggest that acupuncture combined with low dosages of conventional analgesics provides better effective pain management which can reduce the side effects of often-debilitating pharmaceuticals.¹²²

Acupuncture Research Trajectory

While acupuncture has been taught by scholars and practiced for more than 2,500 years by clinicians in China and other East Asian countries, its acknowledgement and clinical application in the West is more historically proximate. Medical essays, observational accounts, and clinical case reports by Western physicians date back to the 1600’s, with the first medical essay by Dutch physician Dr. Wilhelm Ten Rhijne based on his observation of the practice in Japan. The first recorded observation of the mechanistic effect of acupuncture on pain dates back to the 1700’s by the Viennese physician Gerard van Swieten.¹⁸⁷ Dr. Louis Joseph Berlioz published the first case reports of clinical application in France in 1816.¹⁸⁷ Analyses of acupuncture points, meridians, and potential parallels to biomedically defined mechanisms of action took place in Japan in the later part of the 19th Century.

The evolution of research methodologies and clinical trial design helped propel a more rigorous investigation of acupuncture in the 20th Century. In the US, research into the efficacy of acupuncture began in the early 1900’s but was expanded in the 1950’s to 1970’s by the discovery of overlapping mechanisms between acupuncture and general anesthesia and by articles in the mass media.^{188,189} In 1972, the NIH first funded acupuncture research. In 1975, the first impactful randomized controlled trial (RCT) was published in the New England Journal of Medicine

describing the use of acupuncture for osteoarthritic pain.¹⁹⁰ In the 1980's inquiry into the effect of acupuncture on conditions other than pain began to take hold. Basic science research findings on the physiological effects of acupuncture stimulation (eg release of neurotransmitters, endorphins, enkephalins, etc) supported exploration of the potential application of acupuncture in health care.¹⁷⁷

In 1997, the NIH conducted the “Consensus Conference on Acupuncture” and concluded, *There is sufficient evidence of acupuncture's value to expand its use into conventional medicine and to encourage further studies of its physiology and clinical value.*³¹

While an in-depth history of the trajectory of acupuncture research is beyond the scope of this paper, between 1995 and 2014, there was an exponential growth rate in the number of acupuncture papers (mean annual growth rate of 10.7%), which was significantly higher than the growth rate in biomedicine (4.5%).¹⁹¹

Section VII: Conclusion

Acupuncture and Herbal Medicine is a diagnostic and therapeutic system of whole person care in which distress and dysfunction are recognized as patterns of disharmony within a complex system. Thus, the practice of “Acupuncture” in the United States could be more accurately described as “acupuncture systems medicine”, a complex process of diagnosis and intervention that applies techniques of acupuncture and acupressure, herbal medicine, phytotherapy, moxibustion, medical cupping, gua sha, dietetics, specialized manual therapies, mind-body techniques, and other established modalities.

While some mechanisms remain to be fully elucidated, much is known about the way that insertion, retention, and manipulation of acupuncture needles impact the biochemical, cytoskeletal, anatomical, neuromuscular, and neuromodulatory components of the body. Acupuncture is widely studied and accepted as a form of treatment for pain, and it is both safe and effective in addressing a broader set of biomedical conditions and symptoms.

In the United States, acupuncture may be performed by a variety of practitioners who are trained to various levels of expertise. Licensed acupuncturists are the most highly trained practitioners in the context of the acupuncture system of AHM and the technique of acupuncture as a modality.

Acupuncture is being incorporated into inpatient and outpatient settings, has been shown to reduce the costs of medical care, and may provide a substantive, sustained alternative for pharmacologic and surgical management of complex issues such as pain. Acupuncture, as

performed by regulated, highly trained medical professionals, is increasingly valued as a safe and effective part of the larger medical system of care in the United States.

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This is a synopsis of the full paper. If you would like to read it in its entirety or for more information go to: <https://pmc.ncbi.nlm.nih.gov/articles/PMC11472758/>