Acupuncture: A Useful Tool for Health Care in an Operational Medicine Environment

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ABSTRACT Acupuncture is a form of medical care that originated in China; it has evolved and progressed over thousands of years to become one of the most commonly used forms of health care throughout the world. Allopathic (Western) medicine has begun to seriously investigate and to use this system only in the past three decades. Although acupuncture's mechanisms for healing are not fully understood, it helps many conditions. Using acupuncture reduces or eliminates the need for expensive medications and the potential risk of adverse events resulting from medications, with cost savings and health benefits to patients. During a deployment of naval combat engineers to Iraq in support of Operation Iraqi Freedom, acupuncture was used in the health care of sailors, Marines, and soldiers. It objectively and subjectively improved the health of troops in the field. Troops were able to function while being treated, reducing or avoiding sick in quarters or light limited duty status and saving operational man-days. Acupuncture in the right hands can serve as a health force multiplier (amplifying a provider's clinical impact) and can be integrated into routine health care, whether in garrison or in the field.

INTRODUCTION

Five hundred Seabees from Naval Mobile Construction Battalion 18 were mobilized during the summer of 2006, for a 9-month deployment in support of Operation Iraqi Freedom. As a reserve battalion, these sailors were generally older (median age, 38 years) and less fit than their active duty counterparts, as noted in the medical literature[1,2] and by the battalion medical officer during mobilization. As naval combat engineers, they operated in physically demanding conditions in Al Anbar province, performing construction and security duties in an austere environment. They sustained combat-related injuries (including one death), work-related injuries, environmental illnesses, and routine illnesses. The battalion had an echelon I battalion aid station (BAS), where the majority of medical care was administered. In addition to standard allopathic medical treatment, sailors were offered acupuncture to complement their therapy; more than two thirds of the patients agreed to acupuncture. As word of acupuncture therapy spread, the BAS was visited by sailors, Marines, and soldiers from other units on the base who attended the growing acupuncture practice, which was offered thrice weekly.

Acupuncture is an ancient form of medical care that began in China more than two millennia ago. Because the Chinese lacked the scientific method, acupuncture evolved through trial and error and was described in cultural and poetic terms, which in some ways have been hurdles to acceptance in the Western medical community. In the past several decades, increasing numbers of scientific studies have been undertaken to evaluate and to elucidate how acupuncture works. There are difficulties in study design because many of the benefits are nonspecific (and thus difficult to measure, although they should not be discounted) or subjective; furthermore, sham acupuncture treatments yield some positive benefits. A true double-blind study cannot be conducted with the application of needles through the skin.[3] The mechanisms of action have yet to be fully elucidated but appear to include increased capillary blood flow at needle insertion sites, slow electrical conductivity stimulation of fascial electrolytes, opioid peptide release in the spinal cord, neuropeptide anti-inflammatory effects, pathway stimulation in the central nervous system, segmental nervous system effects, and autonomic nervous system regulation.[3–6] Studies have shown that brain activation and deactivation occur in specific and largely predictable areas when specific acupuncture points are stimulated.[7]

Simplistically, in the Chinese paradigm, energy (qi) flows in patterns throughout the body; when the flow is disrupted or blocked, pain or disease arises. Acupuncture, through the insertion of needles in specific points, restores the flow of qi, which leads to healing.

Clinically, acupuncture has shown great promise. The National Institutes of Health created a branch dedicated to complementary medicine, the National Center of Complementary and Alternative Medicine. The National Institutes of Health has set a precedent by taking a position endorsing the growing use of acupuncture for several conditions and is open to adding to that list as science on the matter expands.[3] The National Institutes of Health acknowledges the positive benefits of acupuncture for treating various pain problems, including epicondylitis, menstrual cramps, fibromyalgia, head-

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aches, and dental pain, as well as nausea and vomiting; it also notes that the incidence of adverse events is substantially lower than with many comparable drugs or procedures.[3] Various studies have shown that acupuncture is beneficial for treating musculoskeletal ailments (including strains, arthritis, low back pain, and neck pain), for general pain control, for treating respiratory diseases (such as asthma, bronchitis, and chronic obstructive pulmonary disease), certain infections (such as sinusitis), gastrointestinal conditions (such as inflammatory bowel disease), and headaches, and for rehabilitation after nerve injury, among other applications.[8–13] However, few studies on the cost-effectiveness of acupuncture have been conducted.[14,15] The use of acupuncture as a complementary health care system has also been addressed by the White House, which instituted the White House Commission on Complementary and Alternative Medicine in 2000 and has increasing support from the Department of Health and Human Services.[16] The military is just beginning to investigate the utility of acupuncture for the care of troops (which has been overwhelmingly performed in hospitals and not the field).[17] Nevertheless, military patients, notably veterans, already seek and value acupuncture as a form of medical care.[18] The medical use of acupuncture has rapidly expanded in the past decade, with the creation of a medical acupuncture board examination and the American Academy of Medical Acupuncture; these developments are aimed at integrating acupuncture into mainstream medical care and augmenting patient therapies, in conjunction with traditional Western medical regimens.

METHODS

Subjects

Five hundred sailors in Naval Mobile Construction Battalion Eighteen deployed to Iraq during Operation Iraqi Freedom from September 2006 through March 2007. Sailors, Marines, soldiers, and Special Forces personnel located on the assigned bases were also seen for acupuncture care. Patients were verbally offered acupuncture care in lieu of or in conjunction with allopathic medical care and were informed about the process, as well as the potential risks and benefits. The medical officer, who was board-certified in emergency medicine, was also board-certified in medical acupuncture by the American Academy of Medical Acupuncture and had practiced acupuncture for nearly a decade. The Force Medical Officer at the division level supported the use of acupuncture for patient care. Patients were seen primarily in the BAS at Al Asad Marine Corps Air Station in Al Anbar Province, Iraq, or at the shock trauma platoon located at the base hospital; treatments were also performed in the BAS at Camp Fallujah and at forward operating bases and combat outposts.

Materials

Sterile acupuncture needles were used once, discarded into biohazard sharps dispensers, and disposed of at the base hospital with standard sharps items such as syringe needles. The needles used were primarily C & G (CT5-3215, 0.25 × 40 mm) and Carbo (CB1.25 × 40 and CB1.25 × 75 for deep therapy; Helio Supplies, San Jose, CA). Helio ear seeds with processed vaccaria seeds on surgical tape were used for ear seed pressure therapy. Electroacupuncture was conducted with an Ito electroacupuncture stimulator (Helio Supplies). Moxabustion was performed by using traditional pure moxa rolls (*Artemesia vulgaris*, also known as mugwort; Helio Supplies).

Procedures

Acupuncture treatments were primarily given according to traditional Chinese medicine methods, but the tendinomuscular method, percutaneous electrical nerve stimulation, and the French style were also used. Sterile needles were placed through the skin until the sensation of de qi ("grabbing" of the needle, usually at the fascial level) was noted by either the physician or the patient or, according to the traditional site location, with the depth varying from a single millimeter to several centimeters. Needles were left alone, intermittently manually stimulated, attached to electrodes, or heated with a moxa roll. Electrostimulation was performed either according to the French system or with the percutaneous electrical nerve stimulation method, a more-effective therapy than the more-familiar transcutaneous electrical nerve stimulation. Needles were typically left in place for 10–20 minutes; some therapies, particularly those for chronic pain reduction, were left in place longer. Interestingly, there is no need to sterilize the skin before needle insertion. If no cellulitis or other skin infection is present and the needles are sterile, then acupuncture therapy does not cause infection. Patients who expressed concern had their acupuncture sites treated with alcohol swabs. Patients were encouraged not to take nonsteroidal anti-inflammatory drugs during their treatments.

RESULTS

A total of 435 acupuncture treatments were administered to 132 different patients during deployment to Operation Iraqi Freedom. Patients in this population group were very willing to try acupuncture instead of taking medications when the theory and practice of acupuncture were described to them. Many expressed a dislike for the ubiquitous use of ibuprofen by Navy medicine and were interested in trying an alternative form of therapy. More than 80% of the acupuncture patients did not take medications (notably anti-inflammatory and analgesic medications) for the condition for which acupuncture therapy was being administered, upon the advice of the medical officer. A total of 3,563 needles were used for these 132 patients; 11.1 treatments were conducted weekly, using a 3-day week when acupuncture was offered, with ~6 h/wk dedicated to such care. Patients averaged 3.3 visits, with 2.3 treatments per condition, over the course of the deployment in Iraq. An average of 7.9 needles per treatment were used.

Most conditions treated arose from injury rather than illness (Fig. 1). Injuries in this population were typically related

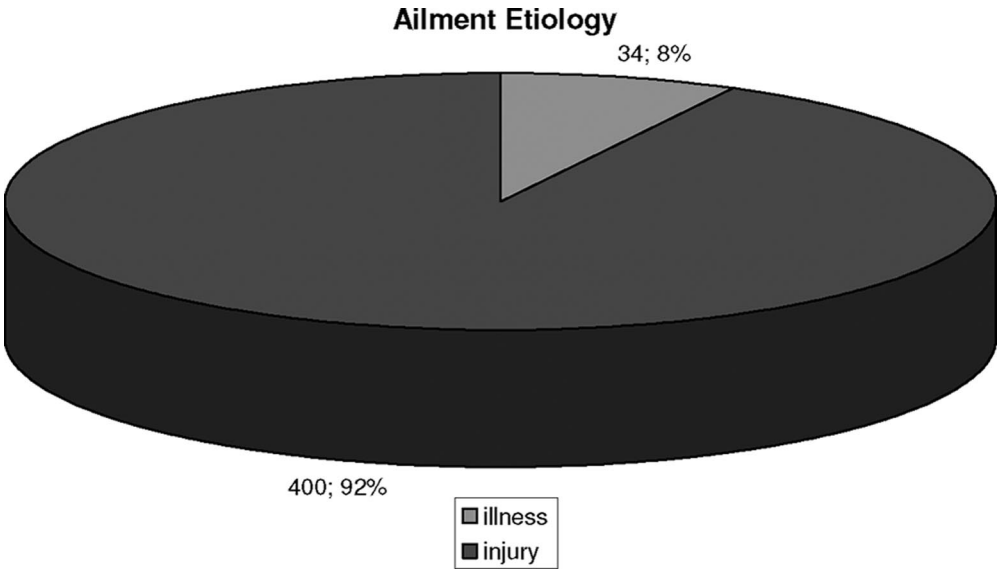

FIGURE 1. Relative proportions and numbers of illness vs. injury causes for ailments treated.

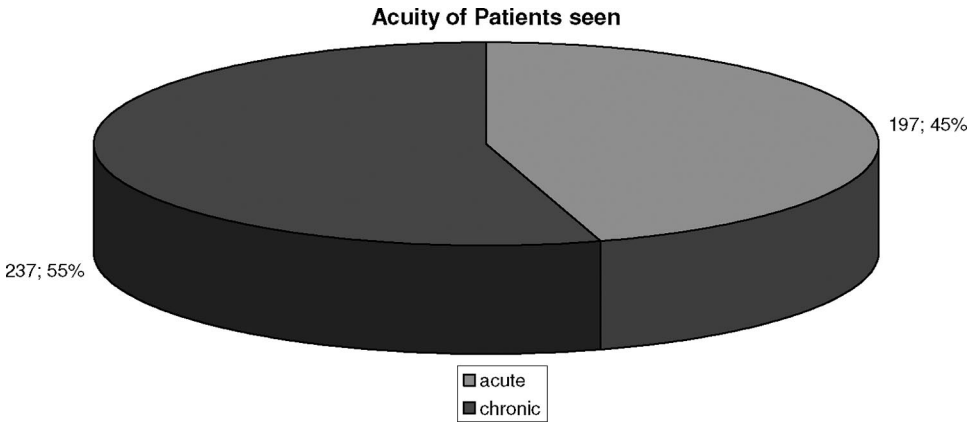

FIGURE 2. Relative proportions and numbers of acute vs. chronic conditions.

to construction work, particularly with repetitive-motion injuries such as with hammering, using screwdrivers, or carrying materiel.

There was a nearly even distribution of those presenting with acute vs. chronic conditions; there was a slight predominance of chronic conditions, defined as persisting ≥10 days (Fig. 2). Acute exacerbations of chronic conditions were included in the acute category. When patient presentations were examined according to ailment category, the overwhelming majority of acupuncture treatments were for orthopedic conditions (Fig. 3). Considering that the population consisted primarily of construction workers in a combat zone, this is hardly surprising. When problems were divided according to different body areas, the majority of patients presented with back and spine conditions (Fig. 4). After this, most treatments were given for hip or pelvis complaints or neck or cervical spine-related ailments, followed by shoulder or elbow conditions. Nineteen sprains and fractures were treated, and acupuncture hastened return to duty by an average of 2 days for all sprains, compared with troops who chose conventional therapy, during this deployment. A case of eye strain in a helicopter pilot accounted for the only ophthalmic condition, with inconclusive results.

Treatment outcomes were divided into three categories, namely, significant improvement, improvement, or no improvement. Significant improvement was defined as a patient requiring fewer than three treatments or subjective improvement with the patient indicating ≥50% reduction in pain or ≥50% improvement using a pain scale of 1 to 10 (Fig. 5). Improvement indicated that more than three treatments were necessary or there was <50% improvement. No improvement was defined as a patient describing no subjective improvement or the medical officer observing no clinical improvement. Patients were readily available to ascertain treatment results and the need for possible follow-up care; there was a high level of compliance and trust among the troops with their medical department. No infections arose as a result of acupuncture treatment.

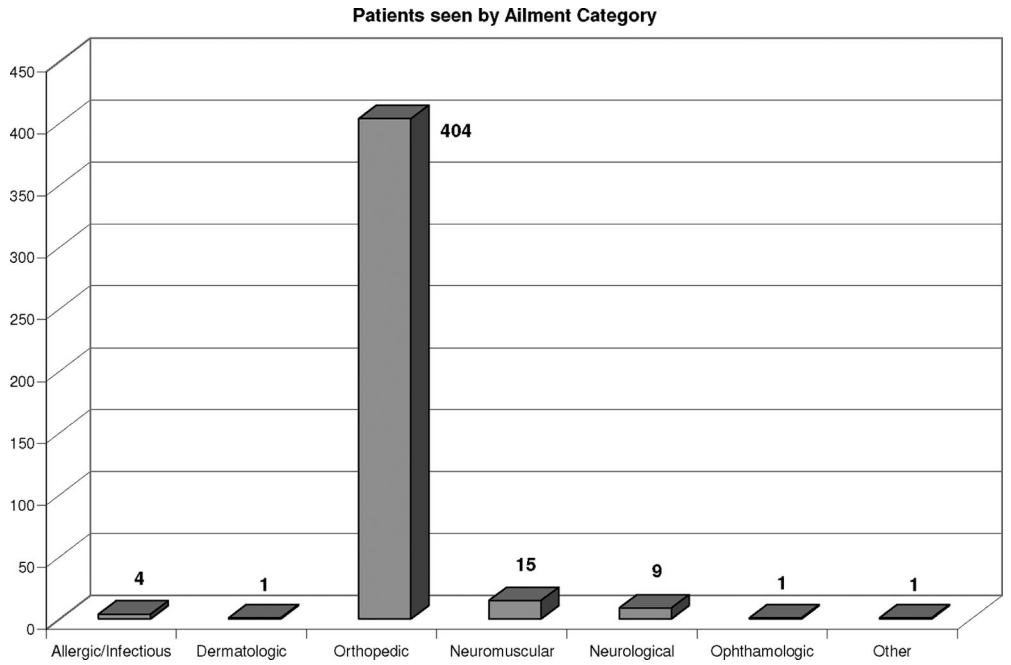

FIGURE 3. Broad categories of conditions for which patients were treated.

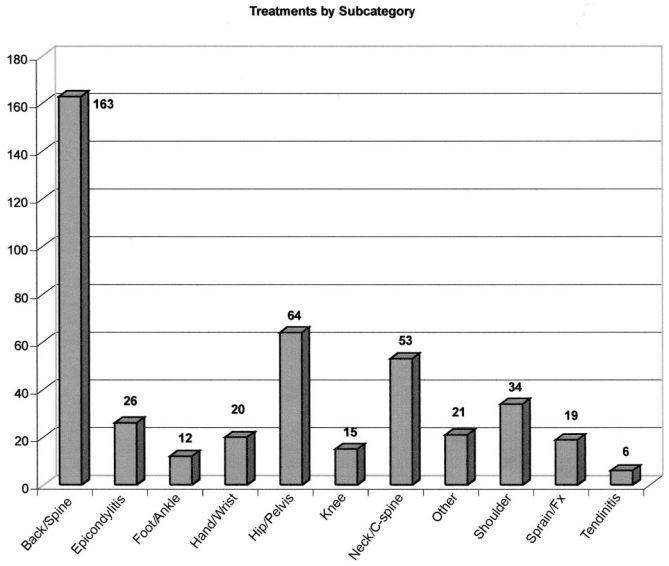

FIGURE 4. Subcategories of conditions treated with acupuncture. C-spine, Cervical spine; Fx, fracture.

DISCUSSION

This was a noncontrolled study that arose from a treatment option offered to troops, which was eagerly accepted and sought out. Although it was not a randomized, double-blind, controlled trial, it still has great value; indeed, for complex interventions such as acupuncture, which at times produces nonspecific results, such studies may not be as useful.[19] In this preliminary descriptive study, the data acquired provide encouragement regarding the utility of acupuncture in operational environments. This should lead to more-advanced and more-frequent comparison studies, to gain the acceptance of acupuncture by the military medical community. As in the civilian community, patients appear more interested and open to complementary health care methods than their health care providers. Among the reasons expressed by troops for using acupuncture were avoidance of medication treatments with which they found it difficult to comply in the tactical environment, avoidance of side effects, ease of treatment, and beneficial results of therapy. The elimination or reduction of medication usage might be particularly advantageous for the aviation community, allowing pilots to avoid grounding by flight surgeons if specific medications might interfere with flying.

An additional benefit to using acupuncture is the low cost of treatment. Consider the following exercise. The price of needles ranges from \$0.06 to \$0.50 per needle. The majority of the needles used during this deployment were in the low end of the range, ~\$0.10 per needle, for a total expense of ~\$375. With an average of 7.9 needles per treatment, the average treatment cost was \$0.79. Considering 2.3 visits per condition, the cost of needles for each treatment course was \$1.82. In comparison, the cost of ibuprofen (\$0.48 for 800 mg) for 1 week is \$10.08 (using prices acquired directly from TAMMIS Customer Assistance Module (TCAM)) and the cost of celecoxib (\$1.47 for 100 mg) for 1 week is \$20.58 (using prices acquired directly from the TCAM). The relative cost of treating mild/moderate pain syndromes is by far lowest using acupuncture (Table I). By avoiding nonsteroidal anti-inflammatory drugs, the potential complications of gastritis, gastric perforation, and renal damage (among others) are avoided. As an example, during the deployment one member declined acupuncture for a stiff knee, choosing to take ibuprofen instead. After 5 days of therapy, she developed severe abdominal pain and was admitted to the shock trauma

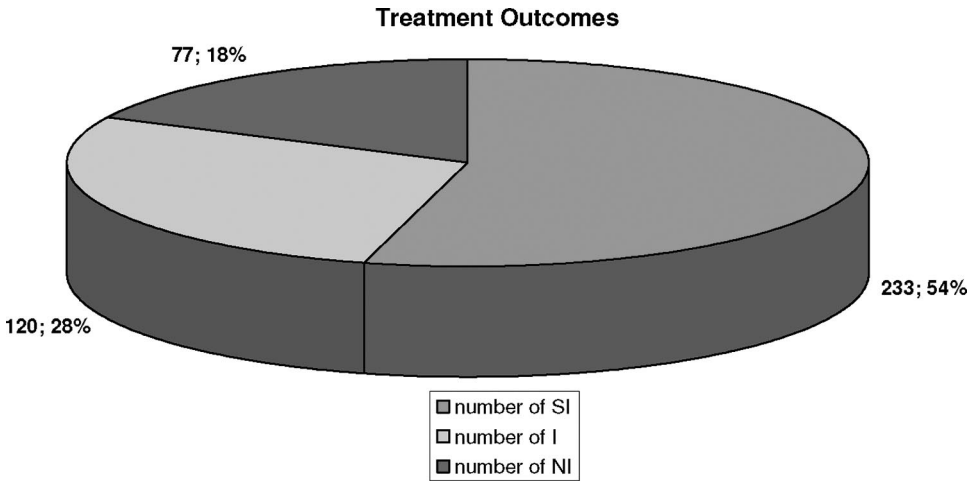

FIGURE 5. Relative proportions and numbers of treatment outcomes after acupuncture therapy. SI, Significant improvement; I, improvement; NI, no improvement.

TABLE I. Relative Costs for Treating a Mild/Moderate Pain Syndrome for 1 Week

Treatment	Weekly Cost	Relative Cost
Acupuncture	$1.82	1
Ibuprofen	$10.08	5.5
Celecoxib	$20.58	11.3

platoon for 24 hours of observation and treatment. Because of the limited capabilities of the echelon II facility, no esophagogastroduodenoscopy was performed, but her blood tests (complete blood count, liver enzyme profile, amylase measurement, serum chemistry profile, and pregnancy test), urinalysis, acute abdominal series, and ultrasound results were normal. The patient was given intravenously administered ranitidine overnight ($24.96 for intravenous therapy; 50-mg intravenous piggyback every 8 hours at $4.16 for 25 mg/mL), followed by oral therapy (150 mg twice per day at $1.42 per tablet; $85.20 per month). In addition, the cost of a 24-hour hospitalization with an average overseas inpatient rate is ~$3,958.[20] The cost of treating this single patient exceeded the cost of the treatment she would have required with acupuncture by a factor of 2,139 ($3,958/$1.82) and the cost of all acupuncture needles used during the entire deployment by a factor of 10.5 ($3,958/$375). The cost difference between the medication needed for gastritis therapy and acupuncture therapy was $108.34 ($110.16 − $1.82). If hospitalization could have been avoided through outpatient acupuncture therapy, then the cost savings to the Department of Defense would have been $3,956.18 ($3,958.00 − $1.82) for this single patient. This cost savings is a benefit above that of returning a member to duty sooner or avoiding sick in quarters status and, as such, provides commanders with reduced lost man-days. This is therefore an operational force multiplier, expanding the clinical capability of providers in operational environments. Cost savings by postponing or reducing the need for expensive procedures can also be predicted. For example, the average costs of ambulatory surgical visits for spinal fusion and laminectomy are $18,600 and $10,700, respectively.[21] If these procedures could be limited or eliminated, then substantial savings could be experienced by the Department of Defense and the Department of Veterans Affairs.

From this study, it can be seen that acupuncture is a useful practical adjunct for therapy in operational environments, but further studies are clearly needed. A commission established by the White House came to the same conclusion.[16] Although acupuncture has been used for nearly 3,000 years, it has only begun to be studied with the scientific method. Acupuncture provides good pain relief and assists in minimizing illness. It is quite safe; a PubMed search (National Library of Medicine) revealed only 18 articles on acupuncture medical errors, whereas there were 57,184 articles for standard medical errors. The Institute of Medicine published a report revealing that preventable adverse events are a leading cause of death in the United States. With extrapolation to the >33 million annual admissions to U.S. hospitals, between 44,000 and 98,000 patients die in U.S. hospitals each year as a result of medical errors.[22] This does not include those who suffer morbidity only, which would naturally be an even greater number. Medical errors carry high financial costs as well; the Institute of Medicine report estimated that medical errors cost ~$37.6 billion each year, with ~$17 billion associated with preventable errors. Approximately one-half of the expenditures for preventable medical errors are for direct health care costs.

Patients are interested in acupuncture therapy when it is available and often prefer it to standard modalities. Acupuncture has been used by at least 8 million U.S. civilians and is entering mainstream medical care.[3,16,23,24] It should be considered by the Department of Defense as an additional medical modality for military health care providers.

CONCLUSIONS

Acupuncture is a valuable tool that can be safely used to augment the health care of troops in operational field envi-

ronments. Acupuncture helps save commanders man-days by reducing lost work time and shortening the interval from injury or illness to return to duty. It is inexpensive, carries little overhead, can be used nearly anywhere, and saves money. Providing acupuncture services in garrison and during deployment is beneficial for both troops and commands.

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