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Economic Evaluation in Acupuncture: Past and Future

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Key Words (MeSH): acupuncture, acupuncture therapy, complementary therapies, costs and cost analysis, cost-benefit analysis, evidence-based medicine, quality-adjusted life years, quality of life

Acupuncture's Place in U.S. Healthcare

The National Center for Complementary and Alternative Medicine (NCCAM) defines complementary and alternative medicine (CAM) as “a group of diverse medical and health care systems, practices, and products that are not generally considered to be part of conventional medicine.”¹ Nearly 40% of United States citizens use some form of CAM each year² and according to the 2007 National Health Interview Survey (NHIS) there were 354 million visits to CAM providers and 835 million CAM purchases. The 2007 out-of-pocket expenditure for CAM in United States was nearly 34 billion dollars.² Visits to a health care practitioner of any kind totaled \$61.5 billion, of which, \$11.9 billion was spent on CAM providers such as acupuncturists and chiropractors. Over 3.1 million adults visited an acupuncturist in 2007, a figure that has risen sharply over the past decade; in 1997 there were 27² visits to an acupuncturist per 1,000 adults compared to 79.2 visits in 2007.³ This is due, in part, to successful efforts at regulation and licensing acupuncturists, a movement toward standardization of acupuncture delivery, and increased referrals by MD/DO physicians.^{4,5}

Making Medical Decisions Depends on Perspective

Factors involved in a patient's decision to seek CAM treatments in general and acupuncture specifically are varied and complex.⁶ They include a desire to participate in one's own care, dissatisfaction with or ineffectiveness of conventional therapy, a desire to avoid side effects or complications of conventional therapy, and belief in a holistic versus reductionist view of health and disease.^{3,6} While reasons that patients choose acupuncture vary, the decision to pay for most or all of the costs without reimbursement strongly suggests that acupuncture is perceived as both valuable and beneficial to consumers.

An insurance company's decision to cover acupuncture (or any treatment) is based on different factors. Insurance companies and health management organizations (HMO) must balance their overall costs with the need to attract and keep customers. The strategies used to determine premium rates and selection of benefits are not publicized but are based on market analyses, actuarial tables, and negotiations with large and medium corporations. Oddly enough, overall patient health may not be the primary determining factor. When this decision process is applied to acupuncture, some insurance companies have determined that paying for visits to an acupuncturist represents a good investment.

Health programs operated on a national level, so called state health programs (not to be confused with individual states within the United States), base funding decisions on a different set of factors. One of the major incentives of federally-operated health care systems is to keep citizens healthy and functional. As national systems operate with a finite pool of resources, maintaining the health of the citizenry must be achieved at a reasonable cost. To achieve this goal, administrators of state health programs rely on economic evaluations of treatments to determine what services should and can be covered. Implicit in this evaluation is the effectiveness of treatment—ineffective treatments are not considered in a cost analysis. Each effective treatment needs to be weighed against its expense. For example, if each citizen has a colonoscopy every month for their entire lives, deaths from colon cancer could be virtually eliminated; however, the direct and indirect costs of this colon cancer screening would be exorbitant and would leave few resources for any other medical intervention. Thus decisions about resource allocation on a national level must balance effective treatments with relative cost.

Acupuncture Reimbursement by Some Western Countries

Government attitudes toward reimbursement for acupuncture vary. In the United Kingdom, acupuncture is available through the federally funded National Health Service (NHS).⁷ Patients obtain acupuncture referrals from their general practitioner and about one million people receive acupuncture treatments through the NHS each year. In France, acupuncture is not covered by the federal health care system but its costs are tax deductible, similar to dental care which is tax-deductible for those above the age of 14 and not yet retired.⁸ While coverage varies by territory, Health Canada does not cover acupuncture beyond an initial visit; however, many supplemental insurance companies in Canada do cover treatment. A similar situation exists in the United States with an increasing number of health insurance companies covering some of the cost of acupuncture. Medicare does not currently reimburse for acupuncture treatments.

Performing Economic Evaluations

There are various ways to perform economic evaluations and each method of economic evaluation has advantages and disadvantages.⁹ Also, there is significant variation in terminology and definitions across economic papers which complicates both interpretation and generalizability across different populations.¹⁰ The challenges that acupuncture researchers face in conducting clinical trials also exist for those conducting economic evaluations. Many of these challenges, however, exist for researchers in mainstream medicine as well, and efforts are underway to standardize economic evaluations so that they are of maximal usefulness to health policy decision makers.¹¹

The simplest form of economic evaluation is the cost-identification study (CIS). A CIS simply defines the economic outcomes of a particular intervention. A CIS can be a useful tool for framing a larger economic evaluation but rarely serves as a complete cost analysis for a treatment. There are three types of full economic evaluations used in health care economics: namely cost-effectiveness analyses (CEA), cost-benefit analyses (CBA), and cost-utility analyses (CUA). A primer on economic evaluation, particularly as it relates to CAM, is provided by Herman et al.¹²

The National Institute for Health and Clinical Excellence (NICE) is an organization responsible for providing health care guidance to the UK's NHS. NICE states a preference for cost effectiveness studies, specifically CUA, to be reported in terms of a metric called a quality-adjusted life-year (QALY; Table 1). The generally accepted definition of a QALY is how NICE defines it: "a measure of a person's length of life weighted by a valuation of their health-related quality of life (HRQL) over that period." A QALY is the arithmetic product of life expectancy and quality of life. A year of perfect health is worth 1, death is scored as zero, and health states that are considered worse than death may be assigned a negative value. Determining a patient's HRQL can be done with several valid, reliable, and patient-friendly questionnaires such as Short Form (SF-36)¹³ and EuroQoL Five Dimensions (EQ-5D is preferred by NICE).¹⁴ In practical terms, one of these questionnaires is completed prior to, during, and after treatment to assess HRQL as perceived by patients. In this way, any change in HRQL that arises from the treatment can be quantified and compared to the effect of a second treatment.

Table 1 - Key Points of a Quality-Adjusted Life-Year or QALY

<p>QALY is the arithmetic product of life expectancy and quality of life</p> <ul style="list-style-type: none"> • A year of perfect health is worth 1 • Death is rated as zero • Health states that are considered worse than death may be assigned a value less than zero 	<p>Treatment A provides five years in health state 0.80</p> <p>Treatment B provides five years in health state 0.40</p> <p>Treatment A = (5)(0.80) = 4 QALYs</p> <p>Treatment B = (5)(0.40) = 2 QALYs</p> <p>In five years, Treatment A provides an additional 2 QALYs over Treatment B</p>
<p>There are several instruments used to assess QALY like EuroQol (EQ-5D) and the Short-Form 36 (SF-36)</p> <p>QALY is a useful measure for comparing the health benefits of treatments in terms of cost per QALY</p> <p>Commonly used figures for cost per QALY are \$50,000/QALY in the US and £30,000/QALY in the UK⁵⁵</p> <p>QALYs can be used in cost-utility studies to define a cost-utility ratio</p>	
<p>Cost-Utility Ratio</p> $\frac{\text{Cost of Treatment A} - \text{Cost of Treatment B}}{\text{Number of QALYs from Treatment A} - \text{Number of QALYs from Treatment B}}$	

The other part of a CUA is to determine the costs for the treatment. For a basic analysis, an accounting of most costs is straightforward. Costs of acupuncture might include a measurement of the combined costs of the acupuncturist's time, needles, and herbs while the same analysis applied to conventional medicine could include costs of physician's time, diagnostic tests, test interpretation, medications and/or surgery. In addition to direct and indirect costs, proper economic evaluations of acupuncture should attempt to include intangible costs such as pain and suffering. Intangible costs can be more difficult to quantify than direct and indirect costs, but these costs can be particularly important to capture when studying acupuncture interventions.

Economic Analysis in Acupuncture

Determining health outcomes in terms of QALYs has several major advantages, especially for the field of acupuncture. QALYs and CUA are becoming the standard means of discussing health outcomes as laid out by NICE. This metric provides health care policy makers with a tool to determine the **value** of a particular treatment. By constructing acupuncture trials in terms of QALYs, insurance companies and federal organizations have useful information in an easily comparable format. HRQL questionnaires provide specific benefits of acupuncture since they offer a scientifically reliable way of quantifying effects of treatment.¹³ This provides a solution for not only some of the barriers to acupuncture research in general¹⁵, but also the hurdles that acupuncture faces as it seeks to justify costs alongside other forms of health care.

Perhaps the clearest example of how a demonstration of cost utility affects health care policy decisions at a national level comes from a series of studies performed in Germany, specifically the Acupuncture Randomized Trials (ART),¹⁶⁻¹⁸ the Acupuncture in Routine Care (ARC) studies,¹⁹ and the German Acupuncture trials (GERAC).²⁰⁻²³ These large clinical trials not only demonstrated the benefit of acupuncture in various disease states, but showed them to have an acceptable cost-utility in terms of cost per QALY as long as the rate of an acupuncture session does not exceed €35 (roughly \$50).²⁴ In April 2006, Germany's social health insurance funds began normal reimbursements for acupuncture treatment of chronic low back pain and osteoarthritis of the knee.

Effectiveness of Acupuncture

Any discussion of the economic impact of an intervention, especially when considering it for inclusion/exclusion in a national health system, must begin by demonstrating that intervention's benefits to health. According to NCCAM, CAM includes therapies that have not yet been shown to be safe or effective in large, scientific trials. NCCAM acknowledges, however, that there are different amounts and levels of scientific evidence to support various CAM therapies. While it is true that acupuncture has not yet been demonstrated in Western scientific literature as effective in the treatment of all medical diseases and disorders, extensive research has demonstrated the benefits of acupuncture for various illnesses. Systematic reviews of the use of acupuncture have shown a significant benefit in many medical conditions including neck disorders,²⁵ migraine,²⁶ tension headache,²⁷ and postoperative nausea and vomiting²⁸ among others. Apart from these disease states, hundreds of small studies in the literature have shown acupuncture's benefit. As acupuncture researchers continue the current trend of performing high quality clinical trials, other roles for acupuncture, as adjunct or replacement for conventional health care, will likely emerge.

Methods

Searches were conducted between May and August 2009 using the search terms: complementary alternative medicine, complementary, alternative, acupuncture, cost-effective, and economic. Searches were conducted on Medline, PubMed, and Web of Science. Some relevant studies were found by alternate methods including NIH and NHS documents on CAM and through the bibliographies of published studies. Acupuncture treatments that involved needling, electroacupuncture, laser acupuncture, and/or acupressure were considered. In some studies, acupuncture needling may have been administered with adjunctive interventions such as moxabustion, cupping, life skills education, etc. For purposes of evaluating the status of economic evaluation in the literature, the definition of cost studies in this study was fairly broad. All acupuncture studies that discussed cost, regardless of payer perspective or type of economic analysis, were included. Studies that did not discuss cost were excluded.

Results

The Value of Acupuncture

Superficially, the cost of acupuncture should be relatively low when compared to conventional medicine. Modern conventional medicine is based on the results of numerous diagnostic tests, branded pharmaceuticals, and surgical and non-surgical procedures, which are often expensive. In contrast, the cost of acupuncture treatment supplies is relatively small and typically included in the overhead costs of the acupuncturist's practice. While there may be notable exceptions,²⁹ most acupuncture practitioners spend nearly an hour with each patient per visit. Since the average time that an MD/DO physician spends with patients is less than 20 minutes^{30,31} the relative costs of acupuncture treatment time must be considered.

Economic studies of acupuncture date back to the mid-1990s (Table 2). They have included CIS, CBA, CUA and CEA evaluations and have covered a wide range of disease states or symptoms. In one of the earliest studies of acupuncture economics, Paul Downey reported results of 50 consecutive patients who presented for a surgery and, if suitable for acupuncture treatment based on a physician's determination and their willingness to try the therapy, were given acupuncture.³² The conditions treated varied widely since consecutive patients were enrolled, regardless of diagnosis. Eighty percent of the participants reported symptom improvement and over half rated their symptom relief as good or excellent. Ten cases had a complete resolution of symptoms. Downey then asked the question, "What other treatment would have been offered to this patient if I had not used acupuncture?" He determined that the cost savings were on the order of £12 per patient in the study. The study is admirable, in that acupuncture was studied in a way that is similar to the way that acupuncture is practiced: unrestricted and based on the acupuncturists assessment. No limitations were placed on which acupuncture points were used or what components of acupuncture could be used in the trial. It also compared acupuncture to conventional care across many different diagnoses. As an economic evaluation, however, the Downey study is of limited usefulness for several reasons, not the least of which is its lack of randomization. All participants were asked if they wished to participate, which introduces a selection bias to the group.

In the late 1990s, Steven Lindall followed 65 patients with pain, mostly of musculoskeletal origin, and offered them acupuncture for pain control as an alternative to outpatient referral.³³ Over three quarters of the participants responded to acupuncture treatment, and, based on these results, the author determined that UK's NHS saved approximately £232 per patient. This study was small and not controlled, but it was one of the earliest indications that acupuncture may offer a cost savings over traditional therapies. Also not included in the estimation of conventional care was the cost of medications, often a considerable expense when dealing with pain management issues.

Table 2 – Cost Studies and Economic Evaluations in Acupuncture

Study	Disease/Symptom	Cost Analysis	Study Design	Participants	Cost outcome of acupuncture
Ballegaard 1999 ³⁴	Angina	CBA	Open, Prospective	105 patients	Cost savings over 5 years were \$32,000 per patient
Ballegaard 2004 ³⁵	Angina	CBA	Retrospective, Nonrandomized	168 consecutive patients who had clinical angina and proven ischemia	Cost savings over 3 years were \$36,000 for surgical and \$22,000 for nonsurgical patients
Branco 1999 ³⁶	Carpal Tunnel	CEA	Open treatment, not controlled	36 hands in 31 patients	Average cost savings of \$11,000 per patient
Downey 1995 ³²	Various	CBA	Case studies	50 consecutive patients	Cost savings of £12 per patient over 50 patients
Humaidan 2004 ⁴⁶	Oocyte Retrieval	CEA	Randomized, Prospective	200 patients	Cost savings of €1.35 per patient
Liguori 2000 ⁵²	Migraine	CEA	Randomized, Prospective	120 patients	Cost savings of 1,332,000 Italian Liras (obsolete) per patient; Roughly 700 Euros
Lindall 1999 ³³	Various	CIS	Not random or controlled	65 patients	Cost savings of £232 per patient
Naeser 2002 ⁵³	Carpal Tunnel	CEA	Double-blind, placebo controlled RCT	11 patients who failed standard medical/surgical treatment	Approximately \$4,000 cost savings per patient
Paterson 2003 ⁵⁴	Dyspepsia	CEA	RCT, Open	60 people with dyspepsia for not less than 2 weeks	Increased cost of £11.61 per patient over 6 months
Ratcliffe 2006 ⁴⁰	Back Pain	CUA	Pragmatic, RCT	241 adults with non-specific low back pain of 1 to 12 months duration in 2:1 ratio of acupuncture to control	ICER of 0.012 QALY (1 yr) ICER of 0.027 QALY (2 yr) £4241 per QALY (SF-36) £3598 per QALY (EQ-5D)
Reinhold 2008 ⁴³	Arthritis	CUA	RCT	489 patients to receive immediate or delayed acupuncture	ICER of €17,845 per QALY gained
Spira 2008 ⁴⁵	Various	CBA-CEA	Case studies, Open	500 patients	Cost savings of \$3,956 per avoidance 1 hospital day
Willich 2006 ⁴¹	Neck Pain	CUA	RCT	3,451 patients; 1,753 acupuncture, 1,698 control	ICER of €12,469 per QALY gained
Witt 2006 ⁴⁴	Back Pain	CUA	Both RCT and nonrandomized	11,630 patients; 1,549 randomized to acu, 1,544 randomized to ctrl; 8,537 not randomized	ICER of €10,526 per QALY gained
Witt 2008 ³⁸	Headache	CUA	RCT	3182 patients 1613 acupuncture; 1569 controls	ICER of €11 657 per QALY gained
Witt 2008 ⁴⁴	Dysmenorrhea	CUA	Both RCT and nonrandomized	649 women; 201 randomized	ICER of €3,011 per QALY gained
Witt 2009 ⁴²	Allergic Rhinitis	CUA	RCT, open	981 patients	ICER = €17,377 per QALY €10,155 for women €44,871 for men
Wonderling 2004 ³⁷	Headache	CUA	RCT	401 patients	0.021 QALY for one year, £9180 per QALY gained

Abbreviations: CBA – Cost-benefit analysis; CEA – Cost-effectiveness analysis; CIS – Cost-identification study; CUA – Cost-utility study; EQ-5D – EuroQoL 5 Dimensions; ICER – incremental cost-effectiveness ratio; RCT – Randomized, controlled trial; SF-36 – Short Form 36; QALY – quality-adjusted life-year

In that same decade, Ballegaard and colleagues performed an open, prospective study on 105 patients with angina pectoris.³⁴ Seventy-three patients were candidates for invasive treatment while the others were excluded from invasive treatment for various health reasons. A cost savings of around \$30,000 was calculated for each patient enrolled in the study. This cost savings was mainly attributed to a reduction in hospitalization and surgery. The Ballegaard study in 1999 is important since it is the first full economic evaluation of acupuncture including not only measure of cost and benefit, but also HRQL measures. In 2004, Ballegaard and coworkers reported results from cardiac patients that were too ill to undergo conventional interventions, and, again, acupuncture (combined with stress management techniques, lifestyle adjustments and Chinese health philosophy) was effective and saved tens of thousands of dollars on average.³⁵

Around the same time, Branco and colleagues showed that needle or laser acupuncture not only provided effective pain relief to patients with carpal tunnel syndrome (in 33/36 hands), but, resulted in a cost savings of around \$10,000 per case, which combines cost estimates of approximately \$5,000 for those that do not need surgery and \$20,000 for those patients that do require surgical release of the carpal tunnel.³⁶

Headache, whether of migraine or tension-type, is also effectively treated with acupuncture and has been the focus of several cost-effectiveness studies. Vickers, Wonderling, and coauthors performed a randomized, controlled trial looking at the use of acupuncture on chronic headache, mostly migraine-type.³⁷ The trial randomly assigned 401 patients to receive either acupuncture or conventional care over a three month period. Patients in the acupuncture group could receive up to 12 acupuncture visits over that three month period. The main outcomes were headache score and HRQL as assessed by SF-36. At twelve months, the headache score was lower in the acupuncture group versus standard care, and patients undergoing acupuncture treatment experienced 22 fewer days of headache per year than subjects in the control group. Acupuncture-treated subjects used 15% less medication, took 15% fewer sick days from work, and consulted a general practitioner 25% less often than controls.

During the first year of this study, acupuncture led to a mean increase of 0.021 QALYs translating to a base-case estimate of nearly £9180 per QALY gained. The cost per QALY is the amount that would be required to achieve a year of perfect health. Commonly used figures for the maximum acceptable cost per QALY are \$50,000/QALY in the US and £30,000/QALY in the UK.³⁸ While the cost of acupuncture was slightly more than conventional treatment, Wonderling et al. suggest that if medical decision makers are willing to pay up to £30,000 per QALY (and perhaps less) then acupuncture is a cost effective intervention for chronic headache.³⁷ Similar results were obtained by Witt and coauthors.³⁸ This analysis examined outcomes of over three thousand patients and found that while the cost of acupuncture does exceed conventional care, the incremental cost-effectiveness ratio of acupuncture treatment was nearly €12,000 per QALY gained.

Low back pain is another symptom in which the scientific literature supports the use of acupuncture.^{39,19} Ratcliffe and colleagues performed a full CEA of a randomized, controlled trial including 241 adults with non-specific low back pain.⁴⁰ In this study, two thirds of participants received individualized acupuncture (along with traditional Chinese medicine) and the rest received usual care. As with chronic headache, acupuncture was slightly more expensive than the usual care group, however the mean incremental health gain was 0.012 QALYs at one year and 0.027 QALYs at two years with a base case estimate of £4241 per QALY gained. The authors concluded that acupuncture provides a modest health benefit for a minor extra cost in persistent low back pain.⁴⁰ This work was echoed by Witt and colleagues who studied over 11,000 patients with back pain.¹⁹ It is interesting to note that many participants refused to be randomized fearing they may be assigned to the group not receiving acupuncture, thus a portion of the participants were not randomized. Considering only those subjects that were randomized, back function was significantly better in the acupuncture group versus control and HRQL was rated higher in the randomized acupuncture arm. Results from non-randomized subjects were similar. Based on these results, the incremental cost-effectiveness ratio was €10,526 per QALY.

Acupuncture appears to be cost-effective in neck pain as well. Willich and colleagues randomized nearly 3,500 patients with neck pain of over six months duration to receive acupuncture or delayed acupuncture treatment for three months (control group).⁴¹ They used a HRQL scale, SF-36, at baseline and at intervals. Subjects were not restricted from accessing the German health system for primary care during this period. As with other disease states, acupuncture was more expensive than not performing acupuncture due to the cost of the treatments themselves; the incremental cost-effectiveness ratio (ICER) was €12,469 per QALY gained. This same group looked at allergic rhinitis⁴² and found acupuncture to be cost effective in women (€10,155 per QALY), but less so for men (€44,871 per QALY). This gender specificity was also seen when this group considered the cost effectiveness of osteoarthritis of the knee.⁴³ Reinhold and colleagues concluded that acupuncture is both effective and cost effective, though more so for women. In a study of women with dysmenorrhea, this same group found a good clinical benefit for acupuncture and an exceptionally low ICER of €3,011 per QALY.⁴⁴ It should be noted that acupuncture is primarily performed by physicians in Germany. Physician-performed acupuncture may raise the overall cost of the intervention compared to countries in which acupuncture is performed by licensed, non-physician practitioners.

A particularly intriguing study performed by Commander Alan Spira demonstrates the effectiveness and cost-benefit of acupuncture within the United States military.⁴⁵ Spira studied 500 sailors that were deployed to Iraq in 2006-7, and all care was performed by board-certified physicians and/or board-certified acupuncturists depending on the treatment arm of the study. Patients were offered acupuncture instead of or in addition to conventional medical care. Acupuncture was delivered as some combination of needle acupuncture, electroacupuncture, moxibustion and other treatments common to traditional Chinese medicine. A total of 435 acupuncture treatments were administered to 132 patients for a variety of acute and chronic illnesses and injuries. Orthopedic complaints were by far the most common symptom treated and usually ailments of the back or spine.

Treatment outcomes were divided into three categories: significant improvement, improvement, or no improvement. Significant improvement was defined as a patient requiring fewer than three treatments, or one who experienced a greater than 50% decrease in symptoms based on a subjective measure. Less than 20% of patients receiving acupuncture experienced no benefit at all across all ailments treated, while over half of individuals reported significant benefit from acupuncture treatment. Also interesting in this study was the high acceptance rate of acupuncture as a treatment modality among US service personnel. This is especially true among patients who faced daily use of pain or anti-inflammatory drugs.

What makes this study so compelling, beyond the general effectiveness of acupuncture in overseas military personnel, is the discussion of cost. In Spira's study, the cost of raw materials used in acupuncture was nominal—about 10 cents per single-use, sterile acupuncture needle. The cost of long-term analgesics, whether ibuprofen or COX-2 inhibitors, outweighs the acupuncture costs considerably. When added to the costs associated with treating side effects of medicinal therapy, the cost benefit ratio is largely in favor of acupuncture. Spira found that if one hospital day was avoided by the use of acupuncture, the cost savings would be \$3,956 per patient. Unfortunately, this evaluation does not include the cost of the acupuncturist's time which, in effect, overestimates the cost savings.

Care must be taken, however, to draw proper conclusions from the collected data. Humaidan and Stener-Victorin examined the role of electroacupuncture as a replacement for conventional medical analgesia in oocyte retrieval, a part of *in vitro* fertilization.⁴⁶ Patients in both trial arms received paracervical nerve blocks. The authors conclude that electroacupuncture provided cost superiority over conventional analgesia. A careful examination of the study shows that patients undergoing electroacupuncture experienced significantly more pain immediately after the ovum retrieval than those receiving drugs. The cost savings of acupuncture was roughly €1.35 per patient. Overstating the effects of a treatment, whether direct benefits or cost, undermines the scientific validity of the endeavor and the field as a whole.

Many studies that have performed economic evaluations of acupuncture were designed to assess acupuncture as an adjunct to conventional therapy. While acupuncture has been shown to be cost-effective under these conditions, it is possible that when evaluated as an alternative to more costly interventions, the increased benefit for acupuncture in terms of cost may become more obvious. Bonafede and coworkers recently published a study in which they examined insurance claims data of 1,688 eligible acupuncture users and compared them with every 18th non-eligible user (16,282 subjects). Acupuncture was found to be a statistically significant substitute for primary care, outpatient services, pathology, surgery and medications to treat gastrointestinal disorders.⁴⁷ The conclusion made by the authors is that acupuncture is an economical substitute for some medical services and pharmaceuticals. It also suggests that spending on acupuncture may be offset by reductions in other medical costs. It is precisely questions such as these that can be answered through careful clinical trial design and economic evaluation.

Conclusions

Both conventional medicine and CAM are being called upon to demonstrate benefit and justify costs.⁴⁸ In this “justify or die” climate of modern medicine, acupuncture researchers face several hurdles in conducting cost analysis work in CAM¹² that are indicative of challenges in CAM research in general.¹⁵ While it is impossible to place a value on human life, there are ways to determine how much a particular treatment costs and psychometric instruments to estimate health and well-being. Acupuncture patients have traditionally paid for treatments and other services mostly out-of-pocket; however, as the United States moves toward a federally-supported system of health care, discretionary spending for health care may fall as the overall tax burden increases. Therefore it is incumbent upon all fields of health care, especially CAM providers and acupuncturists, to justify their role in health care delivery.

This economic justification does not need to be exceedingly difficult, nor must it conflict with the traditions or practice of acupuncture. Just as clinical trials in acupuncture have improved over the last two decades, so have economic evaluations of acupuncture. While there are many hurdles to performing solid clinical and economic studies of acupuncture, researchers have identified many vehicles to overcoming these challenges.^{49,15} With each high quality clinical trial performed in acupuncture, an economic evaluation should be performed in tandem. One straightforward enhancement that can be made to future clinical trials in acupuncture is the simple inclusion of a HRQL questionnaire like SF-36 or EQ-5D. These measures are negligibly more difficult to implement and score than tasks already performed in any other high quality clinical trial. For acupuncture studies, it is useful to include not only the costs of treatment but also indirect costs and intangible costs as outlined by Herman et al.¹² In order to make generalizations from studies it is necessary to obtain results from heterogeneous, randomized, matched populations. While there are some technical considerations in studies on acupuncture, it is certainly possible to design studies that accommodate these issues.^{50, 51}

Other countries, including Western European countries, have managed to integrate acupuncture into the existing conventional system of medicine. In fact, some nations are providing reimbursements through state health programs. This trend toward greater and more widespread reimbursement is likely to continue as more and better economic evaluations in acupuncture are performed. Acupuncture is a safe and effective modality when performed by qualified practitioners and has the capacity to offer cost-effective treatment to society even when compared to conventional medicine; however, a common language must be adopted, one that decision makers understand.

Acknowledgments

The authors wish to thank Patricia M. Herman, ND, PhD, Richard Harris, PhD, Rosa Schnyer, DAOM, LAc, Steven Schram, DC, LAc, PhD, and Bill Reddy, LAc for their careful review and thoughtful consideration of this manuscript. Thanks are also due to Carol Braverman, LAc, MS and Rhonda Wilbur, LAc, MS for their work as contributors.

This work was supported by the Acupuncture Society of New York Research Team and the American Association of Acupuncture and Oriental Medicine National Government Affairs Committee, including Misha R. Cohen, OMD, PhD and Sydney Dugan.

References

1. NCCAM. What Is Complementary and Alternative Medicine? National Center for Complementary and Alternative Medicine. [Online] [Cited: August 24, 2009.] <http://nccam.nih.gov/health/whatiscam/>.
2. Nahin, RL, Barnes, PM, Stussman, BJ, Bloom, B. Costs of Complementary and Alternative Medicine (CAM) and Frequency of Visits to CAM Practitioners: United States, 2007. National Health Statistics Reports. Hyattsville, MD 2009. no. 18.
3. Wolsko PM, Eisenberg DM, Davis RB, Ettner SL, Phillips RS. Insurance coverage, medical conditions, and visits to alternative medicine providers: Results of a national survey. *Arch Intern Med.* 2002;162(3):281-7.
4. Astin JA, Marie A, Pelletier KR, Hansen E, Haskell WL. A review of the incorporation of complementary and alternative medicine by mainstream physicians. *Arch Intern Med.* 1998;158(21):2303-10
5. Wahner-Roedler DL, Vincent A, Elkin PL, Loehrer LL, Cha SS, Bauer BA. Physicians' attitudes toward complementary and alternative medicine and their knowledge of specific therapies: a survey at an academic medical center. *Evid Based Complement Alternat Med.* 2006;3(4):495-501.
6. Astin, JA. Why patients use alternative medicine: results of a national study. *JAMA.* 1998;279(19):1548-53.
7. National Health Service. Who can use acupuncture. [Online] [Cited: August 18, 2009.] <http://www.nhs.uk/Conditions/Acupuncture/Pages/Who-can-use-it.aspx>.
8. Centre des Liaisons Européennes et Internationales de Sécurité Sociale. Le régime saint-marinais de sécurité sociale. le CLEISS. [Online] [Cited: August 18, 2009.] http://www.cleiss.fr/docs/regimes/regime_sanmarin.html.
9. Hutubessy, R, Chisholm, D and Edejer, TT. Generalized cost-effectiveness analysis for national-level priority-setting in the health sector. *Cost Eff Resour Alloc.* 2003;1(1):8.
10. Sculpher MJ, Pang FS, Manca A, et al. Generalisability in economic evaluation studies in healthcare: a review and case studies. *Health Technol Assess.* 2004;8(49):iii-iv, 1-192.
11. Murray CJ, Evans DB, Acharya A, Baltussen RM. Development of WHO guidelines on generalized cost-effectiveness analysis. *Health Econ.* 2000;9(3):235-51. Review
12. Herman, PM, Craig, BM and Caspi, O. Is complementary and alternative medicine (CAM) cost-effective? A systematic review. *BMC Complement Alternat Med.* 2005;5:11.
13. Brazier JE, Harper R, Jones NM, et al. Validating the SF-36 health survey questionnaire: new outcome measure for primary care. *BMJ.* 1992;305(6846):160-4.
14. EuroQol Group. EQ-5D. [Online] [Cited: August 25, 2009.] <http://www.euroqol.org/>.
15. Nahin, RL and Straus, SE. Research into complementary and alternative medicine: problems and potential. *BMJ.* 2001;322(7279):161-4.
16. Linde K, Streng A, Jürgens S, et al. Acupuncture for patients with migraine: a randomized controlled trial. *JAMA.* 2005;293(17):2118-25.
17. Melchart D, Streng A, Hoppe A, et al. Acupuncture in patients with tension-type headache: randomized controlled trial. *BMJ.* 2005 Aug 13;331(7513):376-82.
18. Witt C, Brinkhaus B, Jena S, et al. Acupuncture in patients with osteoarthritis of the knee: a randomized trial. *Lancet.* 2005;366(9480):136-43.
19. Witt CM, Jena S, Selim D, Brinkhaus B, Reinhold T, Wruck K, et al. Pragmatic randomized trial evaluating the clinical and economic effectiveness of acupuncture for chronic low back pain. *Am J Epidemiol.* 2006;164(5):487-96.
20. Endres HG, Böwing G, Diener HC, et al. Acupuncture for tension-type headache: a multicentre, sham-controlled, patient-and observer-blinded, randomised trial. *J Headache Pain.* 2007;8(5):306-14.
21. Haake M, Müller HH, Schade-Brittinger C, et al. German Acupuncture Trials (GERAC) for chronic low back pain: randomized, multicenter, blinded, parallel-group trial with 3 groups. *Arch Intern Med.* 2007;167(17):1892-8.
22. Diener HC, Kronfeld K, Boewing G, et al. Efficacy of acupuncture for the prophylaxis of migraine: a multicentre randomised clinical trial. *Lancet Neurol.* 2006;5(4):310-6.
23. Acupuncture and knee osteoarthritis: a three-armed randomized trial. Scharf, HP, et al. 1, 2006, *Ann Intern Med*, Vol. 145, pp. 12-20.
24. Cummings, M. Modellvorhaben Akupunktur - a summary of the ART, ARC and GERAC trials *Acupunct Med.* 2009;27(1):26-30.
25. Trinh KV, Graham N, Gross AR, et al. Acupuncture for neck disorders. *Cochrane Database Syst Rev.* 2006;3:CD004870.
26. Linde K, Allais G, Brinkhaus B, Manheimer E, Vickers A, White AR. Acupuncture for migraine prophylaxis. *Cochrane Database Syst Rev.* 2009;(1):CD001218.
27. Linde K, Allais G, Brinkhaus B, Manheimer E, Vickers A, White AR. Acupuncture for tension-type headache. *Cochrane Database Syst Rev.* 2009;(1):CD007587.
28. Ezzo J, Richardson MA, Vickers A, et al. Acupuncture-point stimulation for chemotherapy-induced nausea or vomiting. *Cochrane Database Syst Rev.* 2006;(2):CD002285.
29. Teig S, Peacock S, Stevens L, Tordoff K, Maguire E, Watson P. An audit of self acupuncture for chronic musculoskeletal pain. *Acupunct Med.* 2006;24(2):80-6.
30. Gilchrist V, Miller RS, Gillanders WR, et al. Does family practice at residency teaching sites reflect community practice? *J Fam Pract.* 1993 Dec;37(6):555-63.
31. Mechanic, D, McAlpine, DD and Rosenthal, M. Are patients' office visits with physicians getting shorter? *N Engl J Med.* 2001;344:198-204.
32. Downey, P. Acupuncture in the normal general practice consultation: an assessment of clinical and cost effectiveness. *BMJ.* 1995;13:45-7.
33. Lindall, S. Is Acupuncture for Pain Relief in General Practice Cost-Effective? *Acupuncture in Medicine.* 1999;17:97-100.
34. Ballegaard S, Johannessen A, Karpatschof B, Nyboe J. Addition of Acupuncture and Self-Care Education in the Treatment of Patients with Severe Angina Pectoris May be Cost Beneficial: An Open, Prospective Study. *J Altern Complement Med.* 1999;5:405-13.
35. Ballegaard S, Borg E, Karpatschof B, Nyboe J, Johannessen A. Long-Term Effects of Integrated Rehabilitation in Patients with advanced angina pectoris: a nonrandomized comparative study. *J Altern Complement Med.* 2004;10(5):777-83.
36. Branco K, Naeser MA. Carpal tunnel syndrome: clinical outcome after low-level laser acupuncture, microamps transcutaneous electrical nerve stimulation, and other alternative therapies--an open protocol study. *J Altern Complement Med.* 1999;5(1):5-26.
37. Wonderling D, Vickers AJ, Griever R, McCarney R. Cost effectiveness analysis of a randomised trial of acupuncture for chronic headache in primary care. *BMJ.* 2004;328(7442):747.
38. Witt CM, Reinhold T, Jena S, Brinkhaus B, Willich SN. Cost-effectiveness of acupuncture treatment in patients with headache. *Cephalalgia.* 2008;28(4):334-45.
39. MacPherson H, Thorpe L, Thomas K, Campbell M. Acupuncture for low back pain: traditional diagnosis and treatment of 148 patients in a clinical trial. *Complement Ther Med.* 2004;12(1):38-44.
40. Ratcliffe J, Thomas KJ, MacPherson H, Brazier J. A randomised controlled trial of acupuncture care for persistent low back pain: cost effectiveness analysis. *BMJ.* 2006;333(7569):626.
41. Willich SN, Reinhold T, Selim D, Jena S, Brinkhaus B, Witt CM. Cost-effectiveness of acupuncture treatment in patients with chronic neck pain. *Pain.* 2006;125(1-2):107-13.
42. Witt CM, Reinhold T, Jena S, Brinkhaus B, Willich SN. Cost-effectiveness of acupuncture in women and men with allergic rhinitis: a randomized controlled study in usual care. *Am J Epidemiol.* 2009;169(5):562-71.
43. Reinhold T, Witt CM, Jena S, Brinkhaus B, Willich SN. Quality of life and cost-effectiveness of acupuncture treatment in patients with osteoarthritis pain. *Eur J Health Econ.* 2008;9(3):209-19.
44. Witt CM, Reinhold T, Brinkhaus B, Roll S, Jena S, Willich SN. Acupuncture in patients with dysmenorrhea: a randomized study on clinical effectiveness and cost-effectiveness in usual care. *Am J Obstet Gynecol.* 2008;198(2):166.e1-8.
45. Spira, A. Acupuncture: a useful tool for health care in an operational medicine environment. *Mil Med.* 2008;173(7):629-34.
46. Humaidan, P and Stener-Victorin, E. Pain relief during oocyte retrieval with a new short duration electro-acupuncture technique--an alternative to conventional analgesic methods. *Hum Reprod.* 2004;19(6):1367-72.
47. Bonafede M, Dick A, Noyes K, Klein JD, Brown T. The effect of acupuncture utilization on healthcare utilization. *Med Care.* 2008;46(1):41-8.
48. Kernick, DP. The impact of health economics on healthcare delivery. A primary care perspective. *Pharmacoeconomics.* 2000;18(4):311-5.
49. White, A, Trinh, K, Hammerschlag, R. Performing systematic reviews of clinical trials of acupuncture: problems and solutions. *Clinical Acupuncture and Oriental Medicine.* 2002;3:26-31.
50. Sherman, KJ and Cherkin, DC. Challenges of acupuncture research: study design considerations. *Clinical Acupuncture and Oriental Medicine.* 2003;3:200-6.
51. White A, Cummings M, Barlas P, et al. Defining an adequate dose of acupuncture using a neurophysiological approach—a narrative review of the literature. *Acupunct Med.* 2008;26(2):111-20.
52. Liguori A, Petti F, Bangrazi A, et al. Comparison of pharmacological treatment versus acupuncture treatment for migraine without aura--analysis of socio-medical parameters. *J Tradit Chin Med.* 2000;20:231-40.
53. Naeser MA, Hahn KA, Lieberman BE, Branco KE. Carpal tunnel syndrome pain treated with low-level laser and microamperes transcutaneous electric nerve stimulation: A controlled study. *Arch Phys Med Rehabil.* 2002;83(7):978-88.
54. Paterson C, Ewings P, Brazier JE, Britten N. Treating dyspepsia with acupuncture and homeopathy: reflections on a pilot study by researchers, practitioners and participants. *Complement Ther Med.* 2003;11(2):78-84.
55. Eichler HG, Kong SX, Gerth WC, Mavros P, Jönsson B. Use of cost-effectiveness analysis in health-care resource allocation decision-making: how are cost-effectiveness thresholds expected to emerge? *Value Health.* 2004;7(5):518-28.

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