REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188		
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1. REPORT DATE (DD-MM-YYYY) 06-26-2009	**2. REPORT TYPE** FINAL REPORT		**3. DATES COVERED** (From - To) July 2008-June 2009		
4. TITLE AND SUBTITLE A Comparison of Services Utilized by Acupuncture and Non-Acupuncture Patients in the Military Health System			**5a. CONTRACT NUMBER**		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Natalia C. Henriquez, LT, MSC, USN			**5d. PROJECT NUMBER**		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Naval Medical Center 8901 Rockville Pike Bethesda, MD 20889			**8. PERFORMING ORGANIZATION REPORT NUMBER**		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) US Army Medical Department Center and School BLDG 2841 MCCS-HFB (Army Baylor Program in Health & Business 3151 Scott Road, Suite 1411 Fort Sam Houston, TX 78234-6135			**10. SPONSOR/MONITOR'S ACRONYM(S)**		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 32-09		
12. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED					
13. SUPPLEMENTARY NOTES					

14. ABSTRACT
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15. SUBJECT TERMS Acupuncture, RVU, Encounters, Military Health System					
16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER**	**19a. NAME OF RESPONSIBLE PERSON** Education Tech
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**		35	**19b. TELEPHONE NUMBER** (include area code) 210-221-6443

Standard Form 298 (Rev 8-98)
Prescribed by ANSI Std

20100329228

Running head: ACUPUNCTURE PATIENTS IN THE MHS

A Comparison of Services Utilized

by Acupuncture and Non-Acupuncture Patients

in the Military Health System

Graduate Management Project

LT Natalia C. Henriquez

U.S. Army-Baylor University Graduate Program in Health and Business Administration

June 26, 2009

Acknowledgements

Completion of this Graduate Management Project was possible with the help of several key individuals. Captain Michael Hendee, my preceptor, not only ensured I stayed on timeline, but provided sage guidance based on his experiences as an Army-Baylor resident. My reader, Major Cynthia Childress, was extremely helpful with data pulls and timely feedback. She was patient with me during my learning process. The business analysts, in particular, Lieutenant James Hester and Margaret Reynolds, were always available to run data queries and answer questions.

Commander Grudzien, Department Head of the Traumatic Brain Injury Unit at National Naval Medical Center, provided me with the initial idea about acupuncture and put me in contact with Dr. Richard Niemtzow and Dr. Stephen Burns. These two seasoned Air Force Colonels allowed me to spend the day with them at Walter Reed Army Medical Center, observing while they treated Wounded Warriors on an inpatient basis. Not only did they provide me unfettered access, they even performed acupuncture on me for a headache. Skeptical at first, my pain actually dissipated after an hour; it normally would have taken an extra dose of ibuprofen to rid the pain. Dr. Niemtzow also put me in touch with Captain Neil Naito, Director of Public Health at the Bureau of Medicine and Surgery, who guided me to the Center for Naval Analysis study by Jaditz, Edwards, and Morrow (2007).

Disclaimer

The opinions expressed in this paper are those of the author and are not to be construed as reflecting the official policy or position of Baylor University, the U.S. Army Medical Command, the U.S. Navy, the Department of Homeland Security, the Department of the Army, the Department of the Navy, the Department of Defense, or the U.S. Government.

Ethical Consideration

No personal identifying information was used during this study. The author declares no conflict of interest or financial interest in the adoption of any policy or services mentioned in this paper.

Abstract

This study examines differences in the average number of encounters and amount of RVUs between patients that utilize acupuncture as part of their treatment regime and those who do not. This study replicates a study by Jaditz, Edwards, and Morrow (2007), with differences in methodology. Subjects are from Military Health System Management Analysis and Reporting Tool (M2) and consist of all beneficiary categories with a diagnosis of Lumbago, Myalgia, and/or Cervicalgia, treated at Naval Medical Center San Diego, California; Malcolm Grow Medical Center at Andrews Air Force Base, Maryland; and Madigan Army Medical Center in Fort Lewis, Washington, in fiscal year 2008. A two-factor ANOVA revealed significant differences between acupuncture patients and two non-acupuncture groups, as well as differences between diagnoses. Post hoc analysis indicated that acupuncture patients had statistically higher average number of encounters and amount of RVUs than both groups of non-acupuncture patients ($p < 0.05$).

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Introduction

Rising costs of health care and growing acceptance of complementary and alternative medicine directly affect the demand for acupuncture. When successful at controlling pain, acupuncture facilitates a treatment regime free from the side effects of medication. It is performed rapidly, with statistically low numbers of adverse events related to treatment. In the United States, acupuncture is still considered a complement to Western medicine and appropriate for those patients who have failed traditional forms of treatment (Niemtzow, R. C., personal communication, October 6, 2008).

Acupuncture in the United States

Although relatively new to Western culture, acupuncture dates back to Ancient China over 5,000 years ago (Singer, n.d.). More than 3,000 years ago, Egyptians, South African Bantu tribesman, Arabs, Eskimos, and Brazilian cannibals used variations of acupuncture to treat disease (American Acupuncture, n.d.). The United States' introduction to acupuncture did not occur until 1972, when James Reston, a New York Times journalist, wrote about the Chinese doctors' use of acupuncture for pain control after an emergency appendectomy (NCCAM, 2007). The acceptance of acupuncture as a valid complementary and alternative medicine continues to grow in the U.S. The comprehensive National Health Information Survey performed in 2002, indicated an estimated 8.2 million Americans over the age of 18 had ever tried acupuncture and almost 2.2 million had received acupuncture within the previous 12 months (Barnes, Powell-Griner, McFann, & Nahin, 2004). According to the Acupuncture Schools website, acupuncture schools or programs are available in 46 U.S. and 35 international locations (Acupuncture Schools, 2006). The practice of acupuncture is even gaining acceptance from the medical community as a complement to traditional medicine. There are over 17,000 formally trained

acupuncturists and 4,000 medical doctors trained as acupuncturists in the U.S. (Sierpina & Frenkel, 2005). As of January 30, 2006, over 75 U.S. medical schools accredited by the American Association of Medical Colleges offered courses and programs in complementary and alternative medicines (Bhattacharya et al., 2006).

Acupuncture in the Military Health System (MHS)

The Department of Defense (DoD) has 40 licensed acupuncturists (Roberts, 2008), but other estimates range as high as 43 (Niemtzow, R. C., personal communication, November 3, 2008). In fiscal year 2008 (FY08), 12,203 active-duty, retirees, and beneficiaries received acupuncture in 40 different Military Treatment Facilities (MTFs). TRICARE, the health care program for the Military Health System (MHS), only covers care that is medically necessary and proven through evidence-based research (TRICARE, 2008). Currently, acupuncture is not a benefit covered by TRICARE. TRICARE enrollees desiring acupuncture services outside of a MTF must pay out-of-pocket.

Conditions that Prompted the Study

Health care leaders face constant pressure to provide quality medical care as efficiently and cost-effectively as possible. David Walker, the U.S. Comptroller General, notes that unlike the civilian health care industry, TRICARE spending has increased while beneficiary costs have stayed constant or even lowered over the last decade (Walker, 2007). He acknowledges the risk to health care as part of the military benefits package if spending remains unchecked.

Growing acceptance of complementary and alternative medicine results in exploration of the cost-cutting potential of these new treatments. Traditionally, a business case analysis yields quantitative information regarding costs and benefits of an operational decision; given that TRICARE does not cover acupuncture, on the surface the benefits portion of an analysis is

essentially $0. Benefits can be quantified by other methods, however, such as an increase in the number of Relative Value Units (RVUs) or a decrease in average number of appointments. This study examines these potential benefits through the assessment of differences in the acupuncture and non-acupuncture patient population in the MHS. If acupuncture patients do in fact utilize less health care services than non-acupuncture patients with the same diagnosis, the quantitative benefits are truly positive and ensure a sequacious business case analysis. Qualitative benefits such as patient satisfaction and pain reduction most likely result, as well.

Research Question

Do patients who seek acupuncture as part of their treatment regime utilize more services than non-acupuncture patients with the same diagnosis?

Literature Review

Theory of Acupuncture. Traditional Chinese medicine views the body as a continual balance between two opposing forces – the *yin* and the *yang* (NCCAM, 2007). The *yin* force is cold, slow, and passive; the *yang* force is hot, excited, and active. An internal imbalance of these two inseparable forces leads to disease because of the blockage of the flow of vital energy called *qi* (pronounced CHEE). Qi travels along pathways called meridians. Acupuncture serves to unblock the meridians at their connection sites by penetrating the skin with small, metallic needles. This results in resumption of the flow of qi and a balanced, healthy body state.

Medical Doctors. Physicians and/or acupuncturists are the only individuals authorized to perform acupuncture in the U.S. Medical doctors and doctors of osteopathy must earn their board certification in acupuncture from the American Board of Medical Acupuncture (ABMA). This involves a 300-hour Continuing Medical Education course, 100 hours of clinical experience, a

written examination, and a certification-processing fee (ABMA, n.d.). The certification is valid for 10 years, after which recertification is required.

Non-Medical Degree Practitioners. Acupuncture licensing requirements for non-medical degree practitioners vary from state to state, but most states require certification from the National Certification Commission of Acupuncture and Oriental Medicine (NCCAO). In the state of Maryland, the Maryland Board of Acupuncture's general requirements are:

1. At least 18 years of age

2. Graduation from an 1800-hour training course (to include 300 hours of clinical work) approved by the Maryland Higher Education Commission or the Accreditation Commission for Acupuncture and Oriental Medicine (ACAOM)

3. Passing score on a board-approved examination

4. Proof of written and oral proficiency in the English language

5. Various fees (Maryland Board of Acupuncture, 2008).

Acupuncture Research Review. In November of 1997, the National Institutes of Health (NIH) Consensus Development Panel on Acupuncture conducted a comprehensive literature search of acupuncture research on several databases. The January 1970 to October 1997 time period revealed most studies on acupuncture produced equivocal results because of inadequate sample size, improper study design, and use of inappropriate controls (NIH Consensus Development Panel on Acupuncture, 1998). Most of the research examined acupuncture's efficacy for various pain problems (usually in the form of a case study on one patient), but a small amount of studies demonstrated potential for other areas. Factors such as number of encounters, duration of treatment, and specific points of needle placement, varied greatly.

Decreased incidence of adverse effects, as compared to medication or other medical procedures for the same conditions, proved noteworthy and encouraging.

The Panel also addressed the integration of acupuncture into today's health care system. "Acupuncture focuses on a holistic, energy-based approach to the patient, rather than a disease-oriented diagnostic and treatment model" (NIH Consensus Development Panel on Acupuncture, 1998, p. 1520). They also stressed the continuation of appropriate training, licensing, and registration that contribute to patient safety and the low occurrence of adverse events. Many patients seek medical care from medical doctors, as well as acupuncturists, so communication between the two practitioners is vital.

The report by the NIH Consensus Development Panel on Acupuncture is the most comprehensive to date. There seem to be different opinions on the qualitative improvement and/or quantitative increase of clinical research. Reviews by other organizations revealed recommendations derived by consensus panels and accepted standards of practice, not evidence-based research (Sierpina & Frenkel, 2005). Systematic reviews of treatment for neck pain by Aker, Gross, Goldsmith, and Peloso (1996 and 2000), and White and Ernst (1999), revealed questionable efficacy of acupuncture (as cited in Irnich et al., 2001). A randomized controlled trial of acupuncture for patients with migraine headaches found acupuncture and a placebo (sham acupuncture) equally effective, but more effective than a waiting-list control, in reducing number of days of symptoms (Linde et al., 2005). Melchart et al. (2005) and Irnich et al. (2001) found similar results for treatment of tension headaches and chronic neck pain, respectively. Martin, Sletten, Williams, and Berger (2006) found acupuncture improved symptoms of anxiety and fatigue for patients with fibromyalgia, but did not improve levels of activity and physical function.

Wonderling, Vickers, Grieve, and McCarney (2004) published the first exacting cost effective analysis of acupuncture for the treatment of chronic headache. Examination of total costs over a one year time period revealed higher costs for the acupuncture group (allocated up to 12 acupuncture treatments over a three month period) than the control group. Factoring in Quality Adjusted Life Year (QALY), however, changed the results. As a way of quantifying the benefit of a medical intervention, with "1" being perfect health and "0" being death, the QALY score increased by a mean of 0.021 as a result of acupuncture. When considering cost per QALY, the researchers found that cost dropped substantially, especially compared to other interventions. This was true even if a general practitioner performed the treatment (instead of an acupuncturist), but acupuncturists represent a better value for the money. "Even if a general practitioner can manage to treat four patients in an hour this is still less cost effective than a physiotherapist treating two per hour (the base case scenario)" (Wonderling et al., 2004).

Ratcliffe, Thomas, MacPherson, and Brazier (2006) found similar results to the Wonderling et al. (2004) study. Over a two-year period, acupuncture patients utilized more resources and had higher total mean costs for treatment of non-specific low back pain than patients treated through traditional methods. Contrary to what Wonderling et al. (2004) predicted would happen over longer courses of treatment, the QALY score raised from 0.012 at 12 months to 0.027 at 24 months. They concluded that acupuncture is more cost effective if decision makers are willing to pay up to £20,000 (approximately $30,000) for an increase of 1.0 QALY.

Johnstone, Polston, Niemtzow, and Martin (2002) integrated acupuncture into the Oncology Clinic at Naval Medical Center San Diego (NMCSD). Success with acupuncture for palliation of pain made the clinic a logical choice. They started with the addition of a physician acupuncturist with over 10 years of experience to the medical staff. Patients received a referral

by their doctors, or self-referred. Acupuncture techniques varied depending on diagnosis, and standard medical therapies continued. After nine months of operation, the researchers conducted phone interviews of patients treated with acupuncture between January 1, 2000, and April 30, 2000. Seventy-nine out of 89 patients responded. Thirty-six percent of the 42 patients treated for pain relief had no response to acupuncture, but those that responded indicated a 71% mean improvement in their symptoms. Twenty-eight percent of the 25 patients treated for xerostomia had no response to acupuncture, but those that responded indicated a 50% mean improvement. All other patients received treatment for symptoms such as hot flashes, nausea, and vomiting and responded to acupuncture. Interestingly, because of positive indicators for patient satisfaction (including lack of adverse events), and not from any detailed financial analysis, the decision to expand the acupuncture service at NMCSD resulted. The researchers indicated that only the most inexpensive pain medications rival acupuncture in terms of cost.

The Center for Naval Analyses (CNA) conducted a study regarding the use of complementary and alternative medicine (CAM) in the MHS (Jaditz, Edwards, & Morrow, 2007). CAM modalities included acupuncture, biofeedback, and chiropractic services. In addition to identification of demographic characteristics, the researchers determined the most frequently occurring diagnosis from a MHS Mart (M2) data extraction of all professional encounters containing a CAM Common Procedural Terminology (CPT) code from October 2002 to April 2007. Lumbago, generally known as low back pain, was the most frequently occurring diagnosis. A second M2 data extraction supplemented with medical records yielded a data set of all active duty CAM and non-CAM patients in the MHS that presented with a diagnosis of lumbago in 2005. Analysis of this data set revealed greater average number of visits, longer duration of care, increased utilization of resources, and higher numbers and costs of prescription

medications in active duty military personnel that incorporate CAM into their treatment regime for back pain. The CAM population also had significantly more numbers of prescriptions and higher total costs for pharmaceuticals.

Purpose

The purpose of this study is to determine if there are significant differences in the amount of services utilized between acupuncture and non-acupuncture patients with the same diagnosis.

Methods and Procedures

Data

This quantitative analysis involves retrospective secondary data. The data consists of two extracts from M2. The first extract includes all encounters in the MHS that include an acupuncture CPT code in any of the four possible procedure code fields listed in M2 during FY08. The purpose of this extract is to identify patient characteristics and acupuncture trends in the MHS. The acupuncture CPT codes are as follows:

97810   Acupuncture, one or more needles (without electrical stimulation), initial 15 minutes of personal one-on-one contact with the patient.

97811   Acupuncture, one or more needles (without electrical stimulation), each additional 15 minutes of personal one-on-one contact with the patient, with reinsertion of needle(s).

97813   Acupuncture, one or more needles (with electrical stimulation), initial 15 minutes of personal one-on-one contact with the patient.

97814   Acupuncture, one or more needles (with electrical stimulation), each additional 15 minutes of personal one-on-one contact with the patient, with reinsertion of needle(s) (Acupuncture.Com, 2005).

Acupuncture Patient Population in the MHS

There were 3371 patients and 12,209 encounters with an acupuncture procedure code in the MHS in FY08. Females accounted for 53% of the population. Individuals between the ages

of 20 and 49 made up 71.3% of the patient population (see *Figure 1*). Active duty personnel

accounted for 58.2% of all patients (see *Figure 2*). Use of all beneficiaries for analysis represents

a significant departure from the CAM study, with the inclusion of almost 42% more of the

acupuncture patients. Simple RVUs totaled 24,478.84. RVUs per encounter equaled 2.01. PPS
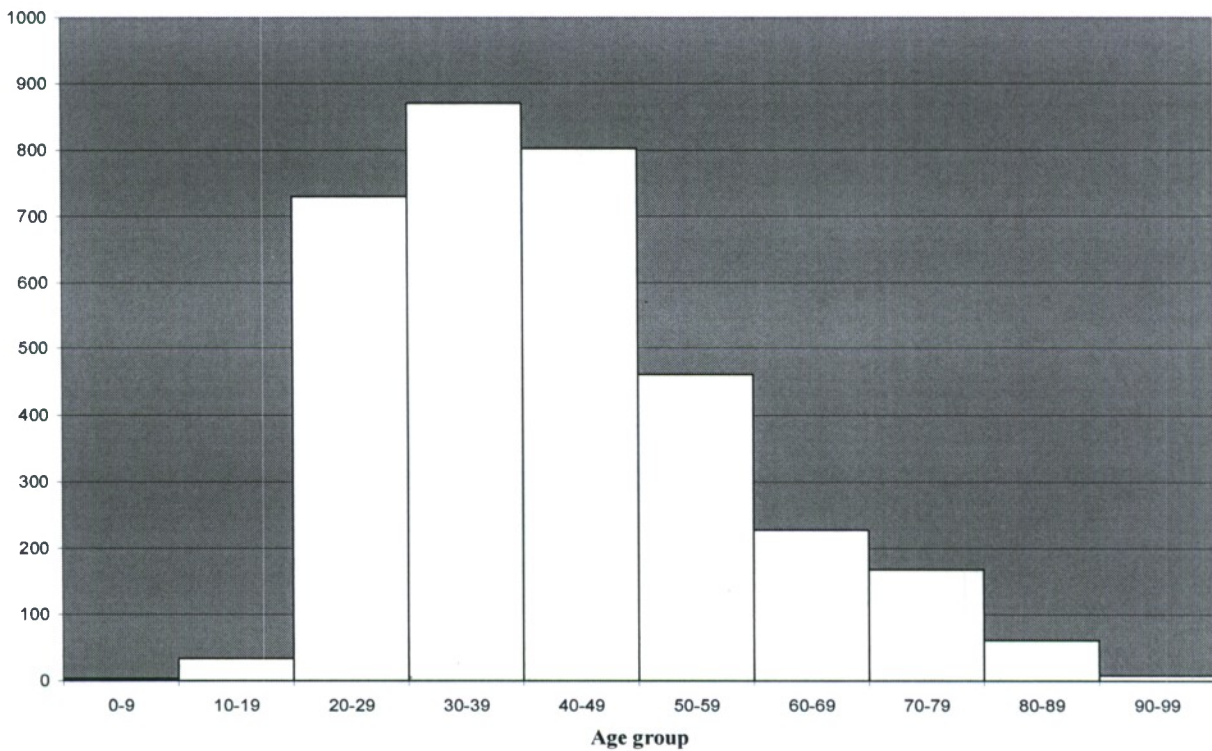
earnings were $1,954,833.20.

Figure 1. Number of patients utilizing acupuncture services in the MHS in FY08 by age group.
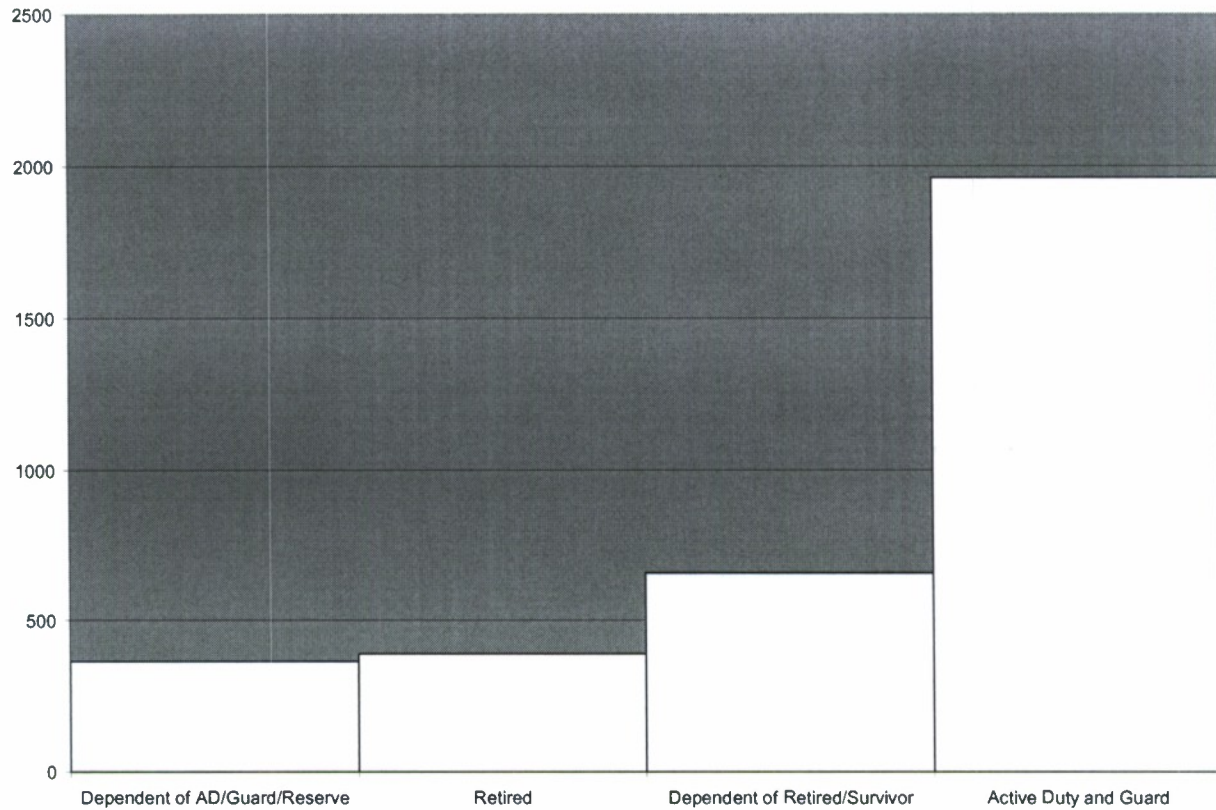
Figure 2. Number of patients utilizing acupuncture services in the MHS in FY08 by beneficiary category.

The top three diagnoses of acupuncture patients within the MHS in FY08 were: (a) Lumbago, (b) Myalgia and Myositis unspecified, and (c) Cervicalgia. Table 1 displays the description and percentage of total encounters for these three diagnoses. Inclusion of the second and third diagnoses accounts for an additional 16.5% of patients, resulting in a data sample of almost 30% of total acupuncture patients versus using only the top diagnosis.

Acupuncture was provided in 40 different MTFs (see Table 2). The top three acupuncture-producing facilities account for over 50% of total encounters. In order to compare acupuncture patients with non-acupuncture patients, the sample was limited to the top three

MTFs: (a) Naval Medical Center, San Diego, California; (b) Malcolm Grow Medical Center at Andrews Air Force Base, Maryland; and (c) Madigan Army Medical Center in Fort Lewis, Washington.

Table 1

Top three diagnoses among acupuncture procedural codes for all beneficiaries in the MHS (FY08).

Diagnosis	Description	Percentage of Total Encounters
Lumbago	Acute or chronic pain in the lumbar or sacral regions, which may be associated with musculo-ligamentous sprains and strains; intervertebral disk displacement; and other conditions.	13.1
Myalgia and Myositis unspecified	A common nonarticular rheumatic syndrome characterized by myalgia and multiple points of focal muscle tenderness to palpation (trigger points). Muscle pain is typically aggravated by inactivity or exposure to cold. This condition is often associated with general symptoms, such as sleep disturbances, fatigue, stiffness, headaches, and occasional depression. There is significant overlap between fibromyalgia and the chronic fatigue syndrome (fatigue syndrome, chronic). Fibromyalgia may arise as a primary or secondary disease process. It is most frequent in females aged 20 to 50 years.	9.1
Cervicalgia	Discomfort or more intense forms of pain that are localized to the cervical region. This term generally refers to pain in the posterior or lateral regions of the neck.	7.4

Description data source: http://www.icd9data.com/

Table 2

Military Treatment Facilities that provided acupuncture services in FY08.

Treatment DMIS ID	Treatment DMIS ID Name	Number of Encounters	Percentage of Encounters (%)
29	NMC SAN DIEGO	3095	25.43
66	779TH MED GRP-ANDREWS	1857	15.26
125	MADIGAN AMC-FT. LEWIS	1306	10.73
37	WALTER REED AMC-WASHINGTON DC	703	5.78
108	WILLIAM BEAUMONT AMC-FT. BLISS	697	5.73
55	375TH MED GRP-SCOTT	657	5.40
607	LANDSTUHL REGIONAL MEDCEN	445	3.66
109	BROOKE AMC-FT. SAM HOUSTON	378	3.11
83	377TH MED GRP-KIRTLAND	346	2.84
89	WOMACK AMC-FT. BRAGG	272	2.23
47	EISENHOWER AMC-FT. GORDON	264	2.17
621	NH OKINAWA	255	2.09
52	TRIPLER AMC-FT SHAFTER	253	2.08
6	3RD MED GRP-ELMENDORF	240	1.97
110	DARNALL AMC-FT. HOOD	224	1.84
67	NNMC BETHESDA	185	1.52
117	59TH MED WING-LACKLAND	172	1.41
60	BLANCHFIELD ACH-FT. CAMPBELL	133	1.09
9	56TH MED GRP-LUKE	127	1.04
48	MARTIN ACH-FT. BENNING	110	0.90
14	60TH MED GRP-TRAVIS	94	0.77
1350	37TH MED GROUP	78	0.64
119	75TH MED GRP-HILL	62	0.51
3	LYSTER AHC-FT. RUCKER	49	0.40
123	DEWITT ACH-FT. BELVOIR	36	0.30
124	NMC PORTSMOUTH	27	0.22
239	NBHC EL CENTRO	21	0.17
1017	AHC VILSECK	20	0.16
1016	AHC GRAFENWOEHR	14	0.12
232	BMC MCAS MIRAMAR	14	0.12
69	KIMBROUGH AMB CAR CEN-FT MEADE	9	0.07
1959	BMC NTC GREAT LAKES	7	0.06
366	12TH MED GRP-RANDOLPH	7	0.06
79	99TH MED GRP-O'CALLAGHAN HOSP	5	0.04
1646	TMC-1-FT. LEWIS	4	0.03
78	55TH MED GRP-OFFUTT	3	0.02
422	CLEARWATER USCG CLINIC	1	0.01
230	NBHC MCRD SAN DIEGO	1	0.01
624	NH SIGONELLA	1	0.01
1481	SOLDIER FAMILY MED CLIN BIGGS	1	0.01

Subjects

For determination of the top three most frequently occurring diagnoses among acupuncture patients, subjects consist of all patients in the M2 database with an associated acupuncture procedure code (in any of the four procedure entry areas) during FY08. For descriptive and inferential statistics purposes, subjects consist of all patients in the M2 database from the top three acupuncture facilities (as determined by number of encounters), Naval Medical Center San Diego, California; Malcolm Grow Medical Center at Andrews Air Force Base; and Madigan Army Medical Center in Fort Lewis, Washington, with any of the top three primary diagnosis of Lumbago, Myalgia and Myositis unspecified, or Cervicalgia during FY08.

This study is based off the CNA study of CAM usage in the MHS conducted by Jaditz, Edwards, and Morrow (2007). This research contains several differences in methodology:

1. Final analysis consists of the top three diagnoses instead of the top diagnosis.

2. For data management purposes, the top three MTFs (in terms of number of acupuncture encounters) are used for descriptive and statistical analysis (instead of the entire MHS).

3. All beneficiary categories are included, not just active duty personnel.

4. Statistical analysis is between three patient categories, instead of two.

Table 3 lists the variables in the study. Services utilized is the dependent variable and includes number of encounters and amount of RVUs. Encounters is further defined by the Medical Group Management Association (MGMA) as "a documented, face-to-face contact between a patient and a provider who exercises independent judgment in the provision of services to the individual" (as cited in Glass & Anderson, 2002b, p. 287). A RVU is further defined as an objective, standardized, nonmonetary relative unit of measure assigned to a CPT

code (Glass & Anderson, 2002a). The independent variable is whether patients with any or all of

the top three diagnoses from the top three acupuncture facilities (in terms of number of

encounters) had an associated acupuncture procedure code, had a procedure code other than

acupuncture, or had no procedure code whatsoever.

Table 3

Variable Code Sheet.

Variable Factors	Variable Name	Description	Oper- ationalized	Variable Type	Data Source
Dependent	Encounters	A documented face-to-face contact between a patient and a provider who exercises independent judgment in the provision of services to the individual	0, 1, 2, 3,...n	Continuous	M2
Dependent	Relative Value Units (RVUs)	An objective, standardized, nonmonetary relative unit of measure assigned to a CPT code	0.0, 0.1, 0.2,...n	Continuous	M2
Independent	Diagnosis	Patient has an encounter with the following diagnoses: 1) Lumbago (724.2) 2) Myalgia (729.1) 3) Cervicalgia (723.1)	Lumbago Myalgia Cervicalgia	Categorical	M2
Independent	Patient category	Patient group based on type of procedures: 1) Patient had any type of acupuncture procedure 97810, 97811, 97813, 97814 2) Patient had no acupuncture procedure, but had other procedures 3) Patient had no acupuncture procedures, and no other procedures	Acupuncture Non-acupuncture w/ procedure Non-acupuncture w/o procedure	Categorical	M2

Hypothesis

Initial hypotheses tested are similar to those in Jaditz, Edwards, and Morrow (2007), but data sampling is different. Differences in encounters and RVUs are between acupuncture patients, non-acupuncture patients with one or more procedure codes, and non-acupuncture patients with no associated procedure code, with any or all of the top three diagnoses from the top three Treatment DMIS ID hospitals or clinics (in terms of number of acupuncture encounters).

Hypothesis #1. There is a significant difference in the average number of encounters between acupuncture patients, non-acupuncture patients with one or more procedures, and non-acupuncture patients with no procedures.

Hypothesis #2. There is a significant difference in the average amount of RVUs between acupuncture patients, non-acupuncture patients with one or more procedures, and non-acupuncture patients with no procedures.

Hypothesis #3. There is no significant difference in the average number of encounters between Lumbago, Myalgia, and Cervicalgia patients.

Hypothesis #4. There is no significant difference in the average amount of RVUs between Lumbago, Myalgia, and Cervicalgia patients.

Hypothesis #5. Patient group differences in encounters do not depend on diagnosis (there is no interaction effect between patient group and diagnosis on encounters).

Hypothesis #6. Patient group differences in RVUs do not depend on diagnosis (there is no interaction effect between patient group and diagnosis on RVUs).

Data Analysis Techniques

Microsoft® Excel was used for all descriptive statistics. SPSS 16.0 for Windows® was used for all inferential statistics. For comparison of number of encounters and amount of RVUs between the three patient categories and three patient diagnoses, a two-factor ANOVA was performed, with the Levene test of equality for error variances. The Tamhane's T2 was used for Post Hoc tests. Tests for normality revealed right tail skewness for all patient categories. No transformations were attempted.

Validity and Reliability

Validity depends on proper coding. "If medical services and procedures are inaccurately or inappropriately coded, then an RVU analysis will reflect dramatically skewed data" (Glass & Anderson, 2002b, p. 286). Although M2 is one of the staples used by the MHS for data extraction and is used regularly for analyses, this study does not address validity of coding.

Reliability of M2 data depends on timeliness. Data can be available for queries in as short as two days of availability of updated tables ("Data Access in the MHS Mart," n.d.), but records can be changed and updated for several months after they are initially available, sometimes past the end of the fiscal year (Jaditz, Edwards, & Morrow, 2007). This can obviously affect the reliability of results, but the effect may be minimal due to the time from the date of the last encounter (September 2008) to the date of the data draw. As the months pass, the changes to encounter data decrease.

Results

Patients in Top Three Facilities with Top Three Diagnoses

All beneficiaries with a primary diagnosis of Lumbago, Myalgia, and Cervicalgia from Naval Medical Center San Diego, Malcolm Grow Medical Center, and Madigan Army Medical Center in FY08 made up the second M2 data query. Beneficiaries were separated into three groups: (1) those patients that received acupuncture procedures (and may have received other non-acupuncture services); (2) those patients that had no acupuncture procedures, but had other types of procedures; and (3) those patients that had no procedures whatsoever. For statistical analysis, patients were further separated by diagnosis, although some patients had multiple diagnoses. All patient identifying information was encrypted in the data extractions.

Descriptive statistics for patient categories, as well as RVUs per patient and RVUs per encounter are displayed in Table 4. Acupuncture patients generated the most RVUs per person (9.107) and the most RVUs per encounter (1.81). Females accounted for 53.7% of the acupuncture patient population, 45.6% of the non-acupuncture with procedures patient population, and 48.6% of the non-acupuncture without procedures patient population. Individuals between the ages of 20 and 49 made up 67.2% of the acupuncture patient population, 74.7% of the non-acupuncture with procedures patient population, and 63.5% of the non-acupuncture without procedures patient population (see *Figure 3*). Active duty personnel accounted for 54.0% of the acupuncture patient population, 50.8% of the non-acupuncture with procedures patient population, and 40.4% of the non-acupuncture without procedures patient population (*see Figure 4*).

Table 4

Descriptive statistics for patient categories (top three diagnoses combined).

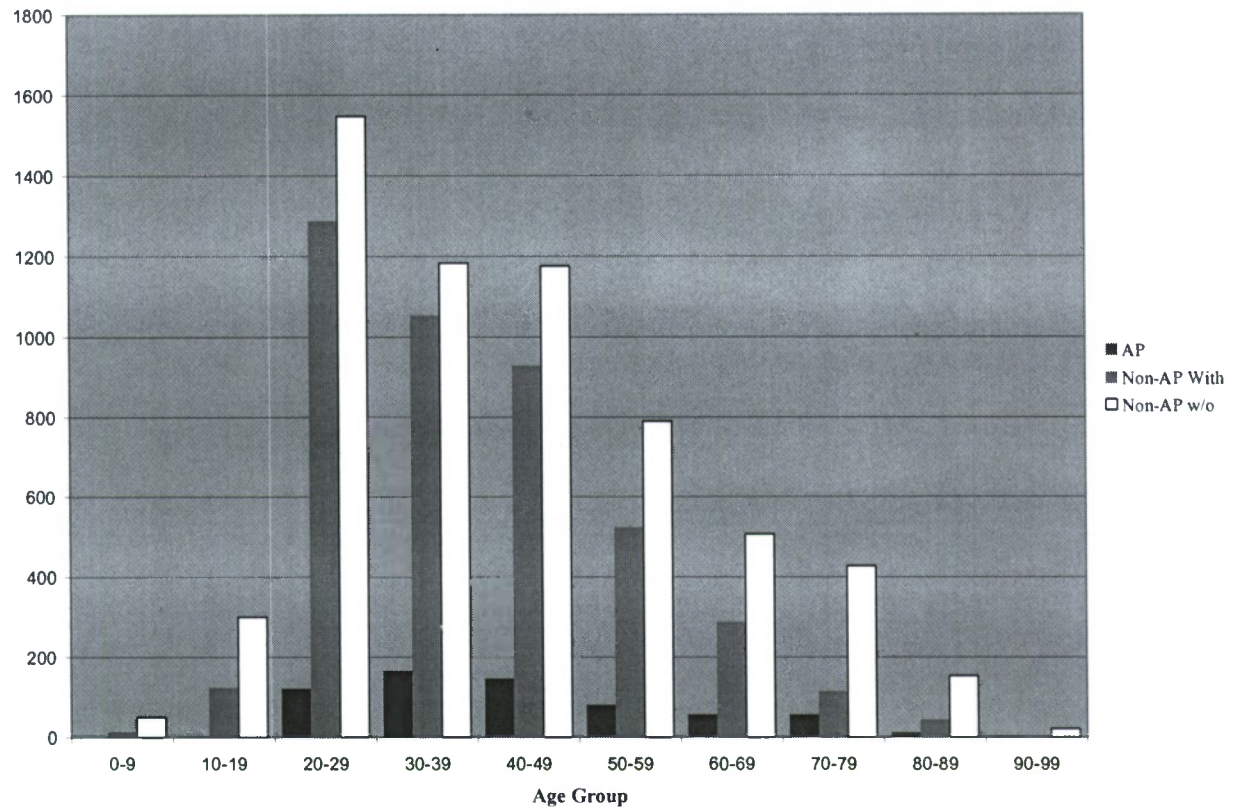|	Acupuncture	Non-acupuncture w/procedure	Non-acupuncture w/o procedure
Number of patients	644	4380	6156
Encounters	3232	8277	10,787
Mean encounters	5.02	2.46	1.34
Standard Deviation	4.50	2.54	0.87
RVUs	5839	9629	16,179
Mean RVUs	9.07	3.69	1.56
Standard Deviation	8.56	3.92	1.18
RVUs per patient	9.067	2.198	2.628
RVUs per encounter	1.807	1.163	1.500

Figure 3. Patients from top three facilities with top three diagnoses in the MHS in FY08 by age category.
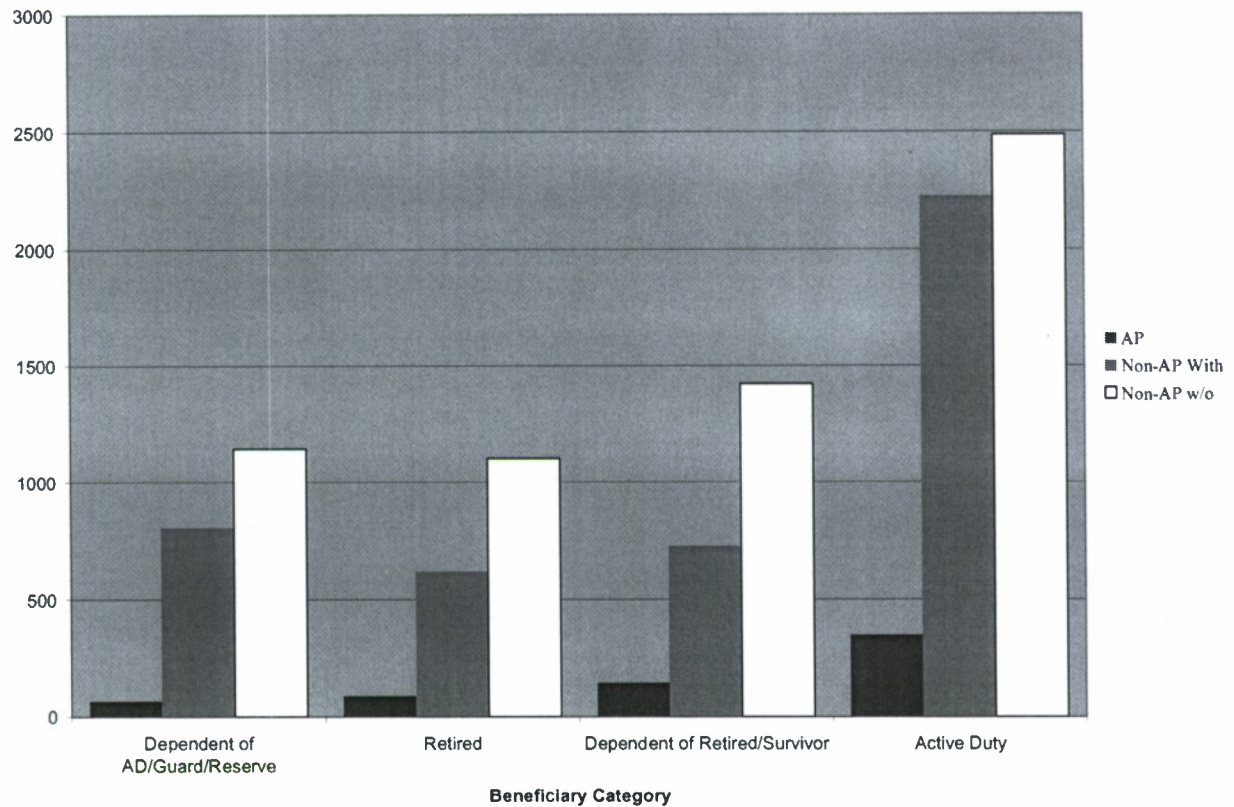
Figure 4. Patients from top three facilities with top three diagnoses in the MHS in FY08 by beneficiary category.

Table 5 presents the descriptive statistics for encounters and RVU by patient group and diagnosis. Acupuncture patients diagnosed with Myalgia have the highest average number of encounters (5.72) and the highest average RVU (10.75). On the other hand, non-acupuncture patients without procedures that were diagnosed with Lumbago had the lowest average number of encounters (1.35) and the lowest average RVU (1.55).

Table 5

Descriptive statistics for patient groups by diagnoses.

		Lumbago		Myalgia		Cervicalgia	
		Encounter	RVU	Encounter	RVU	Encounter	RVU
Acupuncture	Mean	5.56	10.00	5.72	10.75	5.36	9.31
	Std Deviation	4.73	9.33	4.45	8.96	4.75	7.85
	N	400	400	166	166	246	246
Non-acupuncture w/procedure	Mean	2.57	3.86	3.14	4.91	2.74	4.01
	Std Deviation	2.65	4.17	4.37	7.27	2.91	4.32
	N	3230	3230	327	327	1097	1097
Non-acupuncture w/o procedure	Mean	1.35	1.55	1.63	1.88	1.36	1.63
	Std Deviation	.871	1.19	1.28	1.52	.839	1.18
	N	4205	4205	582	582	1515	1515

Statistical Analysis

Table 6 displays results from the two-factor ANOVA for both dependent variables, Encounter and RVU. Main effects for patient group and diagnosis were significant for both Encounter and RVU. The interaction effect of patient group and diagnosis was only significant for RVU. The Levene statistic revealed unequal variances for both encounters and RVUs ($p <$ .001). Therefore, results from the Post Hoc analysis with Tamhane's T2 for unequal variances are shown for patient categories (see Table 7) and diagnoses (see Table 8). All tests revealed significant pairwise differences between all patient categories and between all diagnoses for both encounters and RVUs.

For the dependent variable, encounters, a significant main effect was obtained for patient group, $F (2, 11759) = 1016$, $p < .001$. There were significant differences in encounters between

the three patient groups. Acupuncture patients had significantly higher number of encounters (mean = 5.53) than did both non-acupuncture with procedures patients (mean = 2.65) and non-acupuncture without procedures patients (mean = 1.38). A significant main effect was also obtained for diagnosis, $F(2, 11759) = 7.90$, $p < .001$, indicating that patients diagnosed with Myalgia had significantly higher number of encounters (mean = 2.72) than did both patients diagnosed with Cervicalgia (mean = 2.23) and patients diagnosed with Lumbago (mean = 2.07). Hypothesis 1 was supported and Hypothesis 3 was not supported. The interaction effect of patient group and diagnosis is not significant, $F(4, 11759) = 1.84$, $p > .05$. Hypothesis 5 was supported. As expected, patient group differences in encounters did not depend on diagnosis.

For the dependent variable, RVU, a significant main effect was also obtained for patient group, $F(2, 11759) = 1510$, $p < .001$. There were significant differences in RVU between the three patient groups. Acupuncture patients had significantly higher RVU (mean = 9.94) than did both non-acupuncture with procedures patients (mean = 3.97) and non-acupuncture without procedures patients (mean = 1.60). A significant main effect was obtained for diagnosis, $F(2, 11759) = 7.90$, $p < .001$, indicating that patients diagnosed with Myalgia had significantly higher RVU (mean = 4.17) than did both patients diagnosed with Cervicalgia (mean = 3.21) and patients diagnosed with Lumbago (mean = 2.93). Hypothesis 2 was supported and Hypothesis 4 was not supported. Unlike encounters, the interaction effect of patient group and diagnosis for RVU was significant, $F(4, 11759) = 3.79$, $p < .01$. Hypothesis 6 was not supported. Therefore, patient group differences in RVU depend on the type of diagnosis. For example, acupuncture patients diagnosed with Lumbago have higher RVU (mean = 10.00) than acupuncture patients diagnosed with Cervicalgia (mean = 9.31), but non-acupuncture patients with procedures diagnosed with Lumbago have lower RVU (mean = 3.86) than non-acupuncture patients with

procedures diagnosed with Cervicalgia (mean = 4.01). Patient group differences in RVU did

depend on diagnosis.

Table 6

Analysis of Variance results for Encounters and RVUs

Source	df	Mean square	F	p
		Encounters		
Patient group	2	5277.72	1016.00	<.001*
Diagnosis	2	41.04	7.90	<.001*
Patient group x diagnosis	4	9.56	1.84	0.118
		RVUs		
Patient group	2	21,436.70	1510.00	<.001*
Diagnosis	2	217.75	15.40	<.001*
Patient group x diagnosis	4	53.59	3.79	0.004*

* The mean difference is significant at the .05 level.

Table 7

Tamhane's T2 Post Hoc Analysis for Patient Categories.

	Mean difference	Standard error	Significance level
		Encounters	
AP vs. NonAPW	2.89*	0.169	< .001
AP vs. NonAPw/o	4.15*	0.164	< .001
NonAPW vs. NonAPw/o	1.27*	0.044	< .001
		RVUs	
AP vs. NonAPW	5.98*	0.317	< .001
AP vs. NonAPw/o	8.34*	0.310	< .001
NonAPW vs. NonAPw/o	2.37*	0.068	< .001

*The mean difference is significant at the .05 level. *Note*: AP = Acupuncture patients, NonAPW = Non-acupuncture patients with procedures, NonAPw/o = Non-acupuncture patients with no procedures

Table 8

Tamhane's T2 Post Hoc Analysis for Diagnosis.

	Mean difference	Standard error	Significance level
	Encounters		
Lumbago vs. Myalgia	-0.65*	0.108	< .001
Lumbago vs. Cervicalgia	-0.16*	0.056	0.01
Myalgia vs. Cervicalgia	0.49*	0.116	< .001
	RVUs		
Lumbago vs. Myalgia	-1.239*	0.197	< .001
Lumbago vs. Cervicalgia	-0.275*	0.091	0.008
Myalgia vs. Cervicalgia	0.964*	0.207	< .001

*The mean difference is significant at the .05 level.

Discussion

As predicted, results were similar to those found by Jaditz, Edwards, and Morrow (2007), Wonderling, Vickers, Grieve, and McCarney (2004), and Ratcliffe, Thomas, MacPherson, and Brazier (2006). The addition of acupuncture in patient treatment regimes did not reduce patient resource use in this study. Of all the MHS beneficiaries with a diagnosis of Lumbago, Myalgia, and/or Cervicalgia seen in FY08 at Naval Medical Center San Diego, Malcolm Grow Medical Center, or Madigan Army Medical Center, patients that utilized acupuncture had more encounters and a higher amount of RVUs than patients that did not utilize acupuncture. These significant differences apply to patient category (acupuncture group, non-acupuncture group with at least one procedure code, non-acupuncture group with no procedure codes), as well as diagnosis (Lumbago, Myalgia, and Cervicalgia). The differences between acupuncture patients and non-acupuncture patients makes sense because patients that seek acupuncture typically do so

in conjunction with traditional forms of treatment, obviously increasing the amount of services utilized. Acupuncture patients may also be the sickest patients in the study, thereby being more open to try alternative medicine, and they may have used the most resources even without acupuncture procedures.

Interestingly, the interaction between patient category and diagnosis was significant in RVUs, but not encounters. Looking closer at the raw numbers reveals clues from a productivity standpoint. Between acupuncture and non-acupuncture patients, there was a larger difference (and variance) in RVUs than encounters. If the number of encounters stays relatively the same, but the amount of RVUs increases, acupuncture appears to increase productivity or RVUs per encounter. Given that acupuncture is used in conjunction with traditional forms of Western medicine, adding acupuncture to the treatment regime yields more "bang for the buck."

These results demonstrate the value of data analysis in the decision-making process. Armed with detailed statistics, executive committees can make informed choices about starting, expanding, or stopping a service. Department heads may be lured by the latest and greatest technology or the move towards complementary and alternative medicine. Although quality of care and patient satisfaction must be of utmost consideration, data analysis that proves an endeavor completely fruitless helps decision-makers walk this delicate line.

Limitations

Analysis of the top three diagnoses among acupuncture patients captures a larger percentage of patients, but the fact that the diagnoses are so closely related may be a limitation. Analysis of varying types of diagnoses may reveal different results or may indicate successful treatment with acupuncture for different types of medical problems.

Using the treatment DMIS ID instead of the parent DMIS ID may also be another limitation of this study. Most often, a physician that performs acupuncture will do so at several different clinics in a region on specified days. Using the treatment DMIS ID means that some additional data might have been overlooked. Additionally, it might have been useful to include the treating physician as an independent variable. Doctors that routinely perform acupuncture may be more efficient in acupuncture delivery, use fewer resources, and have better patient outcomes.

Conclusion and Recommendations

This study confirms that patients who utilize acupuncture as part of a treatment regime have more average encounters and a higher amount of RVUs than patients who do not utilize acupuncture. Larger increases in RVUs than encounters provide inferences regarding an increase in productivity. The increase in productivity may reduce the impact of more resource use by acupuncture patients.

Alternative forms of medicine are gaining popularity in the U.S., but the research has yet to catch up. Further study is recommended in the area of patient satisfaction and cost effectiveness including patient outcomes. A small increase in number of encounters or amount of RVUs is a small price to pay if a patient feels increased satisfaction with a treatment regime that includes acupuncture. In doing practical research for this project, this author found all patients eager to be pain-free without medication or side effects from steroid injections. Encounters took anywhere from 15 to 30 minutes. Pain did not subside completely, but was managed.

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