MEDICAL ACUPUNCTURE
Volume 25, Number 1, 2013

DOI: 10.1089/acu.2012.0933

Moving Acupuncture to the Frontline of Military Medical Care: A Feasibility Study

Stephen Burns, MD,[1]* Alexandra York, MS,[2]*
Richard C. Niemtzow, MD, PhD, MPH,[1]*
Betty K. Garner, PhD, RN,[3]*
Nancy Steele, PhD, WHNP,[3,4,]* and Joan A.G. Walter, JD, PA[2]*

ABSTRACT

Background: Currently, opioids are the predominately prescribed treatment for wounded warriors being transported by the United States Air Force aeromedical evacuation system.
Objective: It is not known whether Battlefield Acupuncture (BFA), a type of ear acupuncture, would be an acceptable and utile therapy for patients and medical staff for pain control in the aeromedical evacuation system. The primary aim of this study was to examine the feasibility of introducing BFA into the aeromedical evacuation system.
Design and Setting: This was a feasibility and observational study involving patients with pain who were treated with BFA while being transported by the aeromedical evacuation system from the Landsthul Regional Medical Center (LRMC), in Landstuhl, Germany, to Joint Base Andrews (JBA), in Maryland.
Participants: The participants were patients with pain who were being transported from LRMC to JBA and nurses and physicians providing the BFA treatment for these patients.
Intervention: The intervention was BFA.
Main Outcome Measures: The outcome sought was knowledge of the feasibility and acceptability of BFA trial among the medical staff members and the patients.
Results: It was feasible to train nurses without any previous acupuncture knowledge or skills to implement BFA. In addition, medical staff members stated that the trial did not interfere with their preflight duties or during the flight. Patients reported an average pain rating of 4.07 before BFA and pain scores 1 hour post treatment and post flight of 2.17 and 2.76, respectively ($p < 000.1$).

[1]Joint Base Andrews, MD.
[2]Samueli Institute, Alexandria, VA
[3]Landstuhl Regional Medical Center, Landstuhl, Germany.
[4]Current affiliation: Womack Army Medical Center, Fort Bragg, NC.

**The views, opinions and/or findings contained in this work are those of the author(s) and should not be construed as an official United States Air Force, United States Army, or Department of Defense position, policy or decision unless so designated by other documentation.*

Funding sources: This work was supported by the United States Air Force.

A poster of this study was presented at the Phyllis J. Verhonick Nursing Research Course Military Nursing Research Service and Evidence-Based Practice: Advancing Wellness for the Fighting Force and Their Families, San Antonio, TX, April 29–May 3, 2012. for military nursing in May of 2012.

Conclusions: BFA is a feasible acupuncture technique to be performed within the aeromedical evacuation system without interfering with operational medical duties. Significant pain relief was experienced by those patients who elected to receive BFA to relieve their pain.

Key Words: Battlefield Acupuncture, United States Air Force Aeromedical Evacuation System, Opioids, Patients with Pain, Wounded Warriors

INTRODUCTION

Despite recent advances in pain management, pain remains a daunting problem for the Department of Defense (DoD), with the spate of physical and psychological traumas that continue to occur during this high operational period of two prolonged conflicts.[1] Conventional pain treatment often centers on pain medication, which may lead to tolerance and/or dependence and is associated with many side-effects.[2] Frequently, the acute pain associated with multitrauma transforms into chronic pain that is sometimes accompanied by depression.[3] Current treatment for acute and chronic pain relies heavily on opioids that may desensitize opioid pain receptors, ultimately rendering pain medications less effective or, at times, ineffective.[4] Furthermore, the side-effects associated with commonly prescribed opioids may impede their use. It has been reported[5] and acknowledged by some members of the military leadership, that pain-management paradigms in the military have focused too heavily on medication management.[5] Leadership members at the highest levels of both the operational and medical commands have publicly endorsed the need for more holistic and non–medication-based approaches to pain management.[6–8]

Acupuncture has been shown to be effective as an adjunctive therapy for specific pain conditions, and there is promising evidence that it may relieve some pain-related symptoms, such as anxiety[9] and insomnia.[10] However, to date, acupuncture has played a minimal role in pain management, often being reserved for the most difficult cases or introduced late in the course of therapy when medication alone has failed or when surgery is the final option.[11]

While traditional acupuncture is commonly thought of as the application of needles at various points on the trunk and/or extremities, there are subsets of acupuncture practice emphasizing more limited and focused needle applications. Examples include scalp acupuncture, hand acupuncture, and auriculotherapy (ear acupuncture). The underlying theory is that a somatotopic representation of the entire body exists at these sites. In addition to facilitating a diagnosis of pathologic conditions, ear acupuncture provides the opportunity for treatment of far-ranging conditions by placing needles in only the ears. There is scientific evidence to support the notion of somatotopic correspondence to different auricular (ear) regions, and therapeutic benefit derived by placing needles at these regions.[12–14]

Because military medical staff members often operate in austere environments that do not lend themselves easily to the application of traditional acupuncture,[15,16] ear acupuncture is well-suited as an adjunctive treatment to the conventional pain management administered to a wounded patient. Ear acupuncture has demonstrated effectiveness for reducing postoperative pain[14,17–19] and has been shown to reduce the amount of intraoperative pain medication administered during surgery.[20] The constraints inherent in the large-scale transport of wounded warriors with polytrauma, including limited supplies, providers, and space, create a compelling interest in studying the use of ear acupuncture in this environment.

The current study explored whether ear acupuncture could be introduced earlier in the military medical treatment process to potentially attenuate acute post-injury pain with fewer side-effects. The ear acupuncture protocol selected was developed by medical acupuncturist Richard Niemtzow, MD, PhD, MPH, and researched in a U.S. Air Force Medical Center that evaluated this particular therapy for both acute[21] and chronic pain.[11] The protocol involves a total of 10 specific ear points and uses small, studlike gold needles, with an integrated injector, which are placed exclusively on the ear. Because the protocol does not require access to the scalp or torso, it can be administered in a battlefield situation—for this reason it was named ''Battlefield Acupuncture (BFA)'' by Dr. Niemtzow.[22,23] BFA has demonstrated acceptable acute and chronic pain relief in a military population and was successfully taught to military physicians who were able to practice this technique accurately.[11,21] The goal of the current study was to observe and assess the introduction of BFA into the United States Air Force aeromedical evacuation system, which transports wounded and sick warriors from Germany to the United States.

The feasibility of the following were observed and assessed: (1) teaching BFA to nurse–practitioners (NPs); (2) administering BFA in the hours prior to a flight; (3) assessing acceptance of BFA by patients with pain; and (4) collection of preliminary data on the ability of BFA to relieve pain. To the current authors' knowledge, this is the first study to examine integrating acupuncture into an aeromedical evacuation environment.

METHODS

Prior to recruitment, the Brooke Army Medical Center Institutional Review Board at Fort Sam Houston, Texas approved this observational study. Additional approval was

sought and received from the Commander at the Landstuhl Regional Medical Center in Landstuhl, Germany; the Deputy Medical Commander for Air Mobility Command; and the 86th Medical Group Executive Committee, in Ramstein, Germany. The study began in January 2011 and ended in April 2011.

The feasibility of integrating BFA was assessed through a number of qualitative approaches. Independent observers (Samueli Institute [Alexandria, VA] researchers) traveled to Germany to observe the training of two NPs and recorded observations regarding logistical requirements of these activities (NPs availability and availability of volunteer practice patients). Further observations and discussions were collected once the NPs began administering BFA in the preflight hours to determine whether BFA was unduly burdensome to the staff.

On the evening prior to the scheduled flight, we assessed the feasibility of recruiting patient participation from the pool of ambulatory patients being aeromedically evacuated from Germany to the United States. To be eligible for participation, patients had to be over the age of 18, ambulatory, and report pain >0 using a Numerical Rating Scale (NRS). As the main objective was to assess the feasibility of integrating BFA into the usual care provided within the aeromedical evacuation system, no randomization and no blinding was required. Additional data regarding pain, medication use, expectations, and satisfaction were collected to determine the feasibility of conducting a larger, more-definitive trial at a later date.

After signing a consent and Health Insurance Portability and Accountability Act form, participants received BFA from 1 of the 2 NPs or a physician (medical acupuncturist) all of whom had been trained in BFA by its developer (R.C.N.) and his colleague (S.B.), and credentialed in the BFA technique for the purpose of this research project. The specifics of the BFA approach have been well-documented[22,23] and include a total of five ear acupuncture points—Cingulate Gyrus, Thalamus point, Omega 2, Point Zero, and *Shen Men* (Fig. 1) in each ear. Each participant's pretreatment pain score was self-assessed using the NRS and recorded. Then, up to 10 gold semi-permanent, Acupuncture Semi-Permanent (ASP) needles (Sedatelec, Lyon, France; Fig. 2) were placed in the BFA points and

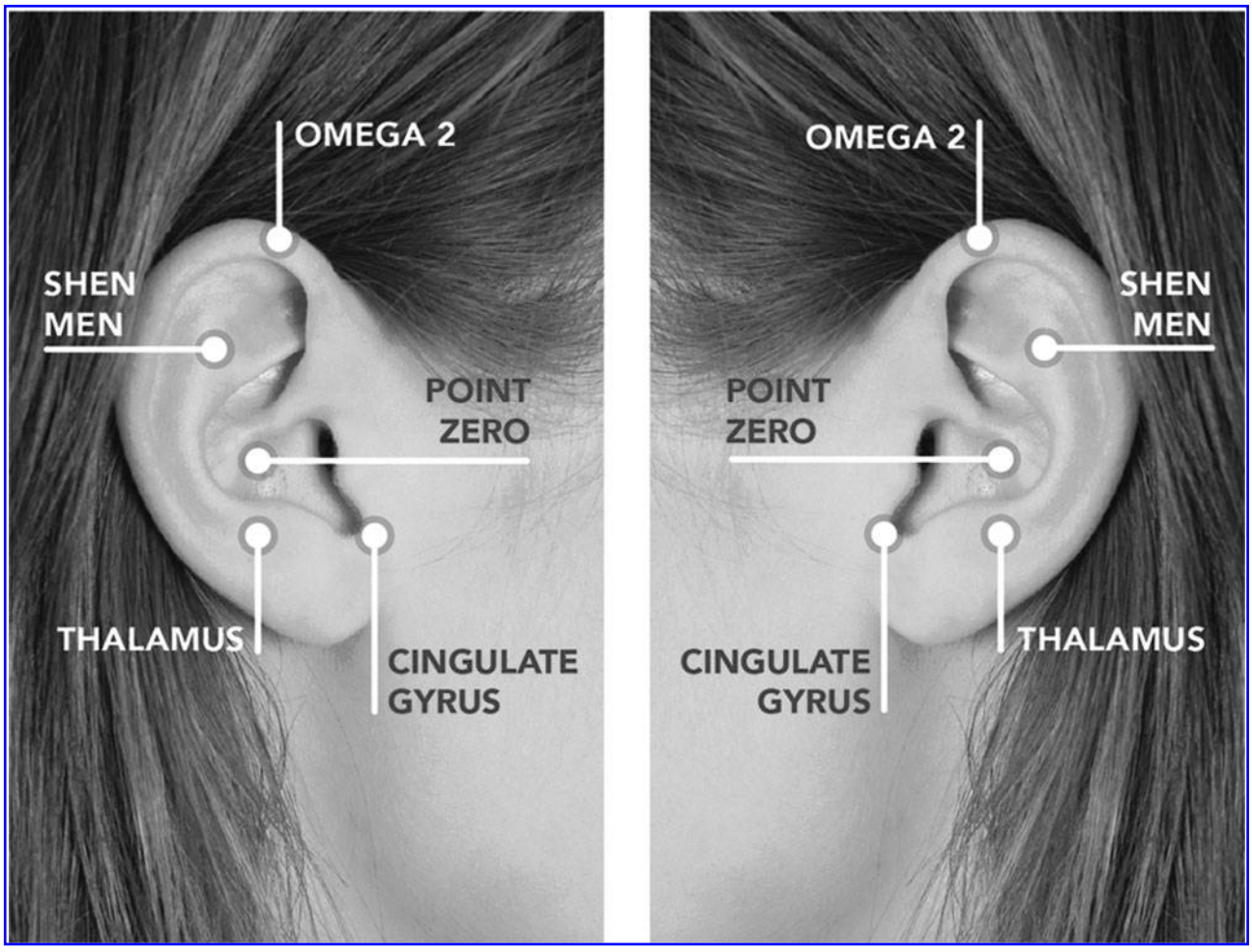

FIG. 1. Battlefield Acupuncture (BFA) points. Figure courtesy of the Samueli Institute, Alexandria, VA.

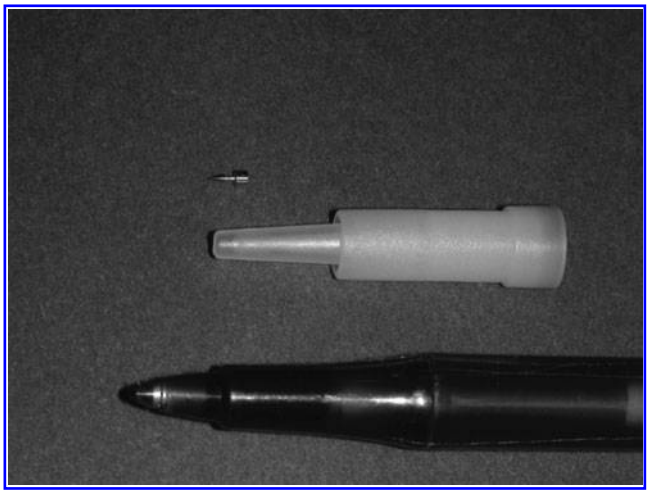

FIG. 2. An Acupuncture Semi-Permanent needle and injector (Sedatelec, Lyon, France).

sequenced per the protocol, one at a time, starting on either ear and alternating left and right. In most cases, all 10 needles were placed, unless the subject reported complete resolution of his/her pain, or requested that the needle insertions be stopped. Once all needles were in place, the participant again rated and recorded his/her pain level using the NRS.

Outcome measures included a demographic questionnaire and timepoint questionnaires (pre-treatment, 1 hour post-treatment, and post-flight), which included components from: (1) the Brief Pain Inventory (BPI), for the purpose of documenting both location of pain and overall pain intensity and (2) questions regarding previous acupuncture use, expectations, medication use, and overall satisfaction with BFA. All timepoint questionnaires included the same BPI components to detect any change in pain outcomes.

Prior to BFA being administered, the demographic questionnaire and the pre-treatment questionnaire (location and level of pain, medication use, and expectations related to the treatment) were collected. One hour post BFA administration, information on location and level of pain again were collected. This datapoint was collected to capture any immediate relief the patients may have experienced after receiving BFA. The final datapoint collection occurred at the conclusion of each participant's flight to the United States. The post-flight questionnaire captured data on location and level of pain, satisfaction, and medication use post-BFA treatment. All the data collected were self-reported. Upon the flight's arrival to the United States, participation in the study ended.

To detect differences among pre-treatment, 1-hour post-treatment, and post-flight pain outcomes, statistical analysis was performed, using Wilcoxon signed-rank tests. Generalized regression analysis and examination of Pearson's correlation coefficients were conducted to capture any correlations between change in reported pain and previous acupuncture treatments, medication taken, and expectations.

RESULTS

Feasibility

The feasibility of integrating BFA via qualitative observational data was assessed. Three main aspects were observed: (1) the training of the two NPs and a medical acupuncturist, and sustained fidelity/accuracy of needle placement; (2) the administrative process of integrating the BFA technique into the usual care offered to patients the evening before or the mornings of their flights; and (3) the administration of BFA to the patients and their satisfaction with the treatment. An attempt was also made to track the percentage of patients who were eligible to enroll in the study, compared to the percentage that actually had enrolled in the study, but logistical challenges prevented tracking of this meaningful data.

Each of the three aspects of integration was successfully folded into the aeromedical evacuation system. The training took only a half day for each of the NPs (the medical acupuncturist had received the BFA training both by R.C.N. and S.B. and as part of his certificate course in acupuncture) and they all mastered the BFA technique successfully by the end of their training, as measured by observation as they practiced placement on volunteers. Accuracy of needle placement was reassessed and, at a point approximately 3 weeks into the study, a refresher session was provided, when ''drift'' of point placement was observed. Thereafter, needle placements were accurate throughout the remainder of the study.

The total time of BFA administration, from assessment to successful placement of the needles, averaged a total of 30 minutes and the aeromedical evacuation staff was easily able to identify a time for this procedure. The study components (presenting the study to patients and filling out forms) added 20 minutes that were easily accommodated during the pre-flight aeromedical orientation routinely provided to passengers.

Demographics, Pain, Expectation, and Satisfaction Outcomes

A total of 75 participants were enrolled in the study. The majority of the participants were male, and a little over half were between 21 and 30 years old (Table 1). Nearly all of the participants ($\sim$92%) were enlisted service members, and $\sim$15% had received acupuncture prior to this study.

TABLE 1. BASELINE CHARACTERISTICS OF STUDY PATIENTS ($N=75$)

Sample characteristics	*%*
Male gender	85.1
Age 21–30	55.4
Education—some college	52.7
Service Rank—enlisted	91.8
Acupuncture use—first time	84.9

Table 2. Average Pain Rate Pre-Treatment (Pre), Post 1 Hour, and Post Flight*

	BFA treatment group	
Pre	4.07	
Post–1 hour	2.17	*p*-Value
Difference	1.89	< 0.0001
Post-flight	2.76	*p*-Value
Difference	1.30	< 0.0001

*This was not a randomized controlled trial therefore it can only be stated that decreased pain levels were observed with the BFA treatment.

Participants reported an average pain rating of 4.07 pre-BFA (rated pain on a scale from 0 to 10; with 0 representing ''no pain'' and 10 representing ''pain as bad as you can imagine''). The average pain rating for 1-hour post-treatment and post-flight were 2.17 and 2.76, respectively (Table 2). A repeated measures analysis of variance confirmed that changes in pain ratings from pre-treatment and 1-hour post-treatment (mean difference = 1.89; p-value < 0.0001) and post-flight (mean difference = 1.30; p-value < 0.0001) were statistically significant. More than half (62%) of all participants reported that they would elect to receive BFA treatment again for pain relief, and 50% reported being mostly satisfied with BFA. Another 21% reported being very satisfied with this treatment.

It has been widely reported that acupuncture is influenced by subjective factors,[24–26] therefore, examinations were done to assesss if changes in pain ratings were associated with prior acupuncture treatments, expectations, and medication use. No significant difference was detected between patients who had received acupuncture treatment prior to the study and those who had not. In addition, while medication takers reported higher pain rates than non-medication takers at all three timepoints, there was no significant difference in the degree of change in pain ratings between these two groups. Lower participant expectations were associated with greater 1-hour post-treatment pain relief; however, the correlation between expectation and the difference between pre-treatment and post-flight pain relief was not significant.

DISCUSSION

The purpose of this study was to assess the feasibility and acceptability of BFA in conjunction with the aeromedical evacuation system from Landstuhl, Germany, to Joint Base Andrews in the United States. Preliminary outcome measures were also used to determine the feasibility of conducting a larger trial aimed at assessing the effectiveness of BFA for acute pain relief. The overall observation and assessments led the current authors to conclude that the offering and administration of BFA did not interfere with the normal pre-flight preparation process. However, if a larger scale trial were to be executed to evaluate BFA definitively for pain in this environment, more personnel (>5 BFA-trained practitioners and >3 researchers) would be required. In addition, the length of the study and follow-up would need to extend beyond participants' immediate arrival into the United States. Given that all flights are processed at Joint Base Andrews in Maryland, and participants are transitioned quickly to their respective military treatment facilities, it would pose an additional—but not insurmountable—challenge to ensure that follow-up data are collected.

The aeromedical transportation of injured and ill patients from Germany is a significant part of the military medical support of ongoing conflicts, which represent particular logistical challenges. The integration of BFA, which is a portable acupuncture modality, within this period of care, has the potential to change practice in this unique environment. Moreover, the risks of narcotic overmedication in mid-flight are real, and management of the respiratory and neurological problems that can ensue, may place extreme burdens on the limited personnel who comprise the crew and medical support teams. Thus, an adjunctive pain-relief modality that might lessen the need for opioids during transport may prove very meaningful and valuable in this population. In addition, the non–medication-based treatment of pain early in the course of care for wounded and injured military personnel may avoid some of the later complications of overdependence on opioids.

The statistically significant changes in pain ratings must be examined cautiously, as there was no randomization of participants or blinding. Subjects were permitted to take any pain medications they had been provided with, but were asked to note pain medications taken during the period of participation in the study. Given that there was no control group, it can only be stated that decreased pain ratings were associated with BFA treatment. Regarding expectations it is of interest to note that lower participant expectations was associated with greater 1-hour post-treatment pain relief than with higher participant expectations. This observation is in contrast to current research, which suggests that higher expectations are associated with greater improvements in outcomes.[27] The fact that a significant majority of participants were satisfied with the BFA treatment and would elect to receive it again should be noted by military health care leaders particularly, when considering the simplicity, ease of administration, low cost, and low side-effect profile of BFA.

CONCLUSIONS

The benefits of moving acupuncture forward in the pain-care paradigm following injury have yet to be evaluated. This study took the initial step of evaluating the feasibility of integrating a simple acupuncture procedure (BFA) into

the unique aeromedical evacuation system environment and population of wounded warriors. While integrating BFA was found to be feasible, more research is needed to determine the effectiveness of BFA in this environment. A larger trial is possible, but more resources will be required. The potential of acupuncture to produce pain relief with minimal side-effects in this population is worthy of further investigation—especially, if BFA may mitigate the overuse of pain medication with its inherent risks.

ACKNOWLEDGMENTS

The authors would like to thank Lt Col JoAnn Danner, RN, USAF, Maj Charlotta Leader, RN, USAF, and Maj Conner Nguyen, of the U.S. Army, for their valuable efforts in support of this project, as well as the flight crews, flight surgeons, and NPs for their cooperation with the study. Their expert skill, dedication, and teamwork in caring for and transporting the United States' wounded warriors, although largely invisible to the public, are awe-inspiring and invaluable. Additional thanks go to the many Air Force and Army sponsors of this project, and those who took care of the logistics to allow the study to be done. Dr. Niemtzow, the Principal Investigator, is acknowledged by his coauthors for his steadfast execution of this project, overcoming extreme challenges and piloting the rest of the authors through the maze of Air Force regulations.

DISCLOSURE STATEMENT

No competing financial interests exist.

REFERENCES

1. Jonas W, O'Connor F, Deuster P, Peck J, Shake C, Frost S. Why total force fitness? *Mil Med.* 2010;175(suppl1):6–13.
2. Black IH, McManus J. Pain management in current combat operations. *Prehosp Emerg Care.* 2009;13(2):223–227.
3. Sinatra R. Causes and consequences of inadequate management of acute pain. *Pain Med.* 2010;11(12):1859–1871.
4. Morasco BJ, Gritzner S, Lewis L, Oldham R, Turk DC, Dobscha SK. Systematic review of prevalence, correlates, and treatment outcomes for chronic non-cancer pain in patients with comorbid substance use disorder. *Pain.* 2011;152(3):488–497.
5. Zoroya G. Report: Military's Pain Relief Programs Fall Short. *USA Today,* 2010. Online document at www.usatoday.com/news/military/2010-06-23-military-pain_N.htm Accessed December 13, 2012.
6. Zoroya G. U.S. Troops Admit Abusing Prescription Drugs. *USA Today*, 2009. Online document at www.usatoday.com/news/military/2009-12-16-milhealth_N.htm Accessed December 13, 2012.
7. General Office of the Army Surgeon General (OoTAS). *Report to Surgeon General: Pain Management Task Force Report: Providing a Standardized DOD and VHA Vision and Approach to Pain Management to Optimize the Care for Warriors and Their Families.* 2010.
8. U.S. Army Medical Command (UAM). *Operation Order 10-76: USAMEDCOM Comprehensive Pain Management Campaign Plan.* 2010.
9. Eich H, Agelink MW, Lehmann E, Lemmer W, Klieser E. Acupuncture in patients with minor depressive episodes and generalized anxiety: Results of an experimental study [in German]. *Fortschr Neurol Psychiatr.* 2000;68(3):137–144.
10. McLay RN, Klam WP, Volkert SL. Insomnia is the most commonly reported symptom and predicts other symptoms of post-traumatic stress disorder in U.S. service members returning from military deployments. *Mil Med.* 2010;175(10):759–762.
11. Niemtzow RC, Burns SM, Cooper J, Libretto S, Walter J, Baxter J. Acupuncture clinical pain trial in a military medical center: Outcomes. *Medical Acupuncture.* 2008;20(4):255–261.
12. Helms J. *Acupuncture Energetics: A Clinical Approach for Physicians*. Berkeley: Medical Acupuncture Publishers; 1996.
13. Oleson T. Overview and History of Auriculotherapy and Theoretical Perspectives of Auriculotherapy: In: *Auriculotherapy Manual: Chinese and Western Systems of Ear Acupuncture, vol. 2.* London: Churchill Livingstone; 2003:1–76.
14. Usichenko TI, Hermsen M, Witstruck T, et al. Auricular acupuncture for pain relief after ambulatory knee arthroscopy—a pilot study. *Evid-Based Complement Alternat Med.* 2005;2(2):185–189.
15. Beninati W, Meyer MT, Carter TE. The critical care air transport program. *Crit Care Med.* 2008;36(7[suppl]):S370–S376.
16. Venticinque SG, Grathwohl KW. Critical care in the austere environment: Providing exceptional care in unusual places. *Crit Care Med.* 2008;36(7[suppl]):S284–292.
17. Usichenko TI, Dinse M, Hermsen M, Witstruck T, Pavlovic D, Lehmann C. Auricular acupuncture for pain relief after total hip arthroplasty—a randomized controlled study. *Pain.* 2005;114(3):320–327.
18. Usichenko TI, Kuchling S, Witstruck T, et al. Auricular acupuncture for pain relief after ambulatory knee surgery: A randomized trial. *CMAJ.* 2007;176(2):179–183.
19. Usichenko TI, Lehmann C, Ernst E. Auricular acupuncture for postoperative pain control: A systematic review of randomised clinical trials. *Anaesthesia.* 2008;63(12):1343–1348.
20. Usichenko TI, Dinse M, Lysenyuk VP, Wendt M, Pavlovic D, Lehmann C. Auricular acupuncture reduces intraoperative fentanyl requirement during hip arthroplasty—a randomized double-blinded study. *Acupunct Electrother Res.* 2006;31(3–4):213–221.
21. Goertz CM, Niemtzow R, Burns SM, Fritts MJ, Crawford CC, Jonas WB. Auricular acupuncture in the treatment of acute pain syndromes: A pilot study. *Mil Med.* 2006;171(10):1010–1014.
22. Niemtzow RC. Battlefield Acupuncture. *Med Acupunct.* 2007;19(4):225–228.
23. Niemtzow RC, Litscher G, Burns SM, Helms JM. Battlefield Acupuncture: Update. *Med Acupunct.* 2009;21(1):43–46.

24. Kong J, Kaptchuk TJ, Polich G, et al. An fMRI study on the interaction and dissociation between expectation of pain relief and acupuncture treatment. *Neuroimage.* 2009;47(3):1066–1076.
25. Kaptchuk TJ, Shaw J, Kerr CE, et al. "Maybe I made up the whole thing": Placebos and patients' experiences in a randomized controlled trial. *Cult Med Psychiatry.* 2009;33(3):382–411.
26. Wasan AD, Kong J, Pham LD, Kaptchuk TJ, Edwards R, Gollub RL. The impact of placebo, psychopathology, and expectations on the response to acupuncture needling in patients with chronic low back pain. *J Pain.* 2010;11(6):555–563.
27. Kalauokalani D, Cherkin DC, Sherman KJ, Koepsell TD, Deyo RA. Lessons from a trial of acupuncture and massage for low back pain: Patient expectations and treatment effects. *Spine (Phila P 1976).* 2001;26(13):1418–1424.

Address correspondence to:
Alexandra York, MS
Samueli Institute
1737 King Street, Suite 600
Alexandria, VA 22314

E-mail: ayork@siib.org