Does Offering Battlefield Acupuncture Lead to Subsequent Use of Traditional Acupuncture?

Eva R. Thomas, MPH,* Steven B. Zeltadt, PhD, MPH,*† Scott Coggshall, PhD,*
Hannah Gelman, PhD,* Adam Resnick, MPH,** Karleen Giannitrapani, PhD,§
Juli Olson, DC, MAOM,** Benjamin Kligler, MD,** and Stephanie L. Taylor, PhD‡§

Objectives: Veterans Health Administration encourages auricular acupuncture (Battlefield Acupuncture/BFA) as a nonpharmacologic approach to pain management. Qualitative reports highlighted a “gateway hypothesis”: providing BFA can lead to additional nonpharmacologic treatments. This analysis examines subsequent use of traditional acupuncture.

Research Design: Cohort study of Veterans treated with BFA and a propensity score matched comparison group with a 3-month follow-up period to identify subsequent use of traditional acupuncture. Matching variables included pain, comorbidity, and demographics, with further adjustment in multivariate regression analysis.

Subjects: We identified 41,234 patients who used BFA across 130 Veterans Health Administration medical facilities between October 1, 2016 and March 31, 2019. These patients were matched 2:1 on Veterans Health Administration medical facilities between October 1, 2016 and March 31, 2019. These patients were matched 2:1 on

Conclusions: Providing BFA, which is easy to administer during a patient visit and does not require providers be formally certified, led to a substantial increase in use of traditional acupuncture. These findings suggest that the value of offering BFA may not only be its immediate potential for pain relief but also subsequent engagement in additional therapies.

Key Words: complementary and integrative health, acupuncture therapy, auricular acupuncture, nonpharmacologic, Veterans

There are now widely recognized limitations in the efficacy of opioids for chronic pain management, and nonpharmacologic approaches have begun to be recommended as first-line treatments. Many barriers remain to providing nonpharmacologic interventions, including patients wanting an immediate solution, with many patients skeptical about nonpharmacologic alternatives and preferring to remain on opioids. Introducing nonpharmacologic interventions in a way that supports patients trying these interventions is a critical step to their adoption.

In 2013, the Veterans Health Administration (VHA) launched a national effort to implement an auricular acupuncture technique (Battlefield Acupuncture/BFA) as part of routine clinical care. The BFA procedure was initially developed for use among military personnel as an adjunct therapy to manage pain and anxiety in combat casualties who could be easily treated when injured through access to their ears. BFA is noted for its ease of administration and ability to be learned by a wide variety of providers without requiring full certification in whole-body acupuncture. By March 2019, over 2400 providers across a range of disciplines have been trained in VHA in delivering BFA. These include physicians, physician assistants, nurse practitioners, chiropractors,
registered nurses, and physical therapists in addition to licensed acupuncturists, if not previously certified in BFA during their typical clinical training.18

One of the goals of training VHA providers was to have an immediate alternative to opioids which could be offered during a routine outpatient visit.18 The effectiveness of this service on short-term pain outcomes has been described in smaller trials and case series.12,19–22 Another study evaluating BFA’s introduction across VHA found some providers reported patients had been feeling hopeless about their pain before using BFA, but experienced pain relief and hope immediately after receiving BFA.23 Specifically, providers detected a significant shift in these patients, due to feeling for the first time that their pain may be manageable through nonpharmacologic approaches. As such, providers described BFA as a gateway to having new dialogues about pain management with their patients. The goal of this learning health care systems evaluation was to assess to what extent these qualitative findings could be confirmed in utilization data. Operational leaders have highlighted within VHA how important it is to shift patients away from opioids with limited efficacy and significant harms by offering more effective and safer alternatives.23

**METHODS**

**Study Population**

We identified 44,594 patients who received BFA treatment between October 1, 2016 and March 31, 2019. The methods to extract the BFA data from the VHA’s Corporate Data Warehouse are available upon request of the authors. We excluded patients who had previously used traditional acupuncture and patients who died in the 3-month follow-up period following their index visit resulting in a final sample of 41,234. As no distinct CPT code currently exists for BFA, treatments were identified using a combination of clinic names, note titles as well as specific VA codes including health factor templates and financial accounting codes. Access to the Corporate Data Warehouse can be arranged through the VA Informatics and Computing Infrastructure.

**Propensity Score Matching**

A general sample of 178,381 non-BFA users was identified by randomly identifying 4 non-BFA users for each BFA user based on the non-BFA user having a primary care or mental health visit in VHA during the same month as a BFA user. After applying the same exclusions of no prior use of traditional acupuncture and at least 3 months of follow-up, a sample of 174,741 non-BFA users identified. From this general sample we used a propensity score matching approach to identify a cohort of non-BFA users as similar possible to the Veterans who used BFA. Propensity scores were estimated for each Veteran using logistic regression with binary use of BFA as the dependent variable and 18 selected covariates as predictors: demographic characteristics, health conditions, and other aspects of patient’s pain. Demographic characteristics included sex, age, geographic region, rurality of patient zip code, race/ethnicity, copay requirement, disability due to service, and VA medical center of the index visit. Health conditions included chronic pain, psychological comorbidities (anxiety disorders, mood disorders, personality disorders, psychotic disorders, substance use disorders, and trauma-related disorders), and a count of Elixhauser comorbidities. Other aspects of patient’s pain included location of pain and pain intensity.

Distributional similarity of the derived propensity scores was examined by comparing mean differences and using back-to-back histograms. We used a nearest neighbor matching method to select 2 Veterans who have not received BFA for each Veteran who have received BFA by a caliper width ≤0.25 using the matchit function from the MatchIt package in R.24 Owing to missing numerical rating scale scores, 16,344 BFA users were dropped from the matching process. In the end, 40,358 Veterans who did not receive BFA were matched to 24,037 Veterans who received BFA.

**Subsequent Utilization of Traditional Acupuncture**

The focus of this evaluation is on subsequent utilization of traditional acupuncture within 3 months of each patient’s index visit. We focused on traditional acupuncture for this analysis because it is one of the most commonly offered complementary and integrative health (CIH) services, of the more than 26 types of CIH services that VHA provides,25 and is logically one that would most likely be influenced by BFA use. We reviewed traditional acupuncture visits documented in VHA’s electronic health record as well as acupuncture claims provided by community providers but paid for by VHA. Traditional acupuncture utilization was identified in VHA’s Corporate Data Warehousing using a combination of CPT codes (97810–97814), clinic names, and other VHA administrative and billing codes. Community care claims were extracted from the VHA’s Program Integrity Tool (https://www.herc.research.va.gov/). The Non-VA Care Program Integrity Tool system is the primary data source for VA Community Care data; it includes comprehensive data on Choice and MISSION Act utilization. All data originate from non-VA providers providing services and submitting claims to Third-Party Administrators.

**Current and Chronic Pain, Clinical Comorbidities, and Demographic Characteristics**

Although many patients use BFA for pain and it can be assumed that pain was likely one of the reasons most BFA patients sought care at their index visit, the medical record does not reliably include reasons for receipt of BFA. To appropriately compare the non-BFA cohort we extracted several pain-related factors as well as other clinical and demographic characteristics. To identify chronic pain history, we adapted methods from the NIH-DoD-VA Pain Management Collaboratory (https://painmanagementcollaboratory.org/) to identify 7 categories of chronic musculoskeletal pain diagnoses including back, joint, neck, and fibromyalgia using ICD9/10 codes within the 90-day period before their first BFA treatment. This approach is modeled on prior administrative approaches to assessing chronic pain.26 Each patient’s most recent pain intensity rating scale information was identified based on the date of the index visit or the most recent visit within the prior 3 months of the index visit if the information was not available on the date of their index visit. VHA routinely collects Defense
### TABLE 1. Demographic and Clinical Characteristics Among Overall Veteran Cohort and Propensity Score Matched Subcohort at Time of Their Index Visit

| Patient and Facility Characteristics | Overall Veteran Cohort | Propensity Score Matched Subcohort |
|-------------------------------------|------------------------|------------------------------------|
|                                     | Non-BFA Users (n = 174,741) | BFA Users (n = 41,234) | P       | Non-BFA Users (n = 40,358) | BFA Users (n = 24,037) | P       |
| Year of index visit (%)             | 0.041                  | <0.001                            |         | 0.001                      | <0.001                  |         |
| 2016                                | 19,823 (11.3)          | 4577 (11.1)                       |         | 4500 (11.2)                | 1595 (6.6)              |         |
| 2017                                | 63,109 (36.1)          | 15,168 (36.8)                     |         | 14,699 (36.4)              | 7129 (29.7)             |         |
| 2018                                | 69,876 (40.0)          | 16,433 (39.9)                     |         | 16,081 (39.8)              | 11,396 (47.4)           |         |
| 2019                                | 21,933 (12.6)          | 5056 (12.3)                       |         | 5078 (12.6)                | 3917 (16.3)             |         |
| Male (%)                            | 156,168 (89.4)         | 35,148 (85.2)                     | <0.001  | 35,262 (87.4)              | 20,417 (84.9)           | <0.001  |
| Age category (%)                    | 18–39                  | 23,624 (13.5)                     | <0.001  | 5842 (14.5)                | 3247 (13.5)             |         |
|                                     | 40–49                  | 17,802 (10.2)                     |         | 4499 (11.1)                | 3419 (14.2)             |         |
|                                     | 50–59                  | 27,689 (15.8)                     |         | 7039 (17.4)                | 5023 (20.9)             |         |
|                                     | 60–69                  | 46,647 (26.7)                     |         | 11,010 (27.3)              | 6428 (26.7)             |         |
|                                     | 70–79                  | 41,418 (23.7)                     |         | 8896 (22.0)                | 4551 (18.9)             |         |
| 80+                                 | 17,561 (10.0)          | 2789 (6.8)                        |         | 3072 (7.6)                 | 1369 (5.7)              |         |
| Race/ethnicity (%)                  | 0.010                  | 0.057                             |         | 0.010                      | 0.057                   |         |
| Non-BFA Users                       | 1150 (0.7)             | 262 (0.6)                         |         | 262 (0.6)                  | 158 (0.7)               |         |
| BFA Users                           | 92,544 (53.0)          | 21,826 (52.9)                     | <0.001  | 21,103 (52.3)              | 12,765 (53.1)           | <0.001  |
| Metropolitan zip code (%)           | 12,704 (7.3)           | 2402 (5.8)                        | 0.010   | 2799 (6.9)                 | 1556 (6.5)              | 0.03    |
| Married (%)                         | 37,148 (21.3)          | 7748 (18.8)                       | <0.001  | 8836 (21.9)                | 5112 (21.3)             |         |
| Unknown (%)                         | 134,668 (77.1)         | 33,366 (80.9)                     |         | 31,306 (77.6)              | 18,834 (78.4)           |         |
| Unmarried                           | 2925 (1.7)             | 120 (0.3)                         |         | 216 (0.5)                  | 91 (0.4)                |         |
| Copay due to (%)                    | 26,138 (15.0)          | 5112 (12.4)                       | <0.001  | 4855 (12.0)                | 2319 (9.6)              | <0.001  |
| Copay required due to means         | 86,044 (49.2)          | 22,300 (54.1)                     |         | 21,320 (52.8)              | 13,679 (56.9)           |         |
| No copay due to disability          | 61,598 (35.3)          | 13,817 (33.5)                     |         | 14,149 (35.1)              | 8034 (33.4)             |         |
| No copay due to means/other         | 961 (0.5)              | 5 (0.0)                           | <0.001  | 34 (0.1)                   | 5 (0.0)                 | <0.001  |
| Pain category (%)                   | 33,880 (19.4)          | 18,493 (44.8)                     | <0.001  | 12,918 (32.0)              | 10,726 (44.6)           | <0.001  |
| More than 1                         | 6661 (3.8)             | 2111 (5.1)                        |         | 2122 (5.3)                 | 1473 (6.1)              |         |
| Back pain                           | 177 (0.1)              | 48 (0.1)                          |         | 54 (0.1)                   | 37 (0.2)                |         |
| Headache                            | 13 (0.0)               | 2 (0.0)                           |         | 2 (0.0)                    | 2 (0.0)                 |         |
| Limb/extremity pain, joint pain and | 1,168 (7.0)            | 1829 (4.4)                        |         | 2866 (7.1)                 | 1436 (6.0)              |         |
| NRS [mean (SD)]*                    | 2.53 (3.08)            | 3.95 (3.18)                       | <0.001  | 3.27 (3.22)                | 3.98 (3.06)             | <0.001  |
| Elixhauser comorbidities            |                       |                                   |         |                           |                         |         |
| HIV and AIDS (%)                    | 715 (0.4)              | 153 (0.4)                         | 0.290   | 158 (0.4)                  | 103 (0.4)               | 0.515   |
| Alcohol abuse (%)                   | 17,000 (9.7)           | 4524 (11.0)                       | <0.001  | 4251 (10.5)                | 2857 (11.9)             | <0.001  |
| Deficiency anemia (%)               | 6968 (4.0)             | 1519 (3.7)                        | 0.004   | 1696 (4.2)                 | 963 (4.0)               | 0.234   |
| Congestive heart failure (%)        | 18,908 (10.8)          | 4113 (10.0)                       | <0.001  | 4580 (11.3)                | 2579 (10.7)             | 0.016   |
| Rheumatoid arthritis/collagen vascular diseases (%) | 3335 (1.9) | 1323 (3.2) | <0.001 | 1035 (2.6) | 853 (3.5) | <0.001 |
| Blood loss anemia (%)               | 836 (0.5)              | 198 (0.5)                         | 0.994   | 229 (0.6)                  | 124 (0.5)               | 0.423   |
| Chronic pulmonary disease (%)       | 2304 (1.3)             | 575 (1.4)                         | 0.236   | 582 (1.4)                  | 366 (1.5)               | 0.431   |
| Diabetes without chronic complications (%) | 50,376 (28.8) | 13,879 (33.7) | <0.001 | 13,000 (32.2) | 8808 (36.6) | <0.001 |
| (Continued)                         |                       |                                   |         |                           |                         |         |

S110 | www.lww-medicalcare.com
TABLE 1. Demographic and Clinical Characteristics Among Overall Veteran Cohort and Propensity Score Matched Subcohort at Time of Their Index Visit (continued)

| Patient and Facility Characteristics | Overall Veteran Cohort | Propensity Score Matched Subcohort |
|--------------------------------------|------------------------|-------------------------------------|
|                                      | Non-BFA Users (n = 174,741) | BFA Users (n = 41,234) | P | Non-BFA Users (n = 40,358) | BFA Users (n = 24,037) | P |
| Diabetes with chronic complications (%) | 9632 (5.5) | 2109 (5.1) | <0.001 | 2243 (5.6) | 1355 (5.6) | 0.684 |
| Drug abuse (%) | 12,015 (6.9) | 3716 (9.0) | <0.001 | 3057 (7.6) | 2357 (9.8) | <0.001 |
| Hypertension, uncomplicated (%) | 84,953 (48.6) | 20,137 (48.8) | 0.426 | 20,156 (49.9) | 12,031 (50.1) | 0.795 |
| Hypertension, complicated (%) | 10,160 (5.8) | 2304 (5.6) | 0.078 | 2360 (5.8) | 1379 (5.7) | 0.573 |
| Hypothyroidism (%) | 12,210 (7.0) | 3173 (7.7) | <0.001 | 2866 (7.1) | 1861 (7.7) | 0.003 |
| Liver disease (%) | 8448 (4.8) | 2443 (5.9) | <0.001 | 2103 (5.2) | 1526 (6.3) | <0.001 |
| Lymphoma (%) | 779 (0.4) | 180 (0.4) | 0.831 | 197 (0.5) | 100 (0.4) | 0.213 |
| Fluid and electrolyte disorders (%) | 7897 (4.5) | 1983 (4.8) | 0.012 | 2042 (5.1) | 1202 (5.0) | 0.754 |
| Paralysis (%) | 739 (0.4) | 241 (0.6) | <0.001 | 207 (0.5) | 161 (0.7) | 0.012 |
| Peripheral vascular disorder (%) | 9143 (5.2) | 2274 (5.5) | 0.022 | 2313 (5.7) | 1397 (5.8) | 0.684 |
| Psychoses (%) | 6505 (3.7) | 963 (2.3) | <0.001 | 1146 (2.8) | 631 (2.6) | 0.114 |
| Pulmonary circulation disorder (%) | 2009 (1.1) | 542 (1.3) | 0.006 | 548 (1.4) | 325 (1.4) | 0.979 |

Psychological comorbidities

| Anxiety disorders (%) | 28,987 (16.6) | 8370 (20.3) | <0.001 | 7757 (19.2) | 5197 (21.6) | <0.001 |
| Mood disorders (%) | 55,281 (31.6) | 14,904 (36.1) | <0.001 | 14,217 (35.2) | 9466 (39.4) | <0.001 |
| Personality disorders (%) | 2925 (1.7) | 930 (2.3) | <0.001 | 830 (2.1) | 577 (2.4) | 0.004 |
| Psychotic disorders (%) | 4968 (2.8) | 657 (1.6) | <0.001 | 798 (2.0) | 461 (1.9) | 0.619 |
| Substance use disorders (%) | 4892 (2.8) | 1401 (3.4) | <0.001 | 1274 (3.2) | 861 (3.6) | 0.004 |
| Trauma-related disorders (%) | 45,130 (25.8) | 11,429 (27.7) | <0.001 | 11,089 (27.5) | 7239 (30.1) | <0.001 |
| Acupuncture Availability Index [mean (SD)] | 0.11 (0.09) | 0.16 (0.08) | <0.001 | 0.12 (0.09) | 0.14 (0.09) | <0.001 |
| Care at VA facility where acupuncture was available (%) | 164,862 (94.3) | 41,192 (99.9) | <0.001 | 39,216 (97.2) | 24,004 (99.9) | <0.001 |
| Region (%) | | | | | | |
| Continental | 31,904 (18.3) | 3685 (8.9) | <0.001 | 5013 (12.4) | 2593 (10.8) | |
| Midwest | 35,619 (20.4) | 20,945 (50.8) | 12,941 (32.1) | 9207 (38.3) | |
| North Atlantic | 40,066 (22.9) | 6576 (15.9) | 8829 (21.9) | 4886 (20.3) | |
| Pacific | 29,438 (16.8) | 3550 (8.6) | 4367 (10.8) | 2286 (9.5) | |
| Southeast | 31,843 (17.8) | 6478 (15.7) | 9209 (22.8) | 5083 (21.1) | |
| Chronic pain (%) | 55,624 (31.8) | 23,112 (56.1) | <0.001 | 18,579 (46.0) | 14,084 (58.6) | <0.001 |

*In the Overall Veteran Cohort, NRS scores were missing for 14,937 non-BFA users and for 1,407 BFA users.

**Nearest neighbor matching method by a caliper width ≤0.25 to select 2 Veterans who have not received BFA for each Veteran who have received BFA.

Continuous variables are presented as means and SDs; 2 sample t tests were used to compare the BFA and non-BFA groups. Categorical variables are presented as counts and percentages; χ2 tests were used to compare the BFA and non-BFA groups.

AIDS indicates acquired immunodeficiency syndrome; BFA, battlefield acupuncture; HIV, human immunodeficiency virus; NRS, numeric rating scale for pain; VA, Veterans Affairs.

and Veterans Pain Rating Scale on the 0–10 numerical rating scale and records it in the electronic medical record.27

We identified the presence of 31 common chronic conditions using Elixhauser comorbidity index based on ICD9/10 codes, as well as psychological and mental health diagnoses common among Veterans.28 We also included Veteran’s service connection and copay status, which is determined based on a Veteran’s disability and income level. This was categorized into 3 groups: (1) a significant enough disability that VA waives any copay requirement; (2) a waiver of a copayment due to low income; or (3) no waiver of a copayment due to either disability or income. We also used each patient’s zip code as an indicator of their residential rurality and geographic location.

Traditional Acupuncture Availability Index

Because subsequent traditional acupuncture utilization would likely be influenced by the underlying availability of acupuncture, we constructed an Acupuncture Availability Index using both VA and community acupuncture care data during the period October 1, 2016 through March 31, 2019. This index is the rate of total acupuncture visits for each VA medical center in each fiscal year divided by the number of unique patients seen in that VA medical center by fiscal year reported by the VHA Support Service Center. We used the total number of acupuncture visits—not unique individuals who received acupuncture—because overall utilization is likely a better measure of general availability. We note that most patients receive multiple acupuncture treatments. While community care claims can be directly linked to patients, the location included in the paid claim is often unreliable. For this analysis we used the location of the patient for whom the claim was linked and not the location included in claim.

Analysis

We conducted descriptive statistics including χ2 and t tests to compare patient demographic and clinical characteristics across the cohort of BFA users and non-BFA users. We used a mixed effects logistic regression model to assess the odds of traditional acupuncture utilization after adjusting for chronic and current pain severity, patient characteristics, and the underlying availability of traditional acupuncture in the fiscal year in which their index visit occurred. This model included a random effect for facility in order to account for within-facility correlation and other underlying facility variation. Subjects with missing information for an individual
TABLE 2. Adjusted Odds of Subsequent Utilization of Traditional Acupuncture (continued)

| Fixed Effects                      | Propensity Score Matched Subcohort n = 64,395 |
|------------------------------------|-----------------------------------------------|
| Non-BFA group                      | 1.0 (0.83–1.24)                               |
| BFA group                          | 1.2 (1.02–1.42)                               |
| Year of index visit                |                                               |
| 2016                               | 1.0 (0.89–1.23)                               |
| 2017                               | 1.1 (0.94–1.31)                               |
| 2018                               | 1.0 (0.82–1.33)                               |
| Sex                                |                                               |
| Female                             | 0.8 (0.67–0.84)                               |
| Male                               |                                               |
| Age category                       |                                               |
| 18–39                              | 1.2 (1.02–1.42)                               |
| 40–49                              | 1.1 (0.97–1.34)                               |
| 50–59                              | 1.2 (1.02–1.37)                               |
| 60–69                              | 1.0 (0.89–1.22)                               |
| 70–79                              | 1.1 (0.94–1.31)                               |
| 80+                                | 1.0 (0.82–1.33)                               |
| Race/ethnicity                     |                                               |
| American Indian or Alaska Native   |                                               |
| —not Hispanic or Latino            | 1.0 (0.42–2.27)                               |
| Asian—not Hispanic or Latino       | 1.2 (0.67–2.18)                               |
| Black or African American—not      |                                               |
| Hispanic or Latino                 | 1.4 (0.77–2.58)                               |
| Hispanic or Latino                 | 1.4 (0.64–2.93)                               |
| Native Hawaiian or other Pacific   |                                               |
| Islander—not Hispanic or Latino    | 1.4 (0.79–2.54)                               |
| White—not Hispanic or Latino       | 1.5 (0.82–2.74)                               |
| Unknown                            |                                               |
| Metropolitan zip code (%)          |                                               |
| No                                 | 1.2 (1.04–1.34)                               |
| Yes                                | 0.6 (0.23–1.42)                               |
| Unknown                            | 0.6 (0.30–1.05)                               |
| Married                            | 0.9 (0.80–0.95)                               |
| Unmarried                          |                                               |
| Copay due to                       |                                               |
| Copay required due to means        |                                                   |
| No copay due to disability         | 1.4 (1.21–1.70)                               |
| No copay due to means/other        | 1.3 (1.09–1.55)                               |
| Pain category                      |                                               |
| Back pain                          | 0.7 (0.57–0.97)                               |
| Limb/extremity pain, joint pain,   |                                               |
| and nonsystemic,                   |                                               |
| noninflammatory arthritic disorders|                                               |
| More than 1                        | 1.3 (1.09–1.60)                               |
| Musculoskeletal chest pain         | 0.5 (0.16–1.35)                               |
| Neck pain                          | 0.6 (0.27–1.24)                               |
| Other painful conditions           | 0.6 (0.33–1.20)                               |
| None                               | 0.8 (0.68–1.01)                               |
| Pain severity—numerical rating     |                                                   |
| scale (0–10)                       | 1.0 (1.01–1.04)                               |
| Count of Elixhauser comorbidities  | 1.0 (0.96–1.02)                               |
| Psychological comorbidities        | 0.7 (0.37–0.93)                               |
| Anxiety disorders                  | 1.0 (0.87–1.08)                               |
| Mood disorders                     | 1.0 (0.95–1.16)                               |
| Personality disorders              | 1.1 (0.86–1.45)                               |
| Psychotic disorders                | 0.8 (0.62–1.02)                               |
| Substance use disorders            | 1.0 (0.92–1.12)                               |
| Trauma-related disorders           | 0.8 (0.60–1.00)                               |
| (Continued)                        |                                               |

| Fixed Effects                      | Propensity Score Matched Subcohort n = 64,395 |
|------------------------------------|-----------------------------------------------|
| Acupuncture Availability Index     | 1.2 (0.34–4.01)                               |
| Acupuncture not available in VA    | 1.2 (0.34–4.01)                               |
| Acupuncture available in VA        | 2.4 (0.82–6.72)                               |
| Random Effects                     | Standard Deviation                             |
| VA medical center                  | 0.81                                           |
| Residual deviance                  | 17.225                                         |

AIC indicates Akaike information criteria; BFA, battlefield acupuncture; CI, confidence interval from profiled log-likelihood function; VA, Veterans Affairs.

RESULTS

We identified 41,234 patients who used BFA at least once during the period October 2016 to March 2019 in VHA without prior utilization of traditional acupuncture. A random sample of 174,741 patients from this same time period who did not receive BFA provides a general understanding of the characteristics of patients who receive BFA compared with the general population (Table 1). Notably, in the general sample of VHA users nearly one third of the non-BFA cohort had chronic pain and high pain severity scores, compared with 56% of the BFA users. Patients using BFA were more likely to be women, younger, and from the Midwest where BFA is more available compared with other regions (Table 1). Using propensity score matching a cohort of 24,037 BFA users were matched to 40,358 non-BFA users. These 5 variables were the most influential in constructing the propensity score matched cohorts.

In unadjusted analyses, 9.5% of the matched BFA user cohort (n = 24,037) subsequently utilized traditional acupuncture in the 3-month period following their first use of BFA, while 0.9% of the matched comparison cohort (n = 40,358) used traditional acupuncture after their selected index visit. These unadjusted differences corresponded to 12.3 times greater odds of traditional acupuncture among BFA users compared with the general sample of non-BFA users (mean = 2.53); however, these scores were lower than the matched cohort of BFA users (mean = 3.98).

In unadjusted analyses, 9.5% of the matched BFA user cohort (n = 24,037) subsequently utilized traditional acupuncture in the 3-month period following their first use of BFA, while 0.9% of the matched comparison cohort (n = 40,358) used traditional acupuncture after their selected index visit. These unadjusted differences corresponded to 12.3 times greater odds of traditional acupuncture among BFA users compared with the general sample of non-BFA users (mean = 2.53); however, these scores were lower than the matched cohort of BFA users (mean = 3.98).

In unadjusted analyses, 9.5% of the matched BFA user cohort (n = 24,037) subsequently utilized traditional acupuncture in the 3-month period following their first use of BFA, while 0.9% of the matched comparison cohort (n = 40,358) used traditional acupuncture after their selected index visit. These unadjusted differences corresponded to 12.3 times greater odds of traditional acupuncture among BFA users compared with the general sample of non-BFA users (mean = 2.53); however, these scores were lower than the matched cohort of BFA users (mean = 3.98).

In unadjusted analyses, 9.5% of the matched BFA user cohort (n = 24,037) subsequently utilized traditional acupuncture in the 3-month period following their first use of BFA, while 0.9% of the matched comparison cohort (n = 40,358) used traditional acupuncture after their selected index visit. These unadjusted differences corresponded to 12.3 times greater odds of traditional acupuncture among BFA users compared with the general sample of non-BFA users (mean = 2.53); however, these scores were lower than the matched cohort of BFA users (mean = 3.98).
without BFA use (n = 174,741) received subsequent traditional acupuncture. After adjusting for availability of traditional acupuncture, chronic pain, current pain severity, and other demographic and clinical characteristics, patients in the propensity score matched cohorts who received BFA had 10.9 times greater odds of going on to receive traditional acupuncture compared with patients in the comparison cohort, a slight attenuation compared to the unadjusted analysis (Table 2). Patients with chronic pain and higher current pain severity scores were more likely to have a subsequent traditional acupuncture visit. Men were less likely to use subsequent traditional acupuncture. Veterans residing in metropolitan areas were more likely to use subsequent traditional acupuncture.

In Figure 1 we highlight the variation in subsequent utilization of traditional acupuncture across VA Medical Centers. Although nearly 100% of patients who received BFA were from medical centers where traditional acupuncture was routinely available, slightly fewer patients (97.2%) of the matched non-BFA group were from medical centers in which BFA was routinely available. Figure 1 describes the frequency of traditional acupuncture among the full sample of all non-BFA users (n = 174,741), which ranged from 2.2% in 1 VA Medical Center to 0% in 12 of the included 130 VHA Medical Centers. While overall utilization of traditional acupuncture was generally low, 0.9% in the matched cohort of non-BFA users (n = 40,358), and 0.7% in the general sample of non-BFA users (n = 174,741), there was significant regional variation. In calculating the Acupuncture Availability Index, most of the traditional acupuncture utilization was received through community referrals, with 71.4% of patients receiving acupuncture only in the community and 29.6% receiving either all or some of their traditional acupuncture visits in VA clinics. In the multivariate model, the SD for the random intercept (VA Medical Center) was estimated to be 0.81, indicating that a substantial portion of the variance in subsequent use of traditional acupuncture was associated with the medical center where the patient was seen.

DISCUSSION

These findings demonstrate BFA is associated with a large increase in subsequent utilization of traditional acupuncture compared with a comparison cohort of non-BFA users, providing evidence to support the hypothesis that BFA is a gateway for patients to increase use of CIH services and other nonpharmacologic pain management options. In another study, providers reported that offering BFA to patients and the immediate response they received from it, led to engagement in discussions with many patients about considering other nonpharmacologic options for pain management. This initial evaluation of subsequent traditional acupuncture utilization supports these findings. This is important because one of the key reasons patients continue to use opioids is because patients and providers have difficulty engaging in discussions about nonpharmacologic options. This finding suggests there is likely indirect value associated with VHA’s national efforts to train providers in offering this service beyond its potential for short-term pain relief. Our findings also highlight that ease of access to traditional acupuncture was strongly correlated with its use, which is not surprising. The variability in acupuncture use across VHA medical centers and high reliance on community acupuncture providers is notable.

There were several differences in observed demographic and clinical characteristics between BFA users and Veterans who did not receive BFA. Although propensity score matching was able to bring the groups closer together, many differences remained and continued to be important predictors in multivariate analysis. One notable factor, which was a strong predictor of BFA use was history of chronic pain and pain severity. The finding that over 56% of BFA users and nearly one third of non-BFA users had chronic pain is consistent with prior studies suggesting that nearly half of all primary care visits include pain a key concern. One limitation is that the reason for BFA use was not recorded. Additionally, many patients received BFA where a pain severity score was not recorded, and these patients were not
included in the primary analysis. Another challenge is that patients who were receptive to the offer of BFA may be different from general population of patients, and because patients were not randomized to treatment residual selection or confounding may be present. In sensitivity analyses, the propensity score analysis generated similar findings to multivariate analysis of the overall populations. The finding that BFA was associated with increased use of subsequent traditional acupuncture strongly persisted in the propensity score matched cohorts after adjusting for chronic and current pain severity. The main objective of this analysis was to assess the gateway hypothesis; future studies comparing long-term pain outcomes between BFA users, who appear to also use subsequent traditional acupuncture at a high rate, may need to randomize or consider approaches that fully address selection and confounding bias when comparing with non-BFA users.

We are not able to assess traditional acupuncture use by Veterans that was paid for out-of-pocket or by other insurance, and it is possible that we did not fully exclude patients who had prior acupuncture or missed some subsequent use of acupuncture. Most Veterans in this study met VA eligibility levels that do not require any copays, which is an indicator that many patients in this sample rely on VA for their care and the use of acupuncture paid for out-of-pocket or by other insurance is likely low. Notably, Medicare, which is the most likely source of additional health care coverage for Veterans, did not cover acupuncture during the period of this study, although Medicare did begin covering acupuncture for low back pain in early 2020. This evaluation focused only on use of subsequent traditional acupuncture and we did not explore subsequent use of the more than 26 types of CIH services provided in VA or other nonpharmacologic approaches such as behavioral and psychosocial treatments. This was in part because regional variation in their use is likely and identifying availability indexes for all nonpharmacologic options would be a substantial challenge, but also because traditional acupuncture was hypothesized to be the service most likely affected by BFA. In addition, acupuncture is one of the most common forms of CIH in VHA, and a substantial evidence base for acupuncture as an effective treatment for pain is well recognized. Medicare’s 2020 coverage decision was influenced by the potential role of acupuncture in reducing reliance on opioids.

This study is one of the first to report on national BFA use in VHA, and the use of community acupuncture paid for by VHA. Although we relied on coding and documentation of BFA procedures from a variety of methods in VHA’s electronic medical record, BFA is a new service that does not have traditional CPT codes so it is possible that some BFA procedures were not captured by our approach. In addition, the changes in VHA’s community care programs and volume of community care claims in the past few may have reduced the accuracy of information in those claims. We observed errors in location of services with many claims appearing to have the claim processing center’s location rather than location where the service was performed, which we resolved by relying on the patient’s residence to assign a location for the service.

Acupuncture is only one of many nonpharmacologic pain management options that is evidence based and available to patients as an alternative to opioids. Understanding how to engage in patients in developing a comprehensive and personalized pain treatment plan that includes nonpharmacologic options is a priority of VHA and other health care systems. These findings support BFA having a role in those efforts.

REFERENCES

1. Chou R, Deyo R, Friedly J, et al. Systemic pharmacologic therapies for low back pain: a systematic review for an American College of Physicians clinical practice guideline. Ann Intern Med. 2017;166:480–492.
2. Krebs EE, Gravely A, Nugent S, et al. Effect of opioid vs nonopioid medications on pain-related function in patients with chronic back pain or hip or knee osteoarthritis pain the SPACE randomized clinical trial. J Am Med Assoc. 2018;319:872–882.
3. Chaparro LE, Furlan AD, Deshpande A, et al. Opioids compared with placebo or other treatments for chronic low back pain: an update of the cochrane review. Spine (Phila Pa 1976). 2014;39:556–563.
4. Meske DS, Lawal OD, Elder H, et al. Efficacy of opioids versus placebo in chronic pain: A systematic review and meta-analysis of enriched enrollment randomized withdrawal trials. J Pain Res. 2018;11:923–934.
5. Chou R, Deyo R, Friedly J, et al. Nonpharmacologic therapies for low back pain: a systematic review for an American College of Physicians Clinical Practice Guideline. Ann Intern Med. 2017;166:493–505.
6. Skelly AC, Chou R, Dettori JR, et al. Noninvasive nonpharmacologic treatment for chronic pain: a systematic review. AHRO Comp Eff Rev. 2018;209. 18-EHC013-EF. 10.23970/AHRQEPCCER209.
7. Kerns RD, Philip EJ, Lee AW, et al. Implementation of the veterans health administration national pain management strategy. Transl Behav Med. 2011;1:635–643.
8. Hawkins EJ, Malte CA, Hagedom HJ, et al. Survey of primary care and mental health prescribers’ perspectives on reducing opioid and benzodiazepine co-prescribing among veterans. Pain Med. 2017;18:454–467.
9. White R, Hayes C, Boyes AW, et al. General practitioners and management of chronic noncancer pain: a cross-sectional survey of influences on opioid deprescribing. J Pain Res. 2019;12:467–475.
10. Burns S, York A, Niemtzow RC, et al. Moving acupuncture to the frontline of military medical care: a feasibility study. Med Acupunct. 2013;25:48–54.
11. Moss DA, Crawford P, Ear acupuncture for acute sore throat: a randomized controlled trial. J Am Board Fam Med. 2015;28:697–705.
12. Niemtzow RC, Belard J, Nogier R. Battlefield acupuncture in the US Military: a pain-reduction model for NATO. In: Integrative Medicine Interventions for Military Personnel. North Atlantic Treaty Organization Science and Technology Organization; 2017:TR-HFM-195. Available at: https://www.sto.nato.int/Pages/default.aspx. Accessed November 24, 2019.
13. Niemtzow RC. Integrating acupuncture into military medicine: strategies and challenges. Med Acupunct. 2011;23:203–204.
21. Federman DG, Zeliadt SB, Thomas ER, et al. Battlefield acupuncture in the Veterans Health Administration: effectiveness in individual and group settings for pain and pain comorbidities. *Med Acupunct*. 2018;30:273–278.

22. Federman DG, Poulin LM, Ruser CB, et al. Implementation of shared medical appointments to offer battlefield acupuncture efficiently to veterans with pain. *Acupunct Med*. 2018;36:124–126.

23. Taylor SL, Bolton R, Huyhn A, et al. What should health care systems consider when implementing complementary and integrative health: lessons from Veterans Health Administration. *J Altern Complement Med*. 2019;25(S1):S52–S60.

24. Olmos A, Govindasamy P. Propensity scores: a practical introduction using R. *J Multidiscip Eval*. 2015;11:68–88.

25. Taylor SL, Hoggatt KJ, Kliger B. Complementary and integrated health approaches: what do Veterans use and want. *J Gen Intern Med*. 2019;34:1192–1199.

26. Goulet JL, Kerns RD, Bair M, et al. The musculoskeletal diagnosis cohort: examining pain and pain care among veterans. *Pain*. 2016;157:1696–1703.

27. Buckenmaier CC, Galloway KT, Polomano RC, et al. Preliminary validation of the Defense and Veterans Pain Rating Scale (DVPRS) in a military population. *Pain Med*. 2013;14:110–123.

28. Trivedi RB, Post EP, Sun H, et al. Prevalence, comorbidity, and prognosis of mental health among US veterans. *Am J Public Health*. 2015;105:2564–2569.

29. Elliott AM, Smith BH, Penny KI, et al. The epidemiology of chronic pain in the community. *Lancet*. 1999;354:1248–1252.

30. Kerns RD, Otis J, Rosenberg R, et al. Veterans’ reports of pain and associations with ratings of health, health-risk behaviors, affective distress, and use of the healthcare system. *J Rehabil Res Dev*. 2003;40:371–379.

31. Vickers AJ, Cronin AM, Maschino AC, et al. Acupuncture for chronic pain: Individual patient data meta-analysis. *Arch Intern Med*. 2012;172:1444–1453.

32. Fan AY, Miller DW, Bolash B, et al. Acupuncture’s role in solving the opioid epidemic: evidence, cost-effectiveness, and care availability for acupuncture as a primary, non-pharmacologic method for pain relief and management-white paper 2017. *J Integr Med*. 2017;15:411–425.

33. CMS.gov. CMS finalizes decision to cover Acupuncture for Chronic Low Back Pain for Medicare beneficiaries, 2020. Available at: https://www.cms.gov/newsroom/press-releases/cms-finalizes-decision-cover-acupuncture-chronic-low-back-pain-medicare-beneficiaries. Accessed July 1, 2020.