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

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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 non-pharmacologic 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 who used VA care but not BFA during the same period resulting in a population of 24,037 BFA users and a comparison cohort of 40,358 non-BFA users. Patients with prior use of traditional acupuncture were excluded.

Results: Among Veterans receiving BFA, 9.5% subsequently used traditional acupuncture compared with 0.9% of non-BFA users ($P < 0.001$). In adjusted analysis, accounting for patient characteristics and regional availability of traditional acupuncture, patients who used BFA had 10.9 times greater odds (95% confidence interval, 8.67–12.24) of subsequent traditional acupuncture use.

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

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There are now widely recognized limitations in the efficacy of opioids for chronic pain management,[1–4] and non-pharmacologic approaches have begun to be recommended as first-line treatments.[5–7] Many barriers remain to providing nonpharmacologic interventions, including patients wanting an immediate solution,[8] with many patients skeptical about nonpharmacologic alternatives and preferring to remain on opioids.[9] 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.[10–13]

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.[14] 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.[12,15–17] 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
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 (%)			< 0.001			< 0.001
18–39	23,624 (13.5)	5508 (13.4)		5842 (14.5)	3247 (13.5)	
40–49	17,802 (10.2)	5630 (13.7)		4499 (11.1)	3419 (14.2)	
50–59	27,689 (15.8)	8326 (20.2)		7039 (17.4)	5023 (20.9)	
60–69	46,647 (26.7)	11,086 (26.9)		11,010 (27.3)	6428 (26.7)	
70–79	41,418 (23.7)	7895 (19.1)		8896 (22.0)	4551 (18.9)	
80+	17,561 (10.0)	2789 (6.8)		3072 (7.6)	1369 (5.7)	
Race/ethnicity (%)			< 0.001			< 0.001
American Indian or Alaska Native—not Hispanic or Latino	1150 (0.7)	262 (0.6)		262 (0.6)	158 (0.7)	
Asian—not Hispanic or Latino	1673 (1.0)	188 (0.5)		237 (0.6)	130 (0.5)	
Black or African American—not Hispanic or Latino	32,369 (18.5)	8338 (20.2)		7007 (17.4)	4620 (19.2)	
Hispanic or Latino	12,675 (7.3)	2540 (6.2)		2587 (6.4)	1559 (6.5)	
Multirace	74 (0.0)	16 (0.0)		18 (0.0)	11 (0.0)	
Native Hawaiian or other Pacific Islander—not Hispanic or Latino	1307 (0.7)	269 (0.7)		309 (0.8)	172 (0.7)	
White—not Hispanic or Latino	112,789 (64.5)	27,219 (66.0)		27,139 (67.2)	15,831 (65.9)	
Unknown	12,704 (7.3)	2402 (5.8)		2799 (6.9)	1556 (6.5)	
Metropolitan zip code (%)			< 0.001			0.003
No	37,148 (21.3)	7748 (18.8)		8836 (21.9)	5112 (21.3)	
Yes	134,668 (77.1)	33,366 (80.9)		31,306 (77.6)	18,834 (78.4)	
Unknown	2925 (1.7)	120 (0.3)		216 (0.5)	91 (0.4)	
Marital status (%)			0.010			0.057
Married	92,544 (53.0)	21,826 (52.9)		21,103 (52.3)	12,765 (53.1)	
Unknown	1568 (0.9)	307 (0.7)		330 (0.8)	171 (0.7)	
Unmarried	80,629 (46.1)	19,101 (46.3)		18,925 (46.9)	11,101 (46.2)	
Copay due to (%)			< 0.001			< 0.001
Copay required due to means	26,138 (15.0)	5112 (12.4)		4855 (12.0)	2319 (9.6)	
No copay due to disability	86,044 (49.2)	22,300 (54.1)		21,320 (52.8)	13,679 (56.9)	
No copay due to means/other	61,598 (35.3)	13,817 (33.5)		14,149 (35.1)	8034 (33.4)	
Unassigned	961 (0.5)	5 (0.0)		34 (0.1)	5 (0.0)	
Pain category (%)			< 0.001			< 0.001
More than 1	33,880 (19.4)	18,493 (44.8)		12,918 (32.0)	10,726 (44.6)	
Back pain	6661 (3.8)	2111 (5.1)		2122 (5.3)	1473 (6.1)	
Fibromyalgia	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 nonsystemic, noninflammatory arthritic disorders	12,168 (7.0)	1829 (4.4)		2866 (7.1)	1436 (6.0)	
Musculoskeletal chest pain	1220 (0.7)	116 (0.3)		155 (0.4)	74 (0.3)	
Neck pain	749 (0.4)	209 (0.5)		200 (0.5)	147 (0.6)	
Orofacial, ear, and temporomandibular disorder pain	119 (0.1)	22 (0.1)		32 (0.1)	18 (0.1)	
Other painful conditions	637 (0.4)	282 (0.7)		229 (0.6)	171 (0.7)	
None	119,117 (68.2)	18,122 (43.9)		21,780 (54.0)	9953 (41.4)	
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
Cardiac arrhythmias (%)	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
Congestive heart failure (%)	9241 (5.3)	2024 (4.9)	0.002	2299 (5.7)	1258 (5.2)	0.014
Chronic pulmonary disease (%)	24,806 (14.2)	6629 (16.1)	< 0.001	6587 (16.3)	3967 (16.5)	0.553
Coagulation deficiency (%)	2304 (1.3)	575 (1.4)	0.236	582 (1.4)	366 (1.5)	0.431
Depression (%)	50,376 (28.8)	13,879 (33.7)	< 0.001	13,000 (32.2)	8808 (36.6)	< 0.001
Diabetes without chronic complications (%)	40,132 (23.0)	9570 (23.2)	0.296	9781 (24.2)	5659 (23.5)	0.047

(Continued)

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 (%)			<0.001			<0.001
Continental	31,904 (18.3)	3685 (8.9)		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)	4868 (20.3)	
Pacific	29,438 (16.8)	3550 (8.6)		4367 (10.8)	2286 (9.5)	
Southeast	37,714 (21.6)	6478 (15.7)		9208 (22.8)	5083 (21.1)	
Chronic pain (%)	55,624 (31.8)	23,112 (56.1)	<0.001	18,578 (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; χ^2 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 χ^2 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

Fixed Effects	Propensity Score Matched Subcohort n = 64,395	
	Odds Ratio (95% CI)	P
Non-BFA group	—	—
BFA group	10.9 (9.67–12.24)	< 0.001
Year of index visit		
2016	—	—
2017	1.2 (0.98–1.42)	0.090
2018	1.2 (0.96–1.41)	0.127
2019	1.2 (0.99–1.53)	0.060
Sex		
Female	—	—
Male	0.8 (0.67–0.84)	< 0.001
Age category		
18–39	—	—
40–49	1.1 (0.97–1.34)	0.106
50–59	1.2 (1.02–1.37)	0.031
60–69	1.0 (0.89–1.22)	0.593
70–79	1.1 (0.94–1.31)	0.235
80+	1.0 (0.82–1.33)	0.702
Race/ethnicity		
American Indian or Alaska Native —not Hispanic or Latino	—	—
Asian—not Hispanic or Latino	1.0 (0.42–2.27)	0.954
Black or African American—not Hispanic or Latino	1.2 (0.67–2.18)	0.530
Hispanic or Latino	1.4 (0.77–2.58)	0.272
Native Hawaiian or other Pacific Islander—not Hispanic or Latino	1.4 (0.64–2.93)	0.426
White—not Hispanic or Latino	1.4 (0.79–2.54)	0.236
Unknown	1.5 (0.82–2.74)	0.187
Metropolitan zip code (%)		
No	—	—
Yes	1.2 (1.04–1.34)	0.013
Unknown	0.6 (0.23–1.42)	0.228
Marital status		
Married	—	—
Unknown	0.6 (0.30–1.05)	0.070
Unmarried	0.9 (0.80–0.95)	0.003
Copay due to		
Copay required due to means	—	—
No copay due to disability	1.4 (1.21–1.70)	< 0.001
No copay due to means/other	1.3 (1.09–1.55)	0.003
Pain category		
Back pain	—	—
Limb/extremity pain, joint pain and nonsystemic, noninflammatory arthritic disorders	0.7 (0.57–0.97)	0.029
More than 1	1.3 (1.09–1.60)	0.005
Musculoskeletal chest pain	0.5 (0.16–1.35)	0.159
Neck pain	0.6 (0.27–1.24)	0.159
Other painful conditions	0.6 (0.33–1.20)	0.158
None	0.8 (0.68–1.01)	0.063
Pain severity—numerical rating scale (0–10)	1.0 (1.01–1.04)	< 0.001
Count of Elixhauser comorbidities	1.0 (0.96–1.02)	0.328
Psychological comorbidities		
Anxiety disorders	1.0 (0.87–1.08)	0.593
Mood disorders	1.0 (0.95–1.16)	0.377
Personality disorders	1.1 (0.86–1.45)	0.395
Psychotic disorders	0.7 (0.47–0.93)	0.018
Substance use disorders	0.8 (0.62–1.02)	0.066
Trauma-related disorders	1.0 (0.92–1.12)	0.806

(Continued)

TABLE 2. Adjusted Odds of Subsequent Utilization of Traditional Acupuncture (*continued*)

Fixed Effects	Propensity Score Matched Subcohort n = 64,395	
	Odds Ratio (95% CI)	P
Acupuncture Availability Index	1.2 (0.34–4.01)	0.802
Acupuncture not available in VA	—	—
Acupuncture available in VA	2.4 (0.82–6.72)	0.111
Random Effects	**Standard Deviation**	
VA medical center	0.81	
AIC	17,315	
Residual deviance	17,225	

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

demographic characteristic were included in the analysis, although groups with fewer than 100 individuals are not reported due to limited precision. All statistical analyses were performed in R (https://www.R-project.org/).

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.

Patients in the matched cohorts were more similar to each other across demographic and clinical characteristics, however residual differences remained (Table 1). Patients in the non-BFA group in the matched cohorts had higher pain severity scores (mean = 3.3) 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 in a simple random effects model that only included a facility random effect. We note that in the full sample of BFA users before matching, these patterns of subsequent use of traditional acupuncture were nearly identical with 9.9% of all BFA users overall (n = 41,234) receiving subsequent traditional acupuncture care, and 0.7% of the general sample of all Veterans
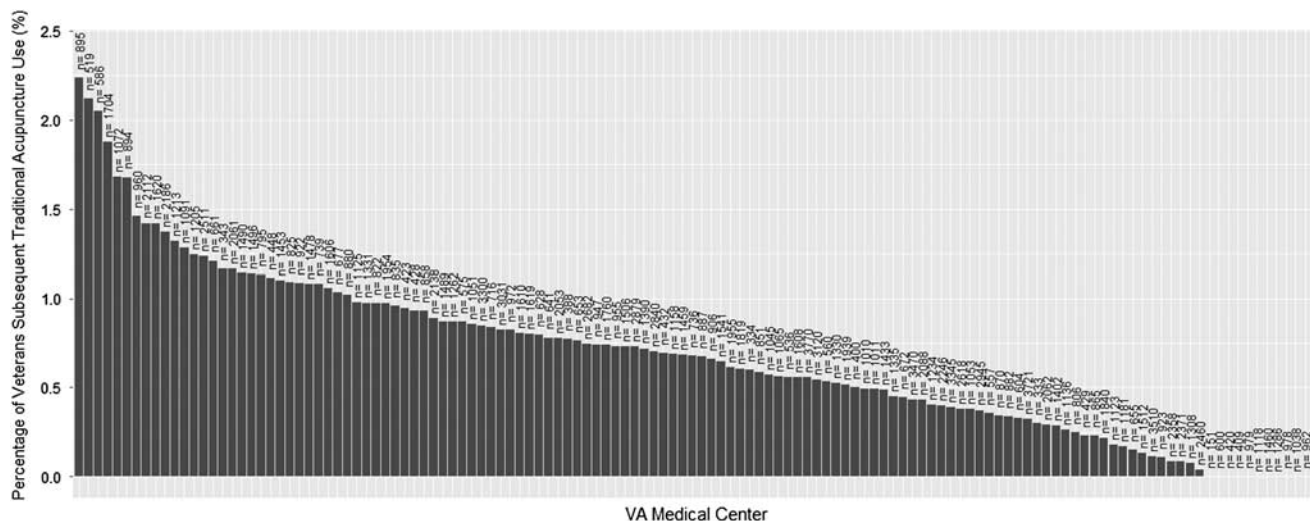
FIGURE 1. Frequency of traditional acupuncture use in 130 Veterans Health Administration Medical Centers among patients who did not use battlefield acupuncture. VA indicates Veterans Affairs.

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.[18] 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.[9] 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.[17,18] 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.[29,30] 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,[25] and a substantial evidence base for acupuncture as an effective treatment for pain is well recognized.[31] Medicare's 2020 coverage decision was influenced by the potential role of acupuncture in reducing reliance on opioids.[32,33]

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.

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