

# Integrating Massage Therapy Into the Health Care of Female Veterans

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**Background:** Female veterans experience higher rates of chronic pain, depression, and anxiety than do male veterans. Gynecologic examinations and procedures can be stressful, painful, and anxiety provoking. Research has shown that massage can help reduce pain and anxiety. The purpose of this study was to examine the relationship between massage and well-being in female veterans.

**Methods:** A pre- and postvisit study design was used. In advance of their clinic visit, female veterans were asked by clinic staff whether they would like a relaxation massage in conjunction with their visit. Effleurage massages were administered by licensed volunteer massage therapists in a private space and performed on the back, neck, hands/arms, legs/feet. Patients rated their pain intensity, pain unpleasantness, anxiety, shortness of breath, relaxation, and inner peace pre- and postmassage on 0 to 10 scales. Demographics and data were abstracted from the medical records.

**Results:** Results are based on the first massage received by 96 individuals: A majority of participants were aged  $\leq 40$  years (53%) and were White women (68%). Most (70%) were scheduled for an invasive procedure (eg, pelvic examination, biopsy). Seventy-nine percent had a history of chronic pain; 65% had a diagnosis of depression. Mean scores for pain intensity decreased by 1.9 points, pain unpleasantness by 2.0, and anxiety by 2.4. Relaxation increased by 4.3 points and sense of inner peace by 3.5 points. These changes were all statistically significant ( $P < .001$ ).

**Conclusions:** Results from this pilot study suggest massage therapy may be an effective, inexpensive, and safe treatment for pain and/or anxiety in female veterans attending a gynecology appointment. Further research should assess the effects of massage therapy in female veterans with chronic pain and coexistent mental health conditions.

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There are approximately 2 million female veterans in the United States, representing about 10% of the veteran population.<sup>1</sup> In 2015, 456,000 female veterans used the US Department of Veterans Affairs (VA) health care services. The VA predicts an increase in utilization over the next 20 years.<sup>2</sup>

Female veterans are more likely to have musculoskeletal disorder multimorbidity compared with male veterans and have higher rates of depressive and bipolar disorders, anxiety, and posttraumatic stress disorder (PTSD).<sup>3,4</sup> Compared with male veterans, female veterans are younger, more likely to be unmarried and to have served during the wars in Iraq and Afghanistan.<sup>3</sup> Fifty-five percent of women veterans vs 41% of men veterans have a service-connected disability, and a greater percentage of women veterans have a service connection rating  $> 50\%$ .<sup>5</sup> The top service-connected disabilities for women veterans are PTSD, major depressive disorder, migraines, and lumbosacral or cervical strain.<sup>2</sup> In addition, one-third of women veterans using VA health care report experiencing military sexual trauma (MST).<sup>6</sup> Military service may impact the health of female veterans both physically and mentally. Providing treatments and programs to improve their

health and their health care experience are current VA priorities.

The VA is changing the way health care is conceptualized and delivered by implementing a holistic model of care known as Whole Health, which seeks to empower and equip patients to take charge of their health, blending conventional medicine with self-care and complementary and integrative health (CIH) approaches, such as massage therapy, yoga, acupuncture, and meditation.<sup>7</sup> CIH therapies can help improve physical and mental health with little to no adverse effects.<sup>8-10</sup>

As part of the Whole Health initiative at the VA Ann Arbor Healthcare System (VAAHS) in Michigan, the massage program was expanded in 2017 to offer relaxation massages to female veterans attending the women's health clinic, which provides gynecologic care. Patients visiting a gynecology clinic often experience anxiety and pain related to invasive procedures and examinations. This is especially true for female veterans who experienced MST.<sup>11</sup>

VAAHS has 1 staff massage therapist (MT). To expand the program to the women's health clinic, volunteer licensed MTs were recruited and trained in specific procedures by the staff MT.

Several studies have demonstrated the effect of therapeutic massage on pain and anxiety in predominantly male veteran study populations, including veterans needing postsurgical and palliative care as well as those experiencing chronic pain and knee osteoarthritis.<sup>12-16</sup> Little is known about the effects of massage therapy on female veterans. The purpose of this pilot study was to examine the effects of massage therapy among female veterans participating in the women's health massage program.

## METHODS

The setting for this pre-post intervention study was VAAHS. Veterans were called in advance by clinic staff and scheduled for 60-minute appointments either before or after their clinic appointment, depending on availability. MTs were instructed to provide relaxation massage using Swedish massage techniques with moderate pressure, avoiding deep pressure techniques. Swedish massage was selected to compare with previous veteran studies and because these techniques were approved for delivery by volunteer MTs. Massages were given in a private space on a massage table and were limited to the back, neck, head/face, and extremities.

The volunteer MTs gave the participants a survey to provide comments and to rate baseline pain and other symptoms prior to and following the massage. The MT left the room to provide privacy while completing the survey. The staff included the symptom data in the message note as clinical outcomes and entered them into the electronic health record. Massages were given from October 1, 2017 to June 30, 2018. Data including symptom scores, demographics, the presence of chronic pain, mental health diagnoses, patient comments, and opioid use were abstracted from the electronic health record by 2 members of the study team and entered into an Excel database. This study was approved by the VAAHS Institutional Review Board.

### Study Measures

Pain intensity, pain unpleasantness (the affective component of pain), anxiety, shortness of breath, relaxation, and inner peace

**TABLE 1** Patient Demographics (N = 96)

Variables	Results, No. (%)
Age, y	
21-40	51 (53)
> 40	45 (47)
Race	
White	65 (68)
African American	19 (20)
Married	32 (33)
Previous massage	77 (80)
Opiate use	
Current	7 (7)
Previously	3 (3)
Chronic pain	76 (79)
Migraine diagnosis	29 (30)
Mental health diagnoses	78 (81)
Posttraumatic stress disorder	30 (31)
Depression	62 (65)
Anxiety	42 (44)
Timing of massage	
Before appointment	79 (82)
After appointment	3 (3)
Unknown	6 (6)
No women's health appointment	8 (8)
Invasive procedure performed during visit <sup>a</sup>	67 (70)

<sup>a</sup>Procedures include pelvic examination, removal, or insertion of intrauterine device, removal or insertion of implant, incision and drainage, biopsy, and colposcopy.

were rated pre- and postmassage on a 0 to 10 scale. Shortness of breath was included due to the relationship between breathing and anxiety. Inner peace was assessed to measure the calming effects of massage therapy. Beck and colleagues found the concept of inner peace was an important outcome of massage therapy.<sup>17</sup> The scale anchors for pain intensity were "no pain" and "severe pain"; and "not at all unpleasant" and "as unpleasant as it can be" for pain unpleasantness. For anxiety, the anchors were "no anxiety" and "as anxious as I can be." Anchors for relaxation and inner peace were reversed so that a 0 indicated low relaxation and inner peace while a 10 indicated the highest state of relaxation and inner peace.

Chronic pain was defined as pain existing for > 3 months. A history of chronic pain was determined from a review and

**TABLE 2** Short-Term Change in Symptom Scores in All Patients After Massage

Symptoms	No.	Mean (SD) <sup>a</sup>	95% CI	Median <sup>b</sup>	IQR <sup>c</sup>
Pain intensity	95	1.9 (1.8)	1.7 - 2.1	1	3
Pain unpleasantness	95	2.0 (1.8)	1.6 - 2.4	2	2
Anxiety	95	2.4 (2.2)	2.0 - 2.9	2	2
Shortness of breath	95	0.7 (1.8)	0.3 - 1.1	0	0
Relaxation	95	4.3 (2.2)	3.8 - 4.7	4	3
Inner peace	93	3.5 (2.4)	3.0 - 3.9	3	3

Abbreviation: IQR, interquartile range.

<sup>a</sup>All changes are calculated so that large positive values correspond to large improvement in symptom.

<sup>b</sup>For every symptom, a 1-sided sign test for median change scores being > 0 gave a  $P < .001$ ;  $P < .01$  corresponds to evidence for a significant short-term improvement, adjusting for multiple comparisons.

<sup>c</sup>Calculated as 75th percentile minus 25th percentile.

synthesis of primary care and specialty care recorded diagnoses, patient concerns, and service-connected disabilities. The diagnoses included lumbosacral or cervical strain, chronic low back, joint (knee, shoulder, hip, ankle), neck, or pelvic pain, fibromyalgia, headache, migraine, osteoarthritis, and myofascial pain syndrome. The presence of mental health conditions, including depression, anxiety, bipolar disorders, and PTSD, were similarly determined by a review of mental health clinical notes. Sex was determined from the gynecology note.

**Statistical Analysis**

Means and medians were calculated for short-term changes in symptom scores. Due to skewness in the short-term changes, significance was tested using a nonparametric sign test. Significance was adjusted using the Bonferroni correction to protect the overall type I error level at 5% from multiple testing. We also assessed for differences in symptom changes in 4 subgroups, using an unadjusted general linear model: those with (1) chronic pain vs without; (2) an anxiety diagnosis vs without; (3) depression vs without; and (4) a PTSD diagnosis vs without. Data were analyzed using SPSS 25 and SAS 9.4.

**RESULTS**

Results are based on the first massage received by 96 unique individuals (Table 1). Fifty-one (53%) patients were aged 21 to 40 years, and 45 (47%) were aged

≥ 41 years. Most participants (80%) had had a previous massage. Seven (7%) participants were currently on prescription opioids; 76 (79%) participants had a history of one or more chronic pain diagnoses (eg, back pain, migraine headaches, fibromyalgia) and 78 (81%) had a history of a mental health diagnosis (eg, depression, anxiety, PTSD). Massage sessions ranged from 30 to 60 minutes; most patients received massage therapy for 50 minutes.

Prior to massage, mean scores were 3.9 pain intensity, 3.7 pain unpleasantness, 3.8 anxiety, 1.0 shortness of breath, 4.0 relaxation, and 4.2 inner peace. Short-term changes in symptom scores are shown in Table 2. The mean score for pain intensity decreased by 1.9 points, pain unpleasantness by 2.0 points, anxiety by 2.4 points. The greatest change occurred for relaxation, which increased by 4.3 points. All changes in symptoms were statistically significant ( $P < .001$ ). For subgroup comparisons, there were no significant differences in symptom scores for patients with a diagnosis of anxiety vs without and depression vs without (Table 3). However, anxiety in patients diagnosed with PTSD decreased by 3.3 points compared with 2.0 in patients without PTSD ( $P = .005$ ). For patients with chronic pain, inner peace increased 3.9 points compared with an increase of 2.0 in patients without chronic pain ( $P = .002$ ).

Verbal feedback and written comments about the massage experience were all favorable: No adverse events were reported.

## DISCUSSION

Massage therapy may be a useful treatment for female veterans experiencing chronic pain, anxiety disorders, depression, or situational anxiety related to gynecologic procedures. After receiving a relaxation massage, female veterans reported decreased pain intensity, pain unpleasantness, and anxiety while reporting increased relaxation and feelings of inner peace. The effects of massage were consistent for all the symptoms or characteristics assessed, suggesting that massage may act on the body in multiple ways.

These changes parallel those seen in a palliative care population primarily composed of male veterans.<sup>14</sup> However, the female veterans in this cohort experienced greater changes in relaxation and feelings of inner peace, which may be partly due to relief of tension related to an upcoming stressful appointment. The large mean decrease in anxiety level among female veterans with PTSD is notable as well as the larger increase in inner peace in those with chronic pain.

Many patients expressed their gratitude for the massage and interest in having access to more massage therapy. Female patients who have experienced sexual trauma or other trauma may especially benefit from massage prior to painful, invasive gynecologic procedures. Anecdotally, 2 nurse chaperones in the clinic mentioned separately to the massage program supervisor that the massages helped some very anxious women better tolerate an invasive procedure that would have been otherwise extremely difficult.

Female veterans are more likely to have musculoskeletal issues after deployment and have higher rates of anxiety, PTSD, and depression compared with those of male veterans.<sup>3,4,18,19</sup> Determining relationships between and causes of chronic pain, depression, and PTSD is very challenging but the increased prevalence of chronic pain and comorbid mental health conditions in female veterans may be partially related to MST or other trauma experiences.<sup>20-22</sup> Female veterans are most likely to have more than one source of chronic pain.<sup>23-25</sup> Female patients with chronic musculoskeletal pain report more pain-related disability.<sup>26</sup> Furthermore, greater disability in the context of depression is reported by women with

pain compared with those of men.<sup>27</sup> Most (78%) female veterans in a primary care population reported chronic pain.<sup>23</sup> Similarly, 79% of the female veterans in this study population had chronic pain and 81% had a history of mental health disorders, including depression, anxiety, and PTSD.

Studies have shown that massage therapy improves pain in populations experiencing chronic low back, neck, and knee pain.<sup>28-32</sup> A 2020 Agency for Healthcare Research and Quality review determined there is some evidence that massage therapy is helpful for chronic low back and neck pain and fibromyalgia.<sup>33</sup> Research also has demonstrated that massage reduces anxiety and depression in several different population types.<sup>13,34,35</sup> Li and colleagues showed that foot massage increased oxytocin levels in healthy males.<sup>36</sup> Although further research is needed to determine the mechanisms of massage therapy, there are important physiologic effects. Unlike most medications, massage therapy is unique in that it can impact health and well-being through multiple mechanisms; for example, by reducing pain, improving mood, providing a sense of social connection and/or improving mobility.

Patients using CIH therapies report greater awareness of the need for ongoing engagement in their own care and health behavior changes.<sup>37,38</sup> MTs provide health education and can refer patients to educational resources or programs. While talking to the MT, patients often feel comfortable discussing their exercise or eating habits. Therefore, access to massage therapy may serve as a doorway to other therapies and educational opportunities offered within the Whole Health program or other integrative health care programs, including health coaching, health education and wellness classes, and other CIH therapies. Exploring how massage can lead to self-care and health behavior changes is an opportunity for further research.

Driscoll and colleagues reported that women veterans are interested in conservative treatment for their chronic musculoskeletal pain and are open to using CIH therapies.<sup>39</sup> Research suggests that veterans are interested in and, in some cases, already using massage therapy.<sup>23,40-43</sup> Access to massage therapy and other CIH therapies offers

**TABLE 3** Mean Short-Term Changes in Symptom Scores<sup>a</sup>

	Pain Intensity		Pain Unpleasantness		Anxiety		Shortness of Breath		Relaxation		Inner Peace	
	No.	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)	No.	Mean (SD)
<b>Chronic pain</b>												
Yes	75	1.8 (1.7)	75	2.0 (1.8)	75	2.3 (2.2)	75	0.7 (1.9)	75	4.3 (2.3)	73 <sup>b</sup>	3.9 (2.0)
No	20	2.1 (2.1)	20	1.9 (2.1)	20	2.8 (2.0)	20	0.6 (1.8)	20	4.3 (1.7)	20	2.0 (3.2)
<b>Anxiety</b>												
Yes	43	1.9 (1.6)	43	2.1 (1.7)	43	2.6 (1.9)	43	0.5 (1.6)	43	4.4 (2.1)	43	3.4 (2.8)
No	52	1.9 (2.0)	52	2.0 (2.0)	52	2.3 (2.4)	52	0.9 (2.0)	52	4.2 (2.4)	50	3.5 (2.1)
<b>Posttraumatic stress disorder</b>												
Yes	29	1.6 (1.9)	29	1.7 (1.7)	29 <sup>b</sup>	3.3 (2.2)	29 <sup>b</sup>	1.2 (2.3)	29	4.9 (2.3)	29	3.2 (3.1)
No	66	2.0 (1.8)	66	2.2 (1.9)	66	2.0 (2.1)	66	0.4 (1.6)	66	4.0 (2.1)	64	3.6 (2.1)
<b>Depression</b>												
Yes	62	1.8 (1.8)	62	2.0 (1.9)	62	2.6 (2.0)	62	0.6 (1.8)	62	4.1 (2.1)	62	3.3 (2.6)
No	33	1.9 (1.8)	33	2.0 (1.7)	33	2.1 (2.5)	33	0.8 (1.9)	33	4.6 (2.4)	31	3.7 (2.1)

<sup>a</sup>Score changes reported as absolute values.

<sup>b</sup>Adjusting for multiple comparisons, there were significant differences between groups for changes in anxiety ( $P = .005$ ) and shortness of breath ( $P = .05$ ) in those with and without posttraumatic stress disorder. There was a significant difference in the change of inner peace ( $P = .002$ ) for women with chronic pain compared with those without chronic pain.

patients choice and control over the types and timing of therapy they receive, exemplified by the 80% of patients in our study who previously received a massage and sought another before a potentially stressful situation.

Access to massage therapy or other CIH therapies may reduce the need for more expensive procedures. Although research on the cost-effectiveness of massage therapy is limited, Herman and colleagues did an economic evaluation of CIH therapies in a veteran population, finding that CIH users had lower annual health care costs and lower pain in the year after CIH started. Sensitivity analyses indicated similar results for acupuncture, chiropractic care, and massage but higher costs for those with 8 or more visits.<sup>44</sup>

The prevalence of comorbid mental health conditions with MSD suggests that female veterans may benefit from multidisciplinary treatment of pain and depression.<sup>3,26</sup> Women-centered programs would be both encouraging and validating to women.<sup>39</sup> Massage therapy can be combined with physical therapy, yoga, tai chi, and meditation programs to improve pain, anxiety, strength, and flexibility and can be incorporated into a multimodal treatment plan. Likewise, other subpopulations of female veterans with chronic pain, mental

health conditions, or cancer could be targeted with multidisciplinary programs that include massage therapy.

**Limitations**

This study has several limitations including lack of a control group, a self-selected population, the lack of objective biochemical measurements, and possible respondent bias to please the MTs. Eighty percent had previously experienced massage therapy and may have been biased toward the effects of massage before receiving the intervention. The first report of the effects of massage therapy in an exclusively female veteran population is a major strength of this study.

Further research including randomized controlled trials is needed, especially in populations with coexisting chronic pain and mental health disorders, as is exploring the acceptability of massage therapy for female veterans with MST. Finding viable alternatives to medications has become even more important as the nation addresses the challenge of the opioid crisis.<sup>45,46</sup>

**CONCLUSIONS**

Female veterans are increasingly seeking VA health care. Although further research is needed, results from this pilot study

suggest massage therapy may be an effective, inexpensive, and safe treatment for pain and/or anxiety in female veterans. Massage may be especially beneficial for female veterans who experience both chronic pain and mental health conditions. Providing female veterans with access to massage therapy may encourage better self-care and utilization of other Whole Health services, leading to overall improved health and well-being. VA Whole Health programs should consider targeting female veterans for massage therapy services.

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### Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of *Federal Practitioner*, Frontline Medical Communications Inc., the US Government, or any of its agencies.

### Ethics and consent

This study was approved by the Veterans Affairs Ann Arbor Healthcare System Institutional Review Board.

### References

1. US Department of Veteran Affairs, National Center for Veterans Analysis and Statistics. Veteran population. Updated April 14, 2021. Accessed January 6, 2022. [https://www.va.gov/vetdata/veteran\\_population.asp](https://www.va.gov/vetdata/veteran_population.asp)
2. US Department of Veteran Affairs. Women veterans report: the past, present, and future of women veterans. Published February 2017. Accessed January 6, 2022. [https://www.va.gov/vetdata/docs/specialreports/women\\_veterans\\_2015\\_final.pdf](https://www.va.gov/vetdata/docs/specialreports/women_veterans_2015_final.pdf)
3. Higgins DM, Fenton BT, Driscoll MA, et al. Gender differences in demographic and clinical correlates among veterans with musculoskeletal disorders. *Womens Health Issues*. 2017;27(4):463-470. doi:10.1016/j.whi.2017.01.008
4. Lehavot K, Goldberg SB, Chen JA, et al. Do trauma type, stressful life events, and social support explain women veterans' high prevalence of PTSD?. *Soc Psychiatry Psychiatr Epidemiol*. 2018;53(9):943-953. doi:10.1007/s00127-018-1550-x
5. Levander XA, Overland MK. Care of women veterans. *Med Clin North Am*. 2015;99(3):651-662. doi:10.1016/j.mcna.2015.01.013
6. US Department of Veteran Affairs. Facts and statistics about women veterans. Updated May 28, 2020. Accessed January 6, 2022. <https://www.womenshealth.va.gov/womenshealth/latestinformation/facts.asp>
7. Krejci LP, Carter K, Gaudet T. Whole health: the vision and implementation of personalized, proactive, patient-driven health care for veterans. *Med Care*. 2014;52(12)(suppl 5):S5-S8. doi:10.1097/MLR.0000000000000226

8. Elwy AR, Taylor SL, Zhao S, et al. Participating in complementary and integrative health approaches is associated with veterans' patient-reported outcomes over time. *Med Care*. 2020;58:S125-S132. doi:10.1097/MLR.0000000000001357
9. Smeeding SJ, Bradshaw DH, Kumpfer K, Trevithick S, Stoddard GJ. Outcome evaluation of the Veterans Affairs Salt Lake City Integrative Health Clinic for chronic pain and stress-related depression, anxiety, and post-traumatic stress disorder. *J Altern Complement Med*. 2010;16(8):823-835. doi:10.1089/acm.2009.0510
10. Hull A, Brooks Holliday S, Eickhoff C, et al. Veteran participation in the integrative health and wellness program: impact on self-reported mental and physical health outcomes. *Psychol Serv*. 2019;16(3):475-483. doi:10.1037/ser0000192
11. Zephyrin LC. Reproductive health management for the care of women veterans [published correction appears in *Obstet Gynecol*. 2016 Mar;127(3):605]. *Obstet Gynecol*. 2016;127(2):383-392. doi:10.1097/AOG.0000000000001252
12. Piotrowski MM, Paterson C, Mitchinson A, Kim HM, Kirsh M, Hinshaw DB. Massage as adjuvant therapy in the management of acute postoperative pain: a preliminary study in men. *J Am Coll Surg*. 2003;197(6):1037-1046. doi:10.1016/j.jamcollsurg.2003.07.020
13. Mitchinson AR, Kim HM, Rosenberg JM, et al. Acute postoperative pain management using massage as an adjuvant therapy: a randomized trial. *Arch Surg*. 2007;142(12):1158-1167. doi:10.1001/archsurg.142.12.1158
14. Mitchinson A, Fletcher CE, Kim HM, Montagnini M, Hinshaw DB. Integrating massage therapy within the palliative care of veterans with advanced illnesses: an outcome study. *Am J Hosp Palliat Care*. 2014;31(1):6-12. doi:10.1177/1049909113476568
15. Fletcher CE, Mitchinson AR, Trumble EL, Hinshaw DB, Dusek JA. Perceptions of other integrative health therapies by veterans with pain who are receiving massage. *J Rehabil Res Dev*. 2016;53(1):117-126. doi:10.1682/JRRD.2015.01.0015
16. Juberg M, Jerger KK, Allen KD, Dmitrieva NO, Keever T, Perlman AI. Pilot study of massage in veterans with knee osteoarthritis. *J Altern Complement Med*. 2015;21(6):333-338. doi:10.1089/acm.2014.0254
17. Beck I, Runeson I, Blomqvist K. To find inner peace: soft massage as an established and integrated part of palliative care. *Int J Palliat Nurse*. 2009;15(11):541-545. doi:10.12968/ijpn.2009.15.11.45493
18. Haskell SG, Ning Y, Krebs E, et al. Prevalence of painful musculoskeletal conditions in female and male veterans in 7 years after return from deployment in Operation Enduring Freedom/Operation Iraqi Freedom. *Clin J Pain*. 2012;28(2):163-167. doi:10.1097/AJP.0b013e318223d951
19. Maguen S, Ren L, Bosch JO, Marmar CR, Seal KH. Gender differences in mental health diagnoses among Iraq and Afghanistan veterans enrolled in veterans affairs health care. *Am J Public Health*. 2010;100(12):2450-2456. doi:10.2105/AJPH.2009.166165
20. Outcalt SD, Kroenke K, Krebs EE, et al. Chronic pain and comorbid mental health conditions: independent associations of posttraumatic stress disorder and depression with pain, disability, and quality of life. *J Behav Med*. 2015;38(3):535-543. doi:10.1007/s10865-015-9628-3
21. Gibson CJ, Maguen S, Xia F, Barnes DE, Peltz CB, Yaffe K. Military sexual trauma in older women veterans: prevalence and comorbidities. *J Gen Intern Med*. 2020;35(1):207-213. doi:10.1007/s11606-019-05342-7
22. Tan G, Teo I, Srivastava D, et al. Improving access to care for women veterans suffering from chronic pain and depression associated with trauma. *Pain Med*. 2013;14(7):1010-1020. doi:10.1111/pme.12131

23. Haskell SG, Heapy A, Reid MC, Papas RK, Kerns RD. The prevalence and age-related characteristics of pain in a sample of women veterans receiving primary care. *J Womens Health (Larchmt)*. 2006;15(7):862-869. doi:10.1089/jwh.2006.15.862
24. Driscoll MA, Higgins D, Shamaskin-Garroway A, et al. Examining gender as a correlate of self-reported pain treatment use among recent service veterans with deployment-related musculoskeletal disorders. *Pain Med*. 2017;18(9):1767-1777. doi:10.1093/pm/pnx023
25. Weimer MB, Macey TA, Nicolaidis C, Dobscha SK, Duckart JP, Morasco BJ. Sex differences in the medical care of VA patients with chronic non-cancer pain. *Pain Med*. 2013;14(12):1839-1847. doi:10.1111/pme.12177
26. Stubbs D, Krebs E, Bair M, et al. Sex differences in pain and pain-related disability among primary care patients with chronic musculoskeletal pain. *Pain Med*. 2010;11(2):232-239. doi:10.1111/j.1526-4637.2009.00760.x
27. Keogh E, McCracken LM, Eccleston C. Gender moderates the association between depression and disability in chronic pain patients. *Eur J Pain*. 2006;10(5):413-422. doi:10.1016/j.ejpain.2005.05.007
28. Miake-Lye IM, Mak S, Lee J, et al. Massage for pain: an evidence map. *J Altern Complement Med*. 2019;25(5):475-502. doi:10.1089/acm.2018.0282
29. Cherkin DC, Sherman KJ, Kahn J, et al. A comparison of the effects of 2 types of massage and usual care on chronic low back pain: a randomized, controlled trial. *Ann Intern Med*. 2011;155(1):1-9. doi:10.7326/0003-4819-155-1-201107050-00002
30. Sherman KJ, Cook AJ, Wellman RD, et al. Five-week outcomes from a dosing trial of therapeutic massage for chronic neck pain. *Ann Fam Med*. 2014;12(2):112-120. doi:10.1370/afm.1602
31. Perlman AI, Sabina A, Williams AL, Njike VY, Katz DL. Massage therapy for osteoarthritis of the knee: a randomized controlled trial. *Arch Intern Med*. 2006;166(22):2533-2538. doi:10.1001/archinte.166.22.2533
32. Perlman A, Fogerite SG, Glass O, et al. Efficacy and safety of massage for osteoarthritis of the knee: a randomized clinical trial. *J Gen Intern Med*. 2019;34(3):379-386. doi:10.1007/s11606-018-4763-5
33. Skelly AC, Chou R, Dettori JR, et al. Noninvasive Non-pharmacological Treatment for Chronic Pain: A Systematic Review Update. *Comparative Effectiveness Review*. No. 227. Agency for Healthcare Research and Quality; 2020. doi:10.23970/AHRQEPCCER227
34. Moyer CA, Rounds J, Hannum JW. A meta-analysis of massage therapy research. *Psychol Bull*. 2004;130(1):3-18. doi:10.1037/0033-2909.130.1.3
35. Field T, Hernandez-Reif M, Diego M, Schanberg S, Kuhn C. Cortisol decreases and serotonin and dopamine increase following massage therapy. *Int J Neurosci*. 2005;115(10):1397-1413. doi:10.1080/0020745090956459
36. Li Q, Becker B, Wernicke J, et al. Foot massage evokes oxytocin release and activation of orbitofrontal cortex and superior temporal sulcus. *Psychoneuroendocrinology*. 2019;101:193-203. doi:10.1016/j.psyneuen.2018.11.016
37. Eaves ER, Sherman KJ, Ritenbaugh C, et al. A qualitative study of changes in expectations over time among patients with chronic low back pain seeking four CAM therapies. *BMC Complement Altern Med*. 2015;15:12. Published 2015 Feb 5. doi:10.1186/s12906-015-0531-9
38. Bishop FL, Lauche R, Cramer H, et al. Health behavior change and complementary medicine use: National Health Interview Survey 2012. *Medicina (Kaunas)*. 2019;55(10):632. Published 2019 Sep 24. doi:10.3390/medicina55100632
39. Driscoll MA, Knobf MT, Higgins DM, Heapy A, Lee A, Haskell S. Patient experiences navigating chronic pain management in an integrated health care system: a qualitative investigation of women and men. *Pain Med*. 2018;19(suppl 1):S19-S29. doi:10.1093/pm/pny139
40. Denneson LM, Corson K, Dobscha SK. Complementary and alternative medicine use among veterans with chronic noncancer pain. *J Rehabil Res Dev*. 2011;48(9):1119-1128. doi:10.1682/jrrd.2010.12.0243
41. Taylor SL, Herman PM, Marshall NJ, et al. Use of complementary and integrative health: a retrospective analysis of U.S. veterans with chronic musculoskeletal pain nationally. *J Altern Complement Med*. 2019;25(1):32-39. doi:10.1089/acm.2018.0276
42. Evans EA, Herman PM, Washington DL, et al. Gender differences in use of complementary and integrative health by U.S. military veterans with chronic musculoskeletal pain. *Womens Health Issues*. 2018;28(5):379-386. doi:10.1016/j.whi.2018.07.003
43. Reinhard MJ, Nassif TH, Bloeser K, et al. CAM utilization among OEF/OIF veterans: findings from the National Health Study for a New Generation of US Veterans. *Med Care*. 2014;52(12)(suppl 5):S45-S49. doi:10.1097/MLR.0000000000000229
44. Herman PM, Yuan AH, Cefalu MS, et al. The use of complementary and integrative health approaches for chronic musculoskeletal pain in younger US Veterans: An economic evaluation. *PLoS One*. 2019;14(6):e0217831. Published 2019 Jun 5. doi:10.1371/journal.pone.0217831
45. Jonas WB, Schoomaker EB. Pain and opioids in the military: we must do better. *JAMA Intern Med*. 2014;174(8):1402-1403. doi:10.1001/jamainternmed.2014.2114
46. Han B, Compton WM, Blanco C, Crane E, Lee J, Jones CM. Prescription opioid use, misuse, and use disorders in U.S. adults: 2015 National Survey on Drug Use and Health. *Ann Intern Med*. 2017;167(5):293-301. doi:10.7326/M17-0865