

# The Use of Magnets, Magnetic Fields, and Copper Devices in a Veteran Population

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**Background:** Complementary and alternative medicine (CAM) use is increasing in the US and throughout the world. The use of magnets, magnetic fields, and copper devices (MMFC) for health care are CAM therapies. Available information suggests significant consumer spending on MMFC therapy, but minimal information exists on usage patterns.

**Methods:** We created a brief questionnaire and distributed it to veteran patients at the Carl T. Hayden Veterans Affairs Medical Center infusion center in Phoenix, Arizona. The questionnaire categorized respondents by age groups, diagnostic groups by specialty (endocrinology, gastroenterology, hematology/oncology, neurology, rheumatology, and other), and whether MMFCs were being used and for what purpose. The

questionnaire also asked whether the respondent would consider participating in a clinical study using MMFCs.

**Results:** Analyzing the 206 evaluable surveys, we found an overall use rate of about 1 in 4 respondents. The majority used copper devices, and the endocrinology group showed the highest percentage use. Many veterans reported that they would consider participating in MMFC clinical studies. For interest in clinical trial participation, the age groups with the highest response for magnets in clinical trials was 31 to 50 years (64%), and for magnetic fields 51 to 65 years (52%).

**Conclusions:** About 25% of surveyed veterans reported the use of MMFCs. Veterans reported that they are likely to participate in clinical studies using these CAM therapies.

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Complementary and alternative medicine (CAM) is a therapeutic approach to health care used in association with or in place of standard medical therapeutic approaches. When describing CAM, the terms complementary and alternative are often used interchangeably, but the terms refer to different concepts. A nonmainstream approach used together with conventional medicine is considered complementary, whereas an approach used in place of conventional medicine is considered alternative. Most people who use nonmainstream approaches also use conventional health care.<sup>1</sup>

Integrative medicine represents therapeutic interventions that bring conventional and complementary approaches together in a coordinated way. Integrative health also emphasizes multimodal interventions, which are  $\geq 2$  interventions such as conventional (eg, medication, physical rehabilitation, psychotherapy) and complementary health approaches (eg, acupuncture, yoga, and probiotics) in various combinations, with an emphasis on treating the whole person rather than 1 organ system. Integrative health aims for well-coordinated care among different practitioners and institutions.<sup>1</sup>

Functional medicine requires an individualized assessment and therapeutic plan for each patient, including optimizing the function of each organ system. It uses research to understand a patient's unique needs and formulates a plan that often uses diet, exercise, and stress

reduction methods. Functional medicine may use combinations of naturopathic, osteopathic, and chiropractic medicine, among other therapies. Functional medicine has been called a systems biology model, and patients and practitioners work together to achieve the highest expression of health by addressing the underlying causes of disease.<sup>2,3</sup>

According to a 2012 national survey, more than 30% of adults and about 12% of children use health care approaches that are not part of conventional medical care or that may have unconventional origins. A National Center for Health Statistics study found that the most common complementary medical interventions from 2002 to 2012 included natural products, deep breathing, yoga and other movement programs, and chiropractic, among others. Magnets, magnetic fields, and copper devices (MMFC), which are the focus of this study, were not among the top listed interventions.<sup>4</sup> Recent data showed that individuals in the United States are high users of CAM, including many patients who have neoplastic disease.<sup>5,6</sup>

MMFCs are a part of CAM and are reported to be a billion-dollar industry worldwide, although it is not well studied.<sup>7,8</sup> In our study, *magnet* refers to the use of a magnet in contact with the body, *magnetic field* refers to exposure to a magnetic field administered without direct contact with the body, and *copper devices* refer to devices that are in contact

with the body, such as bracelets, necklaces, wraps, and joint braces. These devices are often constructed using copper mesh, or weaved copper wires. Advertising has helped to increase interest in the use of these devices for musculoskeletal pain and restricted joint movement therapies. However, it is less clear whether MMFCs are being used to provide therapy for other medical conditions, such as neoplastic disease.

It is unclear how widespread MMFC use is or how it is accessed. A 2016 study of veterans and CAM use did not specifically address MMFCs.<sup>9</sup> A Japanese study of the use of CAM provided or prescribed by a physician found that just 12 of 1575 respondents (0.7%) described using magnetic therapy.<sup>10</sup> A Korean internet study that assessed the use of CAM found that of 1668 respondents who received CAM therapy by practice or advice of a physician, 1.2% used magnet therapy.<sup>11,12</sup> An online study of CAM use in patients with multiple sclerosis found that 9 of 1286 respondents (0.7%) had used magnetic field therapy in the previous 3 months.<sup>13</sup>

In this study, we aimed to assess MMFC use and perspectives in a veteran population at the Carl T. Hayden Veterans Affairs Medical Center (CTHVAMC) in Phoenix, Arizona.

## METHODS

We created a brief questionnaire regarding MMFC use and perspectives and distributed it to veteran patients at the infusion center at the CTHVAMC. The study was approved by the CTHVAMC department of research, and the institutional review board determined that informed consent was not required. The questionnaire did not collect any specific personal identifying data but included the participant's sex, age, and diagnosis. Although there are standardized questionnaires concerning the use of CAM, we designed a new survey for MMFCs. The participants in the study were consecutive patients referred to the CTHVAMC infusion center for IV or other nonoral therapies. Referrals came from endocrinology, gastroenterology, hematology/oncology, neurology, rheumatology, and other specialties (eg, allergy/immunology).

The questionnaire was 1 page (front and back) and was completed anonymously without involvement by the study investigators or infusion center staff. Dated and consecutively numbered questionnaires were given to pa-

**TABLE 1** Magnets, Magnetic Fields, and Copper Devices Use

Criteria	Total (N = 206)	Magnets, magnetic fields, and copper devices, No. (%)	
		Use (n = 47)	Nonuse (n = 159)
Age			
18-30 y	5 (2)	1 (20)	4 (80)
31-50 y	28 (14)	6 (21)	22 (79)
51-65 y	52 (25)	18 (35)	34 (65)
≥ 66 y	121 (59)	22 (18)	99 (82)
Diagnosis category			
Endocrinology	11 (5)	6 (55)	5 (45)
Gastroenterology	7 (3)	0 (0)	7 (100)
Hematology/oncology	133 (64)	33 (25)	100 (75)
Neurology	22 (11)	5 (23)	17 (77)
Rheumatology	26 (13)	3 (12)	23 (88)
Other	7 (3)	0 (0)	7 (100)

tients receiving therapy regardless of their diagnosis. Ages were categorized into groups: 18 to 30 years; 31 to 50 years; 51 to 65 years; and ≥ 66 years. Diagnoses were categorized by specialty: endocrinology, gastroenterology, hematology/oncology, neurology, rheumatology, and other. We noted in a previous similar study that the exact diagnosis was often left blank, but the specialty was more often completed.<sup>9</sup> Since some patients required multiple visits to the infusion center, respondents were asked whether they had previously answered the questionnaire; there were no duplications.

The population we studied was under stress while receiving therapy for underlying illnesses. To improve the response rate and accuracy of the responses, we limited the number of survey questions. Since many of the respondents in the infusion center for therapy received medications that could alter their ability to respond, all questionnaires were administered prior to therapeutic intervention. In addition to the background data, respondents were asked: Do you apply magnets to your body, use magnetic field therapy, or copper devices? If you use any of these therapies, is it for pain, your diagnosis, or other? Would you consider participating in a clinical trial using magnets applied to the body or magnetic therapy?

## RESULTS

We collected 210 surveys. Four surveys were missing data and were excluded. The majority of respondents (n = 133, 64%) were in the hematology/oncology diagnostic group and 121 (59%) were aged ≥ 66 years (Table 1). Most respondents (n = 173, 84%) were male.

Respondents were asked whether they were using MMFC therapies. The results from all age groups showed an 18% overall use and in the diagnosis groups an overall use of 23%. Eighteen respondents (35%) aged 51 to 65 years reported using MMFC, followed by 6 respondents (21%) aged 31 to 50 years. Patients with an endocrinology diagnosis had the highest rate of MMFC use (6 of 11 patients; 55%) but more patients (33 of 133 [25%]) with a hematology/oncology diagnosis used MMFCs.

Copper was the most widely used MMFC therapy among individuals who used a single MMFC therapy. Twenty respondents reported copper use, 6 used magnets, and no respondents used magnetic field therapy (Table 2). Some respondents reported the use of multiple therapies, including 2 who used magnetic field therapy (eAppendix, available online at doi:10.12788/fp.0397).

Although we were interested in understanding veterans' use of these therapies, we were also interested in whether the respondent group would see MMFC as a potential therapy. The highest level of interest in participation in magnet clinical trials was reported by patients aged 31 to 50 years (64%) age group, followed by those aged 51 to 65 (62%). All of the respondents in hematology/oncology, rheumatology, neurology, endocrinology, and gastroenterology groups indicated that they would consider participating in clinical studies using magnets.

## DISCUSSION

We surveyed a population of veterans at the CTHVAMC infusion center who were receiving antineoplastic chemotherapy, biologic therapy, immunomodulatory therapy, transfusion, and other therapies to evaluate their use of MMFC. We chose this group to sample because of how accessible this group was and the belief that there would be an adequate survey response. We hypothesized that by asking about a specific group of CAM therapies and not, as in many surveys, multiple CAM therapies, there would be an improved response rate. We expected that very few respondents would indicate MMFC use because in a similar study conducted in 2003 to 2004 at CTHVAMC, none of the 380 survey respondents (all with a hematology/oncology diagnosis) indicated magnet or magnetic

field use (JR Salvatore, unpublished data). Although copper devices were available at that time, they were not included in that study. The current survey added copper devices and showed a greater use of MMFC, including copper devices. We identified veterans who used either 1 MMFC or multiple therapies. In both groups, copper devices were the most common. This may be due to the ubiquity and availability of copper devices. These devices are highly visible and promoted by professional athletes and other well-known personalities.

Our findings showed 2 unexpected results. First, there was greater than expected use of magnets and copper devices. Second, an even less expected result that there was considerable interest in participating in clinical research that used magnets or magnetic fields.

Respondents indicated a high interest in participating in clinical trials using magnets or magnetic fields regardless of their history of MMFC use. We did not ask about a trial using copper devices because there is less scientific/medical research to justify studying those devices as opposed to data that support the use of magnets or magnetic fields. The data presented in this study suggest interest in participating in clinical trials using magnets or magnetic field therapy. One clinical trial combined static magnets as an adjuvant to anti-neoplastic chemotherapy.<sup>14</sup> We believe this is the first publication to specifically quantify both MMFC use in a veteran (or any) population, and to identify the desire to participate in clinical studies that would utilize magnets or magnetic fields, whether or not they currently use magnets or magnetic fields. Based on current knowledge, it is not clear whether use of MMFC by patients represents a risk or a benefit to the population studied, and seeking that information is part of the continuation of our work. We also believe that the data in this study will help practitioners to consider asking patients specifically whether they are using these therapies, and if so why and with what result. We are extending our work to a more generalized patient population.

The use of copper devices relates to beliefs (dating to the mid-1800s) that there was a relationship between copper deficiency and rheumatologic disorders. Copper devices are used as therapies because of the belief that small amounts of copper are absorbed

**TABLE 2** Characteristics of Multiple Device Users

Sex	Age, y	Diagnostic category	Device used		
			Magnet	Magnetic field	Copper
Female	51-65	Hematology/oncology		Y	Y
Female	≥ 66	Endocrinology	Y		Y
Male	51-65	Hematology/oncology	Y		Y
Male	51-65	Hematology/oncology	Y		Y
Male	51-65	Hematology/oncology	Y	Y	Y
Male	≥ 66	Hematology/oncology	Y		Y
Male	≥ 66	Hematology/oncology	Y		Y
Male	≥ 66	Hematology/oncology	Y		Y
Male	≥ 66	Hematology/oncology	Y		Y
Male	≥ 66	Hematology/oncology	Y		Y
Total			9	2	10

through the skin, decreasing inflammation, particularly around joint spaces.<sup>15</sup> Recent data suggest a mechanism for copper-induced cell death.<sup>16</sup> Although this recent research suggests a mechanism for how copper might induce cell death, it is unclear how this would be applied to establishing a mechanism for the health effects of wearing copper devices. Since copper devices are thought to decrease inflammation, they may have a theoretical function by decreasing the number of inflammatory cells in an affected space.

CAM magnetics are typically of lower strength. The field generated by magnets is measured and reported in Tesla. Magnetic resonance imaging typically generates from 1.5 to 3 Tesla. A refrigerator magnet is about 1 milliTesla.<sup>17</sup> In a study conducted at the CTHVAMC, the strength of the magnets used was measured at distances from the magnet. For example, at 2 cm from the magnet, the measured strength was 18 milliTesla.<sup>14</sup> Many MMFC devices approved by the US Food and Drug Administration are pulsed electromagnetic fields (PEMF) devices for healing of nonunion fractures (approved in 1979); cervical and lumbar fusion therapies (approved in 2004); and therapy for anxiety and depression (approved in 2006).<sup>18</sup>

### Limitations

Patients with endocrinology diagnoses were the most likely to use MMFCs but were a very

small percentage of the infusion center population, which could skew the data. The surveyed individuals may not have been representative of the overall patient population. Similarly, the patient population at CTHVAMC, which is primarily male and aged ≥ 66 years, may not be representative of other veteran and nonveteran patient populations.

### CONCLUSIONS

MMFC devices are being used regularly by patients as a form of CAM therapy, but few studies researching the use of CAM therapy have generated data that are as specific as this study is about the use of these MMFC devices. Although there is considerable general public awareness of MMFC therapies and devices, we believe that there is a need to quantify the use of these devices. We further believe that our study is one of the first to look specifically at the use of MMFCs in a veteran population. We have found a considerable use of MMFCs in the veteran population studied, and we also showed that whether or not veterans are using these devices, they are willing to be part of research that uses the devices. Further studies would look at a more general veteran population, look more in depth at the way and for what purpose these devices are being used, and consider the development of clinical research studies that use MMFCs.

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### Disclaimer

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### Ethics and consent

The Division of Research at the Carl T. Hayden Veterans Affairs Medical Center determined that informed consent was not required for this work.

### References

- National Institute of Health. National Center for Complementary and Integrative Health. Updated April 2021. Accessed June 26, 2023. <https://www.nccih.nih.gov/health/complementary-alternative-or-integrative-health-whats-in-a-name>
- Hanaway P. Form follows function: a functional medicine overview. *Perm J*. 2016;20(4):16-109. doi:10.7812/TPP/16-109
- Bland JS. Functional medicine past, present, and future. *Integr Med (Encinitas)*. 2022;21(2):22-26.
- Clarke TC, Black LI, Stussman BJ, Barnes PM, Nahin RL. Trends in the use of complementary health approaches among adults: United States, 2002-2012. *Natl Health Stat Report*. 2015;(79):1-16.
- Horneber M, Bueschel G, Dennert G, Less D, Ritter E, Zwahlen M. How many cancer patients use complementary and alternative medicine: a systematic review and metaanalysis. *Integr Cancer Ther*. 2012;11(3):187-203. doi:10.1177/1534735411423920
- Buckner CA, Lafrenie RM, Dénonnée JA, Caswell JM, Want DA. Complementary and alternative medicine use in patients before and after a cancer diagnosis. *Curr Oncol*. 2018;25(4):e275-e281. doi:10.3747/co.25.3884
- Weintraub MI. Magnetic bio-stimulation in painful diabetic peripheral neuropathy: a novel intervention—a randomized, double-placebo crossover study. *Am J Pain Manage*. 1999; 9(1):8-17.
- Colbert AP, Wahbeh H, Harling N, et al. Static magnetic field therapy: a critical review of treatment parameters. *Evid Based Complement Alternat Med*. 2009;6(2):133-139. doi:10.1093/ecam/nem131
- Held RF, Santos S, Marki M, Helmer D. Veteran perceptions, interest, and use of complementary and alternative medicine. *Fed Pract*. 2016;33(9):41-47.
- Motoo Y, Yukawa K, Arai I, Hisamura K, Tsutani K. Use of complementary and alternative medicine in Japan: a cross-sectional internet survey using the Japanese version of the International Complementary and Alternative Medicine Questionnaire. *JMAJ*. 2019;2(1):35-46. doi:10.31662/jmaj.2018-0044
- Quandt SA, Verhoef MJ, Arcury TA, et al. Development of an international questionnaire to measure use of complementary and alternative medicine (I-CAM-Q). *J Altern Complement Med*. 2009;15(4):331-339. doi:10.1089/acm.2008.0521
- Lee JA, Sasaki Y, Arai I, et al. An assessment of the use of complementary and alternative medicine by Korean people using an adapted version of the standardized international questionnaire (I-CAM-QK): a cross-sectional study of an internet survey. *BMC Complement Altern Med*. 2018;18(1):238. Published 2018 Aug 13. doi:10.1186/s12906-018-2294-6
- Campbell E, Coulter E, Mattison P, McFadyen A, Miller L, Paul L. Access, delivery and perceived efficacy of physiotherapy and use of complementary and alternative therapies by people with progressive multiple sclerosis in the United Kingdom: An online survey. *Mult Scler Relat Disord*. 2017;12:64-69. doi:10.1016/j.msard.2017.01.002
- Salvatore JR, Harrington J, Kummert T. Phase I clinical study of a static magnetic field combined with anti-neoplastic chemotherapy in the treatment of human malignancy: initial safety and toxicity data. *Bioelectromagnetics*. 2003;24(7):524-527. doi:10.1002/bem.10149
- Richmond SJ, Gunadasa S, Bland M, Macpherson H. Copper bracelets and magnetic wrist straps for rheumatoid arthritis—analgesic and anti-inflammatory effects: a randomised double-blind placebo controlled crossover trial. *PLoS One*. 2013;8(9):e71529. Published 2013 Sep 16. doi:10.1371/journal.pone.0071529
- Tsvetkov P, Coy S, Petrova B, et al. Copper induces cell death by targeting lipoylated TCA cycle proteins. *Science*. 2022;375(6586):1254-1261. doi:10.1126/science.abf0529
- Simon NJ. *Biological Effects of Static Magnetic Fields: A Review*. International Cryogenic Materials Commission; 1992:179.
- Waldorff EI, Zhang N, Ryaby JT. Pulsed electromagnetic field applications: a corporate perspective. *J Orthop Translat*. 2017;9:60-68. Published 2017 Mar 31. doi:10.1016/j.jot.2017.02.006

## eAPPENDIX Characteristics of Single Device Users

Sex	Age group, y	Diagnosis category	Device used		
			Magnet	Magnetic field	Copper
Male	18-30	Neurology	Yes	No	No
Female	31-50	Endocrinology			Y
Female	31-50	Endocrinology			Y
Male	31-50	Endocrinology			Y
Male	31-50	Hematology/oncology	Y		
Female	31-50	Rheumatology	Y		
Female	31-50	Hematology/oncology			Y
Male	51-65	Hematology/oncology			Y
Male	51-65	Neurology			Y
Male	51-65	Hematology/oncology			Y
Female	51-65	Hematology/oncology			Y
Male	51-65	Hematology/oncology			Y
Male	51-65	Hematology/oncology			Y
Female	51-65	Rheumatology	Y		
Male	51-65	Hematology/oncology			Y
Male	51-65	Neurology			Y
Male	≥ 66	Hematology/oncology			Y
Female	≥ 66	Endocrinology			Y
Male	≥ 66	Hematology/oncology	Y		
Male	≥ 66	Hematology/oncology			Y
Male	≥ 66	Hematology/oncology			Y
Male	≥ 66	Hematology/oncology			Y
Male	≥ 66	Rheumatology	Y		
Male	≥ 66	Hematology/oncology			Y
Male	≥ 66	Hematology/oncology			Y
Male	≥ 66	Hematology/oncology			Y
Total			6	0	20