Use of Complementary and Integrative Therapies by Fibromyalgia Patients: A 14-Year Follow-up Study

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Abstract

Objective: To reevaluate the frequency and pattern of complementary and integrative medicine (CIM) use in patients with fibromyalgia (FM).

Patients and Methods: Consecutive patients with FM who were referred to the Mayo Clinic fibromyalgia treatment program from January 5 through July 27, 2017, were invited to complete a survey about their use of CIM therapies in the preceding 6 months. The survey asked about 3 primary CIM domains: treatments and techniques, vitamins and minerals, and herbs and other dietary supplements. For direct comparative purposes, we reused the survey instrument from our prior analogous study of CIM use, performed in 2003.

Results: Of the 310 patients who completed the survey, 304 (98.1%) reported using some form of CIM, similar to the percentage reported in our 2003 study (98%). The most frequently used CIM therapies in the current cohort were spiritual healing (54.0% [163 of 302]), massage therapy (50.0% [152 of 304]), chiropractic treatments (39.3% [118 of 300]), aromatherapy (39.0% [117 of 300]), exercise for a specific medical problem (38.6% [117 of 303]), melatonin (37.9% [77 of 203]), magnesium (36.3% [107 of 295]), green tea (36.1% [73 of 202]), and fish oil (34.5% [68 of 197]). We noted numerous substantial differences from the 2003 data in terms of the pattern of CIM use.

Conclusion: The use of CIM therapies among patients with FM continues to be extremely common for adult patients of all ages. Given the continued high prevalence of CIM use, health care professionals must have awareness and knowledge of these various modalities and their potential incorporation into a multifaceted FM treatment regimen.
Prevention and the National Center for Health Statistics, use of CIM therapies remains high, and according to their 2018 report, it is increasing in the United States in general\textsuperscript{17,18} and among persons with musculoskeletal pain disorders. Several evidence-based research studies and reviews have described the use and promising results of various CIM treatments as ancillary strategies for patients with FM.\textsuperscript{19–24} And in 2003, our group surveyed patients with FM and reported a high prevalence (98%) of CIM use.\textsuperscript{25} However, to our knowledge, no studies have compared the trends of CIM use in this patient population. To address this gap, we conducted a comparative study among a cohort of patients with FM seen at an academic, referral-based medical center. The aim of this study was to reevaluate the frequency and usage pattern of CIM therapies among patients with FM and to compare the current results with the trends observed in our 2003 study.\textsuperscript{25}

**PATIENTS AND METHODS**

This study was approved by the Mayo Clinic Institutional Review Board.

**Diagnosis and FM Treatment Program**

Patients underwent an initial evaluation by a registered nurse, specifically trained in FM, in collaboration with a physician. A diagnosis of FM was established by using the American College of Rheumatology 1990 and 2010 criteria.\textsuperscript{9,11} If FM was confirmed, the patient was then enrolled in the Mayo Clinic FM treatment program (FTP) (Rochester, Minnesota). Our 2003 study used the 1990 diagnostic criteria for FM. Since the publication of the 2010 diagnostic criteria, the Mayo FTP has used both sets of criteria in clinical practice. The American College of Rheumatology has since published a 2016 revision,\textsuperscript{10} but the FTP is currently still in the process of integrating these criteria into clinical practice; thus, cases diagnosed by the most recent criteria were not included in the current study.

The Mayo Clinic FTP is a 1.5-day multidisciplinary outpatient treatment program, staffed by physicians from the Division of General Internal Medicine. Access to this program is limited to patients who are referred by other Mayo Clinic physicians or their local primary care physicians. The FTP consists of group and individual sessions that are taught by a core group of registered nurses, general internists, physical therapists, occupational therapists, psychiatrists, psychologists, and ancillary staff. The primary aims of the FTP are to educate patients, improve physical and mental health functioning, provide evidence-based treatment options, and create a lasting treatment regimen.

**Patients and Survey Instrument**

Consecutive patients referred to the Mayo Clinic FTP from January 5 through July 27, 2017, were individually invited to complete a survey about their use of CIM therapies in general during the preceding 6 months. The survey asked about 3 primary domains: treatments and techniques (21 questions), vitamins and minerals (12 questions), and herbs and other dietary supplements (52 questions). For direct comparative purposes, we reused the survey instrument from our prior study (February 1 through July 31, 2003).\textsuperscript{25} Patients were instructed to respond “yes,” “no,” or “I don’t know what [this option] is” for each potential CIM option, in accordance with their usage during the previous 6 months. The survey included space where patients could write in additional CIM therapies. In accordance with the National Center for Complementary and Integrative Health, we excluded dietary supplements that have been incorporated into conventional medicine: multiple vitamins with and without minerals, vitamin D, folic acid (folate), calcium, iron, and potassium.

**Statistical Analyses**

Survey responses are summarized with frequencies and percentages for categorical variables and means and standard deviations for continuous variables. We used $\chi^2$ tests or Fisher exact tests, as appropriate, to compare overall CIM usage between 2003 and 2017 and also to compare usage in narrower and broader age categories by study year. Because of the large number of statistical tests, the threshold for statistical significance was set at $P=0.0004$ with the Bonferroni method (0.05/130 tests). All statistical analyses were performed using SAS statistical software, version 9.4 (SAS Institute).
RESULTS

Demographic Characteristics
Of 407 patients invited to participate in the study, 310 (76.2%) completed the survey (Figure 1). Consistent with the prevalence of FM, most survey respondents were women (268 of 308 [87.0%]; sex was not reported for 2 respondents). The mean ± SD patient age was 44.2 ± 13.5 years. In comparison, in our 2003 study, of the 304 patients invited to participate, 289 (95.1%) completed the survey. For the earlier survey, the majority of respondents were also women (263 [91.0%]), and the mean patient age was 48.8 years (range, 18-90 years).

Total CIM Use
Nearly all patients (304 of 310 [98.1%]; 265 of 268 women [98.9%] and 38 of 40 men [95.0%]) reported some kind of CIM use, similar to 98% who reported using CIM in 2003. Among the 310 patients in the 2017 survey, the 9 most common CIM therapies were spiritual healing (54.0% [163 of 302]), massage therapy (50.0% [152 of 304]), chiropractic treatments (39.3% [118 of 300]), aromatherapy (39.0% [117 of 300]), exercise for a specific medical problem (38.6% [117 of 303]), melatonin (37.9% [77 of 203]), magnesium (36.3% [107 of 295]), green tea (36.1% [73 of 202]), and fish oil (34.5% [68 of 197]). Among the 289 participants in the 2003 survey, the most common CIM therapies were exercise for a specific medical problem (48.1% [139 of 289]), spiritual healing (45.0% [130 of 289]), massage therapy (43.9% [127 of 289]), chiropractic treatments (37.0% [107 of 289]), vitamin C (34.9% [101 of 289]), vitamin E (31.1% [90 of 289]), magnesium (29.1% [84 of 289]), vitamin B complex (24.9% [72 of 289]), green tea (23.9% [69 of 289]), and weight loss programs (20.1% [58 of 289]).

In many countries, spiritual healing is not considered part of CIM; thus, when spiritual healing was excluded from the analysis, 301 patients (97.1% total [301 of 310]; 97.8% of women [262 of 268], 95.0% of men [38 of 40]) reported some type of CIM use. Supplemental Tables 1 through 3 (available online at http://www.mcpiqojournal.org) show the specific modalities reported by at least 5% of respondents to the 2017 survey.

Treatments and Techniques
In the current cohort, 94.2% of patients with FM (292 of 310) reported using some form of CIM-based treatment or technique. The overall proportion of patients using at least one CIM treatment or technique increased significantly from 2003 to 2017 (86.9% [251 of 289 patients] to 94.2% [292 of 310]; P < .0001); treatments and techniques that were increasingly used were aromatherapy (14.9% [43 of 289] to 39.0% [117 of 300]; P < .0001), homeopathic medicine (10.0% [29 of 289] to 24.2% [72 of 298]; P < .0001), and art therapy (4.8% [14 of 289] to 17.1% [51 of 298]; P < .0001). The use of various CIM-based treatments or techniques also differed significantly by age (Table).

Treatments and techniques used by at least 10% of respondents from the 2017 survey are reported in the Table. Other less frequently reported treatments and techniques were chelation therapy, dance therapy, and hypnosis.

Vitamins and Minerals
Approximately three-quarters of patients in the current cohort (73.5% [228 of 310]) reported using at least one vitamin or mineral, less than the 83% (240 of 289) who reported consuming them in the previous study (P < .0001). The use of vitamin E decreased...
TABLE. CIM Therapies Used by Patients Referred to a Fibromyalgia Treatment Program

| CIM therapy | All respondents (N=289) | 2017 Survey (N=310) | P value | 18-24 (n=25) | 25-34 (n=57) | 35-44 (n=70) | 45-54 (n=80) | 55-64 (n=57) | ≥65 (n=19) | P value |
|--------------|--------------------------|---------------------|---------|-------------|-------------|-------------|-------------|-------------|-------------|---------|
| Treatments and techniques | | | | | | | | | | |
| Exercise for a specific medical problem | 48.1 | 38.6 | .02 | 36.0 | 37.5 | 38.6 | 35.9 | 40.7 | 50.0 | <.0001 |
| Spiritual healing | 45.0 | 54.0 | .02 | 44.0 | 49.1 | 47.1 | 62.8 | 60.4 | 52.6 | <.0001 |
| Massage therapy | 43.9 | 50.0 | .14 | 56.0 | 50.9 | 54.3 | 48.1 | 39.3 | 68.4 | <.0001 |
| Chiropractic treatments | 37.0 | 39.3 | .56 | 28.0 | 49.1 | 42.6 | 48.1 | 25.9 | 21.1 | <.0001 |
| Weight loss programs | 20.1 | 17.1 | .26 | 16.0 | 14.5 | 10.1 | 23.0 | 20.4 | 21.1 | <.0001 |
| Relaxation therapy | 17.0 | 27.9 | .02 | 28.0 | 34.5 | 21.4 | 31.2 | 21.8 | 35.3 | <.0001 |
| Aromatherapy | 14.9 | 39.0 | <.0001 | 40.0 | 47.3 | 37.7 | 42.1 | 29.6 | 31.6 | <.0001 |
| Music therapy | 12.1 | 18.7 | .03 | 16.7 | 21.8 | 10.1 | 27.3 | 14.8 | 15.8 | <.0001 |
| Acupuncture | 11.1 | 19.8 | .02 | 24.0 | 21.1 | 14.7 | 22.4 | 16.1 | 31.6 | <.0001 |
| Self-help (support groups) | 11.1 | 16.7 | .09 | 25.0 | 14.5 | 12.9 | 23.7 | 7.4 | 21.1 | <.0001 |
| Homeopathic medicine | 10.0 | 24.2 | <.0001 | 8.0 | 40.0 | 27.1 | 21.6 | 16.7 | 22.2 | <.0001 |
| Acupressure | 10.0 | 14.1 | .13 | 12.0 | 13.0 | 17.4 | 17.3 | 5.6 | 21.1 | <.0001 |
| Reflexology | 9.0 | 11.8 | .27 | 0 | 20.4 | 10.3 | 17.3 | 5.6 | 5.3 | <.0001 |
| Energy healing | 8.0 | 13.3 | .04 | 0 | 16.4 | 18.6 | 13.3 | 10.9 | 10.5 | <.0001 |
| Art therapy | 4.8 | 17.1 | <.0001 | 24.0 | 22.6 | 13.0 | 17.1 | 14.8 | 15.8 | <.0001 |
| At least 1 treatment or technique | 86.9 | 94.2 | <.0001 | 100.0 | 98.2 | 94.3 | 95.0 | 89.5 | 89.5 | <.0001 |
| Vitamins and minerals | | | | | | | | | | |
| Vitamin C | 34.9 | 30.7 | .28 | 24.0 | 27.8 | 26.5 | 27.0 | 40.4 | 50.0 | <.0001 |
| Vitamin E | 31.1 | 13.4 | <.0001 | 12.0 | 11.5 | 10.3 | 11.0 | 17.0 | 35.3 | <.0001 |
| Magnesium | 29.1 | 36.3 | .06 | 36.0 | 31.5 | 34.8 | 34.7 | 37.7 | 64.7 | <.0001 |
| Vitamin B complex | 24.9 | 39.3 | .0002 | 32.0 | 37.7 | 33.8 | 44.2 | 40.4 | 50.0 | <.0001 |
| Zinc | 13.2 | 17.1 | .19 | 16.0 | 9.3 | 14.7 | 20.3 | 18.9 | 35.3 | <.0001 |
| High-dose combination vitamin | 12.1 | 14.6 | .37 | 12.0 | 20.0 | 7.6 | 17.8 | 14.0 | 12.5 | <.0001 |
| Vitamin A | 8.0 | 10.1 | .38 | 16.0 | 5.7 | 10.3 | 8.2 | 11.8 | 18.8 | <.0001 |
| At least 1 vitamin or mineral | 83.0 | 73.5 | <.0001 | 60.0 | 78.9 | 68.6 | 72.5 | 77.2 | 89.5 | <.0001 |
| Herb or dietary supplement | | | | | | | | | | |
| Green tea | 23.9 | 36.1 | .03 | 11.1 | 36.8 | 30.4 | 41.2 | 45.7 | 41.7 | <.0001 |
| Glucosamine | 18.0 | 16.4 | .65 | 11.1 | 10.5 | 13.0 | 20.0 | 20.0 | 33.3 | <.0001 |
| Flaxseed | 13.2 | 28.5 | <.0001 | 11.1 | 26.3 | 26.1 | 29.2 | 44.4 | 16.7 | <.0001 |
| Acidophilus | 13.2 | 25.6 | .0005 | 17.6 | 13.5 | 28.3 | 26.0 | 40.0 | 25.0 | <.0001 |
| Coenzyme Q10 | 12.1 | 15.2 | .28 | 4.0 | 9.1 | 13.2 | 12.3 | 28.0 | 35.3 | <.0001 |
| Fish oil | 11.1 | 34.5 | <.0001 | 29.4 | 37.8 | 34.8 | 25.0 | 48.6 | 33.3 | <.0001 |
| Garlic | 9.0 | 23.7 | <.0001 | 16.7 | 16.2 | 13.0 | 30.6 | 32.4 | 41.7 | <.0001 |
| L-Lysine | 5.9 | 14.7 | .01 | 5.6 | 16.2 | 13.0 | 16.7 | 20.6 | 8.3 | <.0001 |
| Ginger | 4.8 | 30.3 | <.0001 | 27.8 | 32.4 | 23.9 | 27.1 | 34.3 | 50.0 | <.0001 |
| Melatonin | 4.8 | 37.9 | <.0001 | 61.1 | 47.4 | 30.4 | 28.8 | 34.3 | 58.3 | <.0001 |
| Milk thistle | 4.8 | 6.0 | .57 | 0 | 8.1 | 6.5 | 8.0 | 2.9 | 8.3 | <.0001 |
| Cayennee | <5 | 11.2 | ... | 11.1 | 5.4 | 13.0 | 10.4 | 14.7 | 16.7 | <.0001 |
| At least 1 herb or dietary supplement | 50.9 | 57.1 | <.0001 | 60.0 | 59.6 | 52.9 | 52.5 | 61.4 | 68.4 | <.0001 |

*CIM = complementary and integrative medicine.

Data are presented as No. (percentage) of patients.

Ns reflect the number of 2017 respondents within each age category. The denominator varies for each percentage due to missing data.

Specific modalities reported by at least 10% of respondents to the 2017 survey are shown. Supplemental Tables 1 through 3 (available online athttp://www.mcpiqojournal.org) show all modalities reported by at least 5% of respondents to the 2017 survey.

Not reported in 2003.
significantly (31.1% [90 of 289] to 13.4% [38 of 284]; \(P<.0001\)), whereas vitamin B complex use increased (24.9% [72 of 289] to 39.3% [116 of 295]; \(P=.0002\)). The use of various vitamins and minerals differed significantly by age (all \(P=.0001\) or less) (Table). Vitamins and minerals used by at least 5% of respondents from the 2017 survey are reported in the Table. An infrequently reported mineral was silver.

Herbs and Other Dietary Supplements
A greater proportion of the 310 patients surveyed in 2017 used at least one herb or dietary supplement compared with the 289 in the previous study (57.1% [177 of 310] vs 50.9% [147 of 289]; \(P<.0001\)). Over time (2003 to 2017), we noted significant increases in the use of flaxseed (13.2% [38 of 289] to 28.5% [57 of 200]; \(P<.0001\)), fish oil (11.1% [32 of 289] to 34.5% [68 of 197]; \(P<.0001\)), garlic (9.0% [26 of 289] to 23.7% [47 of 198]; \(P<.0001\)), ginger (4.8% [14 of 289] to 30.3% [60 of 198]; \(P<.0001\)), and melatonin (4.8% [14 of 289] to 37.9% [77 of 203]; \(P<.0001\)). The use of specific herbs and dietary supplements increased from less than 5% in 2003 to the following levels in 2017: cayenne (11.2% [22 of 197]), senna (7.1% [14 of 197]), and methylsulfonyl methane (5.6% [11 of 197]). Herbs and other dietary supplements used by at least 5% of respondents from the 2017 survey are reported in Supplemental Table 3, available online at http://www.mcpiqojournal.org. Other less frequently reported herbs and dietary supplements included the use of lutein, creatine, kava, ashwagandha, cat’s claw, goldenseal, and stinging nettle.

Trends of CIM Use by Age Group in 2003 vs 2017
In general, CIM use increased with time for patients of all ages. We stratified patients by age, following the groupings used in the 2003 study to facilitate comparisons. Figure 2 shows the CIM modalities with the greatest increase in use from 2003 to 2017.
Melatonin use significantly increased among the 4 oldest age groups ($P=0.0004$, $P<0.0001$, $P=.0001$, and $P<0.0001$ for age groups 35-44, 45-54, 55-64, and $\geq65$ years, respectively). Fish oil use increased significantly in the 55 to 64 age group ($P=0.0003$). Aromatherapy use increased significantly among the 45 to 54 age group ($P<0.0001$), and the use of ginger increased significantly among the 45 to 54 and 65 or older age groups ($P<0.0001$) and $P=.0004$, respectively.

Most Frequently Used CIM Modalities by Generations

We identified the 10 most common CIM modalities for respondents to the 2003 and 2017 surveys. We ranked these modalities within each generational category, with generations defined as follows: young adults (18-34 years), middle-aged adults (35-54 years), and older adults (>54 years). Figure 3 depicts the most common modalities for each surveyed year, ranked from most to least common within each generation.

In 2017, massage and spiritual healing were among the top 3 modalities for each generational category. In 2003 and 2017, massage, spiritual healing, chiropractic treatments, exercise for a specific medical problem, vitamin B complex, and magnesium were consistently used among all generations. In 2017, melatonin use was more popular among millennials.

DISCUSSION

To our knowledge, this report describes the first study comparing similarities and differences in the prevalence and patterns of CIM use among patients with FM over an extended (14-year) period. This study documents the prevalence of CIM use in 2017 (among various age groups and generational categories) and shows that use of many types of CIM increased from 2003 levels. By using our previously published methods and survey instrument, we had the unique opportunity not only to assess the current climate of CIM use among patients with FM but also to directly

![Figure 3](https://doi.org/10.1016/j.mayocpiqo.2019.07.003)
measure any changes that occurred during the interval period. When comparing the results of our 2003 and 2017 surveys, we noted several major differences in use, which spanned all 3 CIM domains (treatments and techniques, vitamins and minerals, and herbs and other dietary supplements).

We noted a significant increase in the proportion of respondents who used at least one treatment or technique ($P < .0001$) (Supplemental Table 1, available online at http://www.mcpiqojournal.org). Specifically, we noted significant increases in the use of art therapy, aromatherapy, and homeopathic medicine (all $P < .0001$). We noted other increases (relaxation therapy, acupuncture, and magnetic therapy), but they were not statistically significant changes ($P = .002$, $P = .003$, and $P = .004$, respectively). Art therapy, an emerging integrative and stimulating therapy option for various pain-related conditions, has demonstrated benefits for improving pain, quality of life, and psychological outcomes. Aromatherapy has been identified by a survey study of patients with FM as one of the most effective adjunctive treatment options (90% of patients surveyed reported effectiveness of aromatherapy on their overall FM symptoms); thus, it has been suggested as an integrative therapy. Several clinical trials of aromatherapy have reported successful pain management in various patient groups, and a systematic review reported that aromatherapy can be used successfully in pain management (evidenced by a significant reduction in reported pain on a visual analog scale) as an integrative adjunct to conventional treatments. This systematic review further noted that aromatherapy more effectively treated nociceptive and acute pain compared with inflammatory or chronic pain. Mixed results have been reported for homeopathic treatments. Some review data have suggested potential health benefits from homeopathy in FM (specifically as it pertains to tender point count, pain intensity, and fatigue), but another study was unable to draw any definitive conclusions.

In terms of vitamins and minerals, we observed major changes in the use of several vitamins (Supplemental Table 2, available online at http://www.mcpiqojournal.org). Specifically, we noted a significant increase in the use of vitamin B complex ($P = .0002$) and a significant decrease in the use of vitamin E ($P < .0001$). This latter finding is a prime example of the direct impact of research on patient-directed self-care. Vitamin E use declined as evidence increasingly suggested that it did not have a beneficial role in cancer or cardiovascular diseases and might be associated with numerous medication interactions.

We observed a notable increase in the use of herbal or dietary supplements (Supplemental Table 3, available online at http://www.mcpiqojournal.org). Specifically, we noted significant increases in the use of melatonin, fish oil, garlic, ginger, and flaxseed (all $P < .0001$). We further noted non-significant increases in the use of green tea ($P = .003$), acidophilus ($P = .0005$), and L-lysine ($P = .001$) and a decrease in the use of chondroitin ($P = .004$). Melatonin has antioxidant, anti-inflammatory, and analgesic properties and has an important role in the pathophysiology of pain; therefore, it may be an effective tool in the management of FM-related musculoskeletal pain. In reserpine-induced FM in rats, melatonin reduced oxidative stress, inflammatory musculoskeletal changes, and difficulties with motor activity. The efficacy of melatonin in humans with FM has been documented in several clinical trials (reduced tender point count, severity of pain, and Fibromyalgia Impact Questionnaire score; improved sleep quality), with a high level of confirmation and limited adverse effects. For fish oil, studies of nationally representative samples have revealed substantial use among middle-aged women. In fact, the prevalence of fish oil use increased by 4-fold among older adults during a 5-year period. Although investigators have obtained some promising results for fish oil as an adjuvant therapy in rheumatoid arthritis and neuropathic pain management, more research is needed to evaluate its efficacy for FM symptom management. Ginger, with its analgesic and anti-inflammatory properties, has been widely used for more than 2500 years. Several studies have reported the efficacy of ginger in various inflammatory and pain-related conditions, and the authors of those studies recommend it as a suitable supplementary agent. In an experimental mouse model
CIM THERAPIES FOR PATIENTS WITH FIBROMYALGIA

of FM, ginger improved numerous FM-related symptoms, including allodynia, hyperalgesia, cognitive disturbances, anxiety, and depression.\(^5\) Garlic also has anti-inflammatory and analgesic properties and has been widely used since the Middle Ages. A recent review described numerous potential medical uses for garlic that ranged from acute inflammatory conditions (arthritis and hepatic injury) to migraines and vascular diseases.\(^60\,61\) Flaxseed, which contains fiber, has been consumed for thousands of years. Recent studies have documented its potential medical efficacy for constipation, hyperlipidemia, diabetes mellitus, and cancer.\(^62\) The National Center for Complementary and Integrative Health is currently studying the potential role of flaxseed in inflammatory conditions. However, these studies and their results are quite heterogeneous, use different methodologies, and often have weak evidence supporting their conclusions. Furthermore, there is a paucity of data regarding the role and effectiveness of many of these herbal or dietary supplements, including ginger, garlic, or flaxseed, specifically in FM.

Importantly, the prevalence of any kind of CIM use among patients with FM was nearly 100%. Considering the trends in use over the 14 years between our 2 studies, we believe that CIM use is firmly rooted in our patients with FM and is here to stay. What originally began as “alternative” treatment options has slowly, with the aid of ongoing research, assimilated into conventional medical practice and is now considered “complementary” and “integrative.” As such, it is imperative for health care professionals to be aware of these various treatment options and to be familiar with their associated basic efficacies, indications, and risks. Clinicians need to develop an effective strategy to screen patients for CIM use, assess CIMs for possible drug interactions, continually monitor for treatment efficacy (as would be done with all conventional treatments), and provide appropriate counsel. Two comprehensive online resources for clinicians include the National Center for Complementary and Integrative Health website (https://nccih.nih.gov) and the Natural Medicines Comprehensive Database (http://naturaldatabase.therapeuticresearch.com/home.aspx?cs=s&rs=ND).

Another interesting finding of this study is that the current use of various CIM modalities differed considerably between younger and older patients with FM (Supplemental Tables 1-3 [available online at http://www.mcpiqojournal.org]) and across generational categories (Figure 3). All generational categories of patients with FM reported increased CIM use overall compared with the 2003 cohort. The reasons underlying the high prevalence and increasing use of some CIM modalities in patients with FM is likely multifactorial, including the limited response to conventional treatment options, availability of CIM modalities, limited associated adverse effects, low cost, and the perplexing nature of FM symptoms, which often causes patients to seek other treatment options.\(^63\,65\) Our results also highlight that patients with FM are aware of and actively pursuing integrative medicine options, usually without the knowledge of their health care professional, due in part to the advancement of greater internet accessibility, improved evidence-based information available online, and online health information-seeking behavior.\(^66\,68\) We hypothesize that the differences in rates of use of various CIM modalities across generational categories and age also are likely multifactorial. A recent study found that although the sociodemographic characteristics associated with CIM use overall was highest in female, middle-aged, and higher-educated individuals, these characteristics differed significantly by specific disease.\(^69\) A subset analysis of that study concluded that people with musculoskeletal diseases use significantly greater CIM modalities across all sociodemographic variables (age, sex, educational level).\(^70\) In contrast, we identified differences in CIM use rates among our FM cohort (based on age and generational category), which we hypothesize could be due to differences in age or generational familiarity, acceptance, and willingness to try certain CIM modalities; differences in exposure to various CIM options partly due to variable health information-seeking behavior and possible variations in health care professional or facility acceptance, endorsement, and availability of CIM modalities; and socioeconomic variables. Further studies should explore age and generational variations by using a large sample size and preferably qualitative methodologies.

We acknowledge some limitations to the study, which was a survey of referral-based patients at a single academic medical center.
Although we compared survey results of 2 similar cross-sectional groups, future longitudinal, multicenter studies with a larger sample size would provide better understanding of trends in CIM use. Our survey results may have some selection bias, with referral-based patients at an academic center potentially being more knowledgeable and accepting of CIM options compared with other population groups. Another limitation is the exclusion of several popular CIM modalities such as tai chi and yoga. We aimed to maintain consistency with our original 2003 survey, which also excluded those factors. Although we remained consistent in our methodology, we acknowledge that these omissions specifically could have affected our results, potentially leading to an even higher rate of CIM usage. Finally, high-quality, controlled clinical trials with robust study designs are needed to identify the efficacy of CIM therapies for patients with FM.

CONCLUSION
Our results indicate a rising trend in the use of some CIM therapies among patients with FM across age and generational categories. Thus, it is imperative for health care professionals to be aware of and knowledgeable about these various modalities. In time, incorporation of these integrative options into a multifaceted treatment regimen may improve symptom management for patients with FM.

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SUPPLEMENTAL ONLINE MATERIAL
Supplemental material can be found online at http://www.mcpiqojournal.org. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

Abbreviations and Acronyms: CIM = complementary and integrative medicine; FM = fibromyalgia; FTP = fibromyalgia treatment program

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REFERENCES
1. Clauw DJ. Fibromyalgia: a clinical review. JAMA. 2014;311(15):1547-1555.
2. Pompers FB, Funck T, Feer NA, et al. Histological underpinnings of grey matter changes in fibromyalgia investigated using multimodal brain imaging. J Neurosci. 2017;37(5):1090-1101.
3. Di Franco M, Iannuccelli C, Bazzichi L, et al. Misdiagnosis in fibromyalgia: a multicentre study. Clin Exp Rheumatol. 2011;29(6, suppl 69):S104-S108.
4. Wolfe F, Ross K, Anderson J, Russell JJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum. 1995;38(1):19-28.
5. Weir PT, Harlan GA, Nkoy FL, et al. The incidence of fibromyalgia and its associated comorbidities: a population-based retrospective cohort study based on International Classification of Diseases, 9th Revision codes. J Clin Rheumatol. 2006;12(3):124-128.
6. Queiroz LP. Worldwide epidemiology of fibromyalgia. Curr Pain Headache Rep. 2013;17(8):356.
7. McBeth J, Jones K. Epidemiology of chronic musculoskeletal pain. Best Pract Res Clin Rheumatol. 2007;21(3):403-425.
8. Vincent A, Lahr BD, Wolfe F, et al. Prevalence of fibromyalgia: a population-based study in Olmsted County, Minnesota, utilizing the Rochester Epidemiology Project. Arthritis Care Res (Hoboken). 2013;65(5):786-792.
9. Wolfe F, Clauw DJ, Fitzcharles MA, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care Res (Hoboken). 2010;62(5):600-610.
10. Wolfe F, Clauw DJ, Fitzcharles MA, et al. 2016 Revisions to the 2010/2011 fibromyalgia diagnostic criteria. Semin Arthritis Rheumatol. 2016;46(3):319-329.
11. Wolfe F, Smythe HA, Yunus MB, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. report of the multicenter criteria committee. Arthritis Rheum. 1990;33(2):160-172.
12. Steiner JL, Bigatti SM, Ang DC. Trajectory of change in pain, depression, and physical functioning after physical activity adoption in fibromyalgia. J Health Psychol. 2015;20(7):931-941.
13. Steiner JL, Bigatti SM, Slaven JE, Ang DC. The complex relationship between pain intensity and physical functioning in fibromyalgia: the mediating role of depression. J Appl Biobehav Res. 2017;22(4):1207-9.
14. Steiner JL, Bagusch L, Bigatti SM. Values-based action in fibromyalgia: results from a randomized pilot of acceptance and commitment therapy. Health Psychol Res. 2013;1(3):e34.
15. Nüesch E, Häuser W, Bernardy K, Barth J, Jüni P. Comparative efficacy of pharmacological and non-pharmacological interventions in fibromyalgia syndrome: network meta-analysis. Ann Rheum Dis. 2013;72(6):955-962.
16. Higg JB. Fibromyalgia in primary care. Prim Care. 2018;45(2):325-341.
17. Clarke TC, Black LI, Stussman BJ, Barnes PM. Trends in the use of complementary health approaches among adults: United States, 2002-2012. Natl Health Stat Rep. 2015;79(1):1-16.
18. Clarke TC, Barnes PM, Black LI, Stussman BJ, Nahin RL. Use of yoga, meditation, and chiropractors among U.S. adults aged 18 and over. NCHS Data Brief. 2018;325(1):1-8.
19. Iannuccelli C, Mannocci F, Guzzo MP, et al. Complementary treatment in fibromyalgia combination of somatic and abdominal acupuncture. Clin Exp Rheumatol. 2012;30(6, suppl 74):11-116.
20. Iannucci C, Guzzo MP, Atzeni F, et al. Pain modulation in patients with fibromyalgia undergoing acupuncture treatment is associated with fluctuations in serum neuropeptide Y levels. Clin Exp Rheumatol. 2017;35(5 suppl):105:81-85.

21. Li YH, Wang FY, Feng CQ, Yang XJ, Sun YH. Massage therapy for fibromyalgia: a systematic review and meta-analysis of randomized controlled trials. PLoS One. 2014;9(2):e89304.

22. Dias PA, Guimarães AB, Albuquerque ADe O, de Oliveira KL, Cavaletti ML, Guimarães SB. Short-term complementary and alternative medicine on quality of life in women with fibromyalgia. J Int Med Res. 2016;44(1):29-35.

23. Menzies V. Fibromyalgia syndrome: current considerations in symptom management. Am J Nurs. 2016;116(1):124-32.

24. Wang C, Schmid CH, Rones R, et al. A randomized trial of tai chi for fibromyalgia. N Engl J Med. 2010;363(8):743-754.

25. Wahnert-Roedel DL, Elkin PL, Vincent A, et al. Use of complementary and alternative medical therapies by patients referred to a fibromyalgia treatment program at a tertiary care center. Mayo Clin Proc. 2005;80(1):65-50.

26. Demarin V, Bedeković D, Ciglarek P, Rovšek J, Pernar T. Use of melatonin in chronic pain syndromes. Nutrients. 2015;7(4):1469-1490.

27. Kim KS, Loring S, Kwekkeboom K. Use of art-making interventions for patients with fibromyalgia. J Holist Nurs. 2017;49(4):379-388.

28. Barbour C. Use of complementary and alternative treatments by individuals with fibromyalgia syndrome. J Am Acad Nurse Pract. 2000;12(8):311-316.

29. Demirbalı B, Erol B. The effects of sleep and touch therapy on symptoms of fibromyalgia and depression. J Public Health. 2021;41(1):44-53.

30. Sutter D, Monnane LA, Rombolí L, et al. Aromatherapy and aromatic plants for the treatment of behavioural and psychological symptoms of dementia in patients with Alzheimer's disease: clinical evidence and possible mechanisms. Evid Based Complement Alternat Med. 2017;2017:79416305.

31. Gok Metin Z, Arkan Donmez A, Igu N, Ozdemir L, Arslan E. Aromatherapy massage for neuropathic pain and quality of life in diabetic patients. J Nurs Scholarsh. 2017;49(4):379-388.

32. Sut N, Kayaoglu-Sut H. Effect of aromatherapy massage on pain in primary dysmenorrhea: a meta-analysis. Complement Ther Clin Pract. 2017;27:25-10.

33. Lakhani SE, Shearer H, Tepper D. The effectiveness of aromatherapy in reducing pain: a systematic review and meta-analysis. Pain Res Treat. 2016;2016:158693.

34. Boehm K, Raak C, Cramer H, Ostermann T. Homeopathy in the treatment of fibromyalgia—a comprehensive literature-review and meta-analysis. Complement Ther Med. 2014;22(4):731-742.

35. Perry R, Leach V, Davies P, Penfold C, Ness A, Churchill R. An overview of systematic reviews of complementary and alternative therapies for fibromyalgia using both AMSTAR and ROBIS as quality assessment tools. Syst Rev. 2017;6(1):97.

36. National Institutes of Health; Office of Dietary Supplements. Vitamin E: fact sheet for consumers. National Institutes of Health website. https://ods.od.nih.gov/FactSheets/VitaminE-Consumer/. Updated July 12, 2019. Accessed January 3, 2019.

37. Danilov A, Kurganova J. Melatonin in chronic pain syndromes. Pain Ther. 2016;5(3):1-17.

38. Dopico A, Soto A, Arrebola A, Vázquez AA, Santamaria P, García-Ruiz J. Omega-3 fatty acids and melatonin for fibromyalgia: a double-blind, randomized, placebo-controlled clinical trial. J Tradit Complement Med. 2016;6(3):199-203.
59. Ozgoli G, Goli M, Moattar F. Comparison of effects of ginger, mefenamic acid, and ibuprofen on pain in women with primary dysmenorrhea. J Altern Complement Med. 2009;15(2):129-132.
60. Mahdizadeh S, Khaleghi Ghadiri M, Gorji A. Avicenna’s Canon of Medicine: a review of analgesics and anti-inflammatory substances. Avicenna J Phytomed. 2015;5(3):182-202.
61. National Center for Complementary and Integrative Health. Garlic [fact sheet]. https://nccih.nih.gov/health/garlic/ataglance.htm. Updated November 30, 2016. Accessed January 3, 2019.
62. National Center for Complementary and Integrative Health. Flaxseed and flaxseed oil [fact sheet]. https://nccih.nih.gov/health/flaxseed/ataglance.htm. Updated November 30, 2016. Accessed January 3, 2019.
63. Feinberg T, Lilly C, Innes K. Nonvitamin, nonmineral dietary supplement use among adults with fibromyalgia: United States, 2007-2012. Evid Based Complement Alternat Med. 2017:2017:
64. Marcus DA, Bernstein CD, Haq A, Breuer P. Including a range of outcome targets offers a broader view of fibromyalgia treatment outcome: results from a retrospective review of multidisciplinary treatment. Musculoskeletal Care. 2014;12(2):74-81.
65. Lobo CP, Pfalzgraf AR, Giannetti V, Kanyongo G. Impact of invalidation and trust in physicians on health outcomes in fibromyalgia patients. Prim Care Companion CNS Disord. 2014;16(5). https://doi.org/10.4088/PCC.
66. Oh YS, Song NK. Investigating relationships between health-related problems and online health information seeking. Comput Inform Nurs. 2017;35(1):29-35.
67. Bragazzi NL, Amital H, Adawi M, et al. What do people search online concerning the “elusive” fibromyalgia? insights from a qualitative and quantitative analysis of Google Trends. Clin Rheumatol. 2017;36(8):1873-1878.
68. Jong MC, van de Vijver L, Busch M, Fritsma J, Seldenrijk R. Integration of complementary and alternative medicine in primary care: what do patients want? Patient Educ Couns. 2012;89(3):417-422.
69. Drieskens S, Tafforeau J, Demarest S. Do sociodemographic characteristics associated with the use of CAM differ by chronic disease? Eur J Public Health. 2019;29(4):655-660.