ORIGINAL RESEARCH

Advanced Practice Providers' Knowledge, Attitudes, and Utilization of Complementary and Integrative Medicine at an Academic Medical Center

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ABSTRACT

Context • Complementary and integrative medicine comprises treatments used along with conventional medical care. Its use within care settings and communities has increased.

Objective • We aimed to assess baseline knowledge and use of complementary and integrative medicine among advanced practice providers at an academic medical center and their attitudes toward it.

Methods • A 50-question survey was sent to 1018 advanced practice providers at our academic medical center to evaluate their knowledge, attitudes, and utilization of complementary and integrative medicine therapies.

Results • The 556 respondents (54.6% response rate) included physician assistants, nurse practitioners, certified registered nurse anesthetists, clinical nurse specialists, and certified nurse midwives. Respondents reported a positive attitude toward complementary and integrative medicine and were likely to refer their patients to a complementary and integrative medicine practitioner (59%). They agreed that patients whose providers incorporate complementary and integrative medicine into their care have better clinical outcomes (nurse practitioners, 93%; certified registered nurse anesthetists, 87%; physician assistants, 85%; $P = .002$) and improved patient satisfaction (all respondents, 84%). Advanced practice providers, especially nurse practitioners, stated that they initiate the conversation to discuss the benefits and harms of complementary and integrative medicine with their patients (nurse practitioners, 93%; certified registered nurse anesthetists, 87%; physician assistants, 85%; $P < .001$). Respondents most frequently endorsed overall exercise, massage, and melatonin. Prospective randomized controlled trials were the most influential factor for attitude toward complementary and integrative medicine among physician assistants (50%), and personal experience was the most influential factor among nurse practitioners (52.9%) and certified registered nurse anesthetists (46.8%).

Conclusions • Advanced practice providers generally have positive attitudes toward complementary and integrative medicine, but utilization appears limited by a self-report of low knowledge of benefits and risks of various therapies. For patient safety and satisfaction, advanced practice providers require a strong complementary and integrative medicine knowledge base to counsel patients. (*Altern Ther Health Med.* 2020;26(5):8-16)

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INTRODUCTION

Complementary and integrative medicine (CIM) is defined as treatments that are used along with conventional medical care.[1] The use of CIM approaches to health and wellness has grown within care settings and in communities.[2] According to the 2012 National Center for Complementary and Integrative Health, CIM is used by approximately 33% of adults and 11.6% of children aged 4 to 17 in the United States.[1] In 2016, approximately $30 billion was spent out of pocket for CIM by patients in the United States.[1] As the body of reliable CIM evidence grows and insurance coverage of CIM increases, patient demand for CIM is predicted to increase. Because CIM use is being reported by patients, it is

imperative for health care providers to have a strong level of knowledge about CIM to ensure safe and competent practice.

Health care professionals generally have a positive attitude about CIM but report a gap in their current CIM knowledge.[3-5] Previous studies at our academic center assessed physician knowledge of and attitudes toward CIM in 2005 and 2013.[6,7] These surveys demonstrated an increased willingness to use CIM, but knowledge of and experience with many specific CIM treatments did not change. A study assessing the attitudes of physicians, midwives, nurses, and physical therapists in Switzerland toward CIM for chronic pain also found a positive perception of CIM but with self-reported limited CIM knowledge.[8]

Patients frequently do not discuss their use of CIM with their non-CIM medical providers.[3,9] Reasons for this include time constraints during their visits, the patient not understanding its importance to their medical care, or the patients simply not being asked about their CIM use.[10] Although very few prescription medications and dietary supplements have been reported to account for clinically significant interactions,[11] understanding the potential interactions of CIM, especially herbal therapy, with prescription medications is essential for patient safety. Previous studies showed that more than 40% of patients used supplements preoperatively[12,13] and that various herbal therapies and homeopathic medications may adversely interact with blood pressure, coagulation, electrolytes, and cardiac function.[12-14] Other studies have shown that as providers' knowledge about CIM increases, they are more likely to ask patients about their CIM use, are more willing to discuss safety and efficacy of various CIM therapies, and are more likely to offer these therapies as part of the care plan for acute and chronic medical disorders.[15,16]

Because of the need for improved access to health care, especially with a shortage of primary care physicians,[17,18] advanced practice providers (APPs) have been integrated into the American health care system. APPs are now among the fastest growing professions in the United States.[19] APPs often work in direct patient care: 70% of nurse practitioners (NPs) and more than one-fourth of the 123 000 physician assistants (PAs) work in primary care.[20-23] According to the Academy of Family Physicians, primary care providers are seen as the first point of contact in the health care setting for patients and are responsible for continuation of their comprehensive care.[24] Many APPs are, therefore, in an opportune setting to discuss CIM with their patients.

APPs have reported limited CIM knowledge.[25,26] Attending postgraduate workshops and self-study have been the common methods for learning.[27] In 1999, the American Academy of Physician Assistants adopted a policy that supported the integration of CIM into PA education, which was revised in 2005, noting that PAs needed to be knowledgeable about the therapies their patients were using.[28,29] Although CIM education is part of the core competencies of NPs and PAs, Lloyd et al[30] noted that the PA curriculum covers more mainstream methods. The curriculum is taught in the usual lecture format, often without evaluation, and the students spend less than 1 hour with a CIM provider during their training.[30] As a result, providers perceive a sense of lack of knowledge and uncertainty about where to obtain reliable information regarding CIM. One survey of NPs[16] reported that NPs are familiar with the more common CIM therapies through professional educational opportunities and their own personal use and they discuss such therapies with their patients. However, these conversations are directed or limited by the NP's knowledge of the particular CIM therapy.[16] Medical providers desire more education to shift patient discussion from personal experience to evidence based.[31]

Patient demand for CIM is growing and the number of practicing APPs is expanding. Because of the efficacy and safety concerns related to CIM, we evaluated and compared the current knowledge, attitudes, and utilization of CIM among various APPs (PAs, NPs, certified registered nurse anesthetists [CRNAs], clinical nurse specialists [CNSs], and certified nurse midwives [CNMs]) in an academic medical center.

METHODS

APP Survey

Study Population and Setting. The study was approved by the Mayo Clinic Institutional Review Board as an exempt study. This cross-sectional survey study was conducted among all APPs working at Mayo Clinic, Rochester, Minnesota. A link to an anonymous, web-based survey was emailed in April 2017 to 1018 APPs: 484 NPs, 294 CRNAs, 207 PAs, 22 CNSs, and 11 CNMs. An email reminder was sent at 2 weeks and at 4 weeks, and a hard copy reminder was sent at 6 weeks through intrainstitutional mail to those who had not yet responded. To facilitate recruitment, every respondent was provided a free book on stress management.

Survey Instrument Development. The questionnaire was adapted from a survey instrument we used in the past among physicians at our institution.[9,10] The survey consisted of 50 questions, posed in a closed manner, addressing 3 areas of CIM therapy: (1) utilization and outcomes (6 questions); (2) familiarity and experience (27 questions); and (3) attitudes toward CIM (17 questions), along with 12 demographics questions. An electronic survey instrument was created using the Research Electronic Data Capture tool hosted by our institution, which is a secure, web-based application designed to support data capture for research studies.[32]

Statistical Analysis

Survey responses were summarized with frequencies and percentages. Respondent characteristics and answers to the CIM utilization questions were compared between NPs, PAs, and CRNAs with χ^2 tests for categorical items and with Kruskal-Wallis tests for ordinal or continuous items. Scales with Likert-type response options were treated ordinally (ie, strongly disagree to strongly agree; very unlikely to very likely). *P* values less than .05 were considered statistically significant. All analyses were performed with SAS statistical software (version 9.4; SAS Institute Inc).

Table 1. Questions Regarding CIM Referrals and Patient Discussions[a]

Question	Total (N=534)	Nurse Practitioners (n=278)	Physician Assistants (n=130)	Certified Registered Nurse Anesthetists (n=126)	*P* Value
How likely is it that you would refer a patient to a CIM practitioner for treatment of an ailment?					<.001[b]
Very likely	137 (25.7)	93 (33.5)	27 (20.8)	17 (13.5)	
Somewhat likely	180 (33.7)	103 (37.1)	48 (36.9)	29 (23.0)	
Neither likely nor unlikely	68 (12.7)	35 (12.6)	18 (13.8)	15 (11.9)	
Somewhat unlikely	54 (10.1)	24 (8.6)	20 (15.4)	10 (7.9)	
Very unlikely	95 (17.8)	23 (8.3)	17 (13.1)	55 (43.7)	
Have you ever referred a patient to a CIM practitioner?					<.001[c]
Yes	235 (44.0)	156 (56.1)	73 (56.2)	6 (4.8)	
No	299 (56.0)	122 (43.9)	57 (43.8)	120 (95.2)	
What percentage of your patients do you talk about possible benefits of using a CIM therapy?					<.001[b]
0%	134 (25.1)	28 (10.1)	28 (21.5)	78 (61.9)	
1%-25%	251 (47.0)	139 (50.0)	72 (55.4)	40 (31.7)	
26%-50%	83 (15.5)	60 (21.6)	16 (12.3)	7 (5.6)	
51%-75%	43 (8.1)	34 (12.2)	8 (6.2)	1 (0.8)	
76%-99%	18 (3.4)	14 (5.0)	4 (3.1)	0 (0.0)	
100%	5 (0.9)	3 (1.1)	2 (1.5)	0 (0.0)	
With approximately what percentage of your patients do you talk about possible harmful outcomes of using a CIM therapy?					<.001[b]
0%	333 (62.4)	150 (54.0)	77 (59.2)	106 (84.1)	
1%-25%	144 (27.0)	89 (32.0)	36 (27.7)	19 (15.1)	
26%-50%	38 (7.1)	29 (10.4)	9 (6.9)	0 (0.0)	
51%-75%	7 (1.3)	4 (1.4)	3 (2.3)	0 (0.0)	
76%-99%	9 (1.7)	5 (1.8)	4 (3.1)	0 (0.0)	
100%	3 (0.6)	1 (0.4)	1 (0.8)	1 (0.8)	
Who usually initiates discussions of benefits and risks of a CIM therapy?	(n=400)	(n=245)	(n=101)	(n=54)	.002[c]
I initiate the discussion	185 (46.3)	128 (52.2)	37 (36.6)	20 (37.0)	
Patient initiates the discussion	183 (45.8)	105 (42.9)	54 (53.5)	24 (44.4)	
Third party initiates the discussion	32 (8.0)	12 (4.9)	10 (9.9)	10 (18.5)	
To what extent do you believe that CIM therapies in clinical practice result in increased patient satisfaction?					.01[b]
Very positive impact	188 (35.2)	111 (39.9)	39 (30.0)	38 (30.2)	
Somewhat positive impact	261 (48.9)	134 (48.2)	67 (51.5)	60 (47.6)	
Neither positive nor negative	82 (15.4)	31 (11.2)	23 (17.7)	28 (22.2)	
Somewhat negative impact	1 (0.2)	1 (0.4)	0 (0.0)	0 (0.0)	
Very negative impact	2 (0.4)	1 (0.4)	1 (0.8)	0 (0.0)	
To what extent do you believe that CIM therapies in clinical practice attract more patients?					.004[b]
Very likely	123 (23.0)	73 (26.3)	22 (16.9)	28 (22.2)	
Somewhat likely	230 (43.1)	128 (46.0)	53 (40.8)	49 (38.9)	
Neither likely nor unlikely	156 (29.2)	68 (24.5)	46 (35.4)	42 (33.3)	
Somewhat unlikely	20 (3.7)	7 (2.5)	6 (4.6)	7 (5.6)	
Very unlikely	5 (0.9)	2 (0.7)	3 (2.3)	0 (0.0)	

[a]Values are No. of respondents (%).
[b]χ^2 test.
[c]Kruskal-Wallis test.

Abbreviation: CIM, complementary and integrative medicine.

Table 2. Familiarity With Complementary and Integrative Medicine Treatments, Techniques, and Herbs[a]

	Understand Proposed Medicinal Use and Comfortable Counseling Patients			Understand Proposed Medicinal Use but Uncomfortable Counseling Patients			Limited Familiarity			Unfamiliar			
Treatment/Technique	**PA**	**NP**	**CRNA**	**PA**	**NP**	**CRNA**	**PA**	**NP**	**CRNA**	**PA**	**NP**	**CRNA**	***P* Value**
Acupuncture	13.1	23.0	7.1	45.4	45.7	34.9	36.2	27.0	38.1	5.4	4.3	19.8	<.001
Chiropractic	20.8	28.1	10.3	46.9	46.8	44.4	27.7	23.0	29.4	4.6	2.2	15.9	<.001
Massage	51.5	69.8	24.6	32.3	22.7	43.7	12.3	5.8	20.6	3.8	1.8	11.1	<.001
Biofeedback	15.4	20.1	4.8	34.6	34.2	22.2	35.4	33.5	38.9	14.6	12.2	34.1	<.001
Energy healing	1.5	9.0	2.4	19.2	29.5	14.3	31.5	35.3	32.5	47.7	26.3	50.8	<.001
Exercise	76.2	85.6	46.8	16.2	8.6	29.4	4.6	4.3	15.1	3.1	1.4	8.7	<.001
Homeopathy	4.6	6.5	4.0	16.9	30.2	19.0	50.0	42.8	37.3	28.5	20.5	39.7	<.001
Herbal	4.6	11.5	4.0	27.7	32.4	26.2	48.5	43.9	40.5	19.2	12.2	29.4	<.001
Megavitamin therapy	3.1	5.4	4.0	18.5	20.1	15.1	39.2	43.9	34.9	39.2	30.6	46.0	.02
Naturopathy	3.1	4.0	1.6	15.4	18.7	11.1	43.8	42.8	34.9	37.7	34.5	52.4	.002
Resilience	29.2	42.1	15.1	34.6	27.0	27.0	23.1	24.1	30.2	13.1	6.8	27.8	<.001
Cranberry	14.6	20.1	3.2	23.1	20.5	12.7	37.7	37.4	33.3	24.6	21.9	50.8	<.001
Coenzyme Q10	10.8	14.7	1.6	26.2	27.0	13.5	37.7	37.4	36.5	25.4	20.9	48.4	<.001
Echinacea	4.6	10.8	2.4	19.2	21.2	15.9	43.8	43.2	39.7	32.3	24.8	42.1	<.001
Fish oil	28.5	41.0	9.5	33.1	22.7	27.0	29.2	30.2	43.7	9.2	6.1	19.8	<.001
Garlic	5.4	14.0	4.8	26.2	24.5	23.8	37.7	38.8	41.3	30.8	22.7	30.2	.02
Ginkgo biloba	3.8	8.6	4.0	22.3	22.3	21.4	45.4	43.9	42.9	28.5	25.2	31.7	.20
Ginseng	4.6	8.6	4.0	23.1	21.6	19.0	41.5	42.4	43.7	30.8	27.3	33.3	.20
Melatonin	42.3	55.0	8.7	30.0	19.4	27.0	23.8	20.5	44.4	3.8	5.0	19.8	<.001
Saw palmetto	10.0	7.9	2.4	21.5	21.2	12.7	40.0	38.5	41.3	28.5	32.4	43.7	.001
St. John's Wort	6.2	12.6	4.8	23.1	21.9	17.5	45.4	39.9	40.5	25.4	25.5	37.3	.008
Turmeric	6.9	10.4	6.3	22.3	19.1	15.1	34.6	40.3	33.3	36.2	30.2	45.2	.02
Valerian	0.8	6.5	4.0	20.0	17.6	9.5	31.5	36.7	36.5	47.7	39.2	50.0	.03

[a] Values are percentage of respondents.

Abbreviations: CRNA, certified registered nurse anesthetist; NP, nurse practitioner; PA, physician assistant.

RESULTS

Demographic Characteristics

Between April 2017 and July 2017, 1,018 APPs were invited to participate in the study (web- and paper-based survey), of whom 556 responded (response rate, 54.6%). Half of respondents were NPs (n = 278, 50.1%), followed by PAs (n = 130, 23.4%), CRNAs (nv= 126, 22.7%), CNSs (n = 16), and CNMs (n = 5), and 1 with an unknown role. The summary and analyses that follow focus on the 534 NPs, PAs, and CRNAs.

Most of the 534 respondents were women (n = 444, 83.1%), with significantly more women in the NP role (93.1%) than the PA and CRNA roles (72.1% and 76.6%, respectively, $P < .001$) (Supplemental Table). PAs were younger than NPs and CRNAs (25-35 years: 55.9%, 34.7%, and 25.4%, respectively; $P < .001$). The majority of respondents (n = 500, 93.6%) were white. Specialties included anesthesiology (n = 124, 23.2% [largely because of the inclusion of CRNAs]), cardiology (n = 57, 10.7%), general internal medicine (n = 51, 9.6%), family medicine (n = 39, 7.3%), and hematology (n = 30, 5.6%). For the majority (73.8%) of the APPs, most of their time was dedicated to direct patient care (76%-100% of their time). The largest percentage of respondents (42.1%) had 0 to 5 years of practice experience, followed by 6 to 10 years (20.8%), 11 to 15 years (12.2%), 16 to 20 years (9.7%), and more than 20 years (15.2%). CRNAs had significantly more experience overall than PAs and NPs (≥16 years: 35.7% vs 19.2% and 22.7%, respectively; $P < .001$) (Supplemental Table).

CIM Referrals and Discussion

The majority of APPs (n = 317, 59.4%) were likely to refer their patients to a CIM practitioner, with NPs (70.6%) being more likely than PAs (57.7%) or CRNAs (36.5%) (P <v.001) (Table 1). NPs (56.1%) and PAs (56.2%) were equally likely to have referred a patient to a CIM provider compared with CRNAs (4.8%) ($P < .001$). The percentage of patients with whom possible benefits of using a CIM therapy were discussed was significantly higher in NPs followed by PAs, and was quite low among CRNAs ($P < .001$). Similarly, discussion with patients about possible harmful outcomes of using a CIM therapy was significantly higher in NPs, followed by PAs and CRNAs ($P < .001$), although discussion of possible harmful outcomes occurred less frequently than discussion of possible benefits. More NPs (52.2%) initiated discussion of benefits and risks of CIM compared with PAs (36.6%) and CRNAs (37.0%) ($P = .002$). Overall, 449 APPs (84.1%) believed that CIM in clinical practice would increase patient satisfaction, and 353 (66.1%) believed that CIM would likely attract more patients, with NPs having slightly more positive attitudes than PAs and CRNAs ($P = .004$).

APP Familiarity and Experience With Various CIM Treatments, Herbs, and Supplements

When asked about their familiarity and comfort level with counseling patients about the proposed medicinal use of various CIM modalities, APPs understood and were most comfortable

Table 3. APP Attitudes Toward CIM[a]

Statement	Agree			Neither Agree Nor Disagree			Disagree			*P* Value
	PA	NP	CRNA	PA	NP	CRNA	PA	NP	CRNA	
Patients whose providers are knowledgeable about CIM practices, in addition to conventional medicine, have better clinical outcomes than those whose providers are ONLY familiar with conventional medicine.	45.4	60.4	50.8	43.8	34.9	46.8	10.8	4.7	2.4	.002
The spiritual beliefs and practices of PROVIDERS play an important role in healing.	44.6	51.1	53.2	35.4	33.8	30.2	20.0	15.1	16.7	.57
The spiritual beliefs and practices of PATIENTS play an important role in healing.	84.6	92.8	86.5	10.8	5.8	12.7	4.6	1.4	0.8	.02
Counseling on nutrition should be a major role of the provider toward prevention of chronic disease.	87.7	93.9	84.9	7.7	4.7	14.3	4.6	1.4	0.8	.002
Providers should have knowledge about the most prominent CIM treatments.	76.9	88.8	79.4	18.5	9.7	19.8	4.6	1.4	0.8	.003
I believe that CIM treatments have a positive impact on the treatment of symptoms, conditions, and/or diseases.	70.0	86.7	74.6	26.2	12.9	24.6	3.8	0.4	0.8	<.001

[a]Values are percentage of respondents.

Abbreviations: APP, advanced practice provider; CIM, complementary and integrative medicine; CRNA, certified registered nurse anesthetist; NP, nurse practitioner; PA, physician assistant.

Table 4. Impact of Various Factors on APP Attitudes Toward CIM Therapies[a]

Impact on Your Opinion of CIM Effectiveness	High Impact			Moderate Impact			Minimal Impact			No Impact			*P* Value
	PA	NP	CRNA	PA	NP	CRNA	PA	NP	CRNA	PA	NP	CRNA	
Personal experience; positive results when using therapy on myself	36.9	52.9	46.8	40.8	36.0	38.1	11.5	7.2	10.3	10.8	4.0	4.8	.002
Recommendations of family and friends who have tried the therapy	16.2	27.3	23.0	47.7	49.3	55.6	29.2	20.5	15.1	6.9	2.9	6.3	.004
Recommendations of respected colleagues who have used the therapy on themselves	28.5	38.5	34.1	51.5	51.1	50.8	13.1	8.3	9.5	6.9	2.2	5.6	.02
Recommendations of a medical specialist to whom you have referred a patient	33.1	41.7	27.8	44.6	50.4	49.2	14.6	5.4	14.3	7.7	2.5	8.7	<.001
Case reports in CIM journals	13.1	21.2	12.7	37.7	46.4	54.0	35.4	27.3	23.0	13.8	5.0	10.3	.001
Case reports in standard medical journals	20.8	24.8	16.7	43.8	50.0	57.9	26.9	21.6	16.7	8.5	3.6	8.7	.10
Retrospective case-control studies reported in standard medical journals	26.9	27.3	23.0	45.4	52.9	50.0	19.2	16.5	19.0	8.5	3.2	7.9	.20
Prospective randomized controlled trials	50.0	46.0	39.7	33.1	40.3	42.1	10.8	10.8	8.7	6.2	2.9	9.5	.24

[a]Values are percentage of respondents.

Abbreviations: APP, advanced practice provider; CIM, complementary and integrative medicine; CRNA, certified registered nurse anesthetist; NP, nurse practitioner; PA, physician assistant.

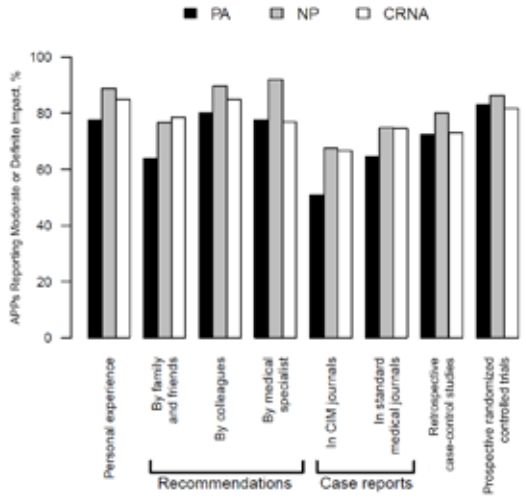
with exercise, massage, melatonin, resilience/stress management, and fish oil (Table 2). The understanding of and comfort level with most of the CIM modalities also differed significantly ($P<.001$) between the 3 groups. In general, NPs tended to report the highest understanding and comfort level, followed by PAs and CRNAs.

We asked participants about the ease of finding reliable information about herbs and other CIM therapies (eg, acupuncture and massage therapy). APPs reported that it was somewhat to very difficult to find reliable information regarding herbs (PA = 42%, NP = 38%, CRNA = 40%) and information regarding other therapies (PA = 35%, NP = 34%, CRNA = 41%).

APP Attitudes Toward CIM

When APPs were asked about their attitudes toward CIM, NPs had slightly stronger attitudes in favor of CIM than PAs and CRNAs; although these differences were significantly different among the groups in most cases, the level of agreement for most APPs overall was high (Table 3). Most APPs agreed that CIM has a positive impact on the treatment of symptoms, conditions, and diseases (NP = 86.7%,

Figure. Respondents Reporting Moderate or Definite Impact of Various Factors on Their Attitudes Toward Complementary and Integrative Medicine (CIM) Therapies. APPs indicates advanced practice providers; CRNA, certified registered nurse anesthetist; NP, nurse practitioner; PA, physician assistant.



CRNA = 74.6%, PA = 70.0%; $P < .001$). APPs also believed that providers should have knowledge about the most prominent CIM treatments (NP = 88.8%, CRNA =v79.4%, PA = 76.9%; $P = .003$), including counseling on nutrition for the prevention of major disease (NP= 93.9%, PAv= 87.7%, CRNA = 84.9%; $P = .002$).

Most APPs also agreed that the spiritual beliefs and practice of patients are important in the healing process (NP = 92.8%, CRNA = 86.5%, PA = 84.6%; $P = .02$). Similarly, many APPs agreed that patients of providers who are knowledgeable in both CIM and conventional medicine have better clinical outcomes than those whose providers are only familiar with conventional medicine (NP = 60.4%, CRNA = 50.8%, PA = 45.4%; $P = .002$). About half the APPs believed that the spiritual beliefs and practices of providers have an important role in healing (lowest among PAs, but not significant between provider types; $P = .57$).

Impact of Various Factors on APP Attitudes Toward CIM Therapies

Several factors had a moderate to high impact on APPs' attitudes toward CIM (Table 4, Figure). In particular, recommendations by medical specialists or colleagues, as well as personal experience or recommendations by family/friends, were the most influential, but this varied by provider type (highest percentages among NPs; $P < .05$ for all). PAs tended to express less impact of these factors than did NPs and CRNAs. Prospective randomized controlled trials were reported as having moderate to high impact, and the percentages were similar between the provider groups. For the factors that had high (not moderate) impact, prospective randomized controlled trial data was the most influential factor among PAs (PA = 50.0%, NP = 46.0%, CRNA = 39.7%), and personal experience was the most influential factor among NPs and CRNAs (NP = 52.9%, CRNA = 46.8%, PA = 36.9%). Case reports in CIM journals and recommendations by family and friends had lesser impact, especially among PAs.

CNSs/CNMs

CNSs and CNMs accounted for less than 4% of the respondents in this survey so were not included in the overall analysis, but there were a few points of interest in these small subsets. CNSs/CNMs believed that CIM in clinical practice has a somewhat to very positive impact on a patient's health outcomes and that offering CIM positively impacts patient satisfaction. CNSs/CNMs also agreed that providers should have knowledge about the most prominent CIM. These APPs felt most familiar with exercise and stress management and least familiar with megavitamins, energy healing, and naturopathy.

DISCUSSION

This study was designed to assess the knowledge, attitudes, and utilization of CIM in a cohort of APPs of an academic medical center. Although multiple studies have assessed physician attitudes toward CIM,[6,7,33-35] there are limited studies on PA attitudes[26,30] and NP attitudes and knowledge.[16,36]To our knowledge, this is the first study surveying a collective group of APPs working at a major academic medical center with regard to their attitude, knowledge, and utilization of CIM.

Our study showed that APPs generally have a positive view of CIM and are likely to refer patients to a CIM practitioner, which is concordant with other studies.[16,25,37,38] We noted significant differences in utilization, discussion, and understanding of CIM among the various subgroups of APPs. NPs were more likely to initiate discussions about CIM, discuss benefits and harms, and refer their patients to a CIM specialist. The reason for this may be the inclusion of a more holistic approach to patient care in nursing education than in the other groups.[39] APPs, even within subgroups, may have different levels of exposure to CIM during their education depending on the program they attend. Practice setting also most likely contributes to the differences in discussion and referral rates. In the current survey, NP and PA respondents were more likely than CRNAs to work in a clinical setting where they might have more opportunity to discuss the use of CIM (97% of the CRNAs practiced in anesthesiology or general surgery).

APP respondents in all 3 groups were overwhelmingly women; our percentage was slightly higher than the national average of women APPs.[20,21,37] Other studies have shown that female medical providers are more likely to use CIM themselves and to refer patients to CIM practitioners than their male counterparts.[4,5,8,10] The respondents were also younger and with fewer years in practice than national averages for the 3 professions; their responses may reflect changes in APP curricula, as well as increased personal

exposure to CIM as therapies have become more accepted in mainstream medicine.[20,21,37]

Patients' disclosure of their CIM use is important for a holistic care plan. One meta-analysis[40] revealed some reasons why patients neglect to disclose their CIM use to their medical providers: (1) lack of inquiry from the provider and (2) belief that providers lacked the knowledge. Our findings were also similar in that the majority of APPs do not initiate the discussion about CIM use or talk about the possible benefits/harms of CIM therapy with most of their patients. However, they reported that integrated CIM therapies can foster a positive impact on patient satisfaction, which is in agreement with prior studies.[3,4,41] These findings indicate that more education/training and awareness about CIM therapy are required for medical providers to integrate CIM with conventional treatment.

NPs tended to report a greater understanding of and comfort level with CIM than the other surveyed groups. The reason for this may be the inclusion of a more holistic approach to patient care in nursing education than in other groups.[39] APPs noted difficulty finding reliable information about the safety and efficacy of various CIM therapies. This was unexpected because at our institution, the CIM department has been available since 2006, and computers are available in every patient room. Therein exists an opportunity for increased awareness of resources at our academic center. Reliable databases (such as Natural Medicine Comprehensive Database https://naturalmedicines.therapeuticresearch.com) may be used to foster conversation with patients regarding the safety and effectiveness of many herbal therapies during a clinic visit. Institutions could provide professional CIM educational opportunities and program development to meet the needs of patient demands. Fostering the belief that CIM is an integrative part of a patient's treatment plan, as its name implies, rather than an alternative to traditional allopathic therapies, is crucial. Multiple studies have documented that providers who attend lectures on CIM, receive formal CIM training, or have personal experience with CIM have higher rates of referral for CIM.[8,15,16]

Education centers and workplaces should take the opportunity for demonstration (eg, CIM fairs or noon-hour sessions) such as the weekly noon lecture series provided at our institution to increase provider exposure to CIM. Additionally, increased CIM education may be beneficial to provider well-being in the long term. In one study, after CIM course instruction, medical students not only expressed increased familiarity with various modalities but also reported improved well-being because as they were learning they were also incorporating CIM practices in their own self-care.[42]

Many factors are involved as patients come to decisions regarding treatment; providers must be knowledgeable about CIM as well as sensitive to their patients' decision-making process and beliefs. An open conversation with patients about CIM may promote a stronger patient-provider relationship.[9,43]

CNSs/CNMs at our institution believed that CIM positively affects patient health outcomes and patient satisfaction, which is in accordance with similar surveys of CNMs.[44] CNSs/CNMs also agreed that providers should have knowledge about the most prominent CIM, which is consistent with findings of other CNM surveys.[45,46] CNSs/CNMs also felt most familiar with exercise and stress management and least familiar with megavitamins, energy healing, and naturopathy; findings regarding therapies most often prescribed has been variable in other studies, which may be accounted for by the phrasing or choices of therapies presented in the surveys and/or geographical location.[45,46]

Limitations

Our results were collected from APPs at a single academic medical center and cannot necessarily be extrapolated to other medical centers or health sites. Although a response rate of 54.6% is acceptable, bias cannot be excluded because those with the strongest opinions were probably more likely to respond, express positive feelings toward CIM, and refer more often. The percentage of respondents who were white non-Hispanic was higher than national averages for NPs, PAs, and CRNAs; there may be a cultural bias.[1,4,20,21,32]

CONCLUSION

The use of CIM is substantial and increasing. Our survey showed that APPs believe that CIM positively affects patient satisfaction and treatment. Providers who self-rate their knowledge base as high were more likely to initiate a conversation with patients regarding CIM. Personal experience and prospective randomized controlled trials were reported as the most influential factors.

APPs are in an opportune position to discuss with patients the therapies they are already using, to have a conversation regarding reliable safety and efficacy data, and to potentially suggest additional therapies that may be beneficial. APPs need access to reliable information and exposure to CIM to have a strong enough knowledge base to feel confident discussing therapies with their patients.

Because of the differing levels of CIM information offered in APP education programs, there may be an opportunity to enhance this information with current evidence that supports current and future patient needs. APP program development should include formal CIM education, including opportunities to personally experience CIM modalities. APP core curricula should include using evidence-based information, as well as opportunities to train in various CIM practices.

A coordinated CIM program including consult services in various modalities of CIM (supplements, herbs, massage, acupuncture, mind/body) is available at several large academic medical institutions in the United States (Academic Consortium for Integrative Medicine and Health). Making sure that APPs have access to referrals to these programs and access to CIM databases should be very helpful.

APP understanding of CIM may lead to more effective communication with patients, safer CIM use, and improved (not only perceived) quality of care.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to report.

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Supplemental Table. Demographics of Advanced Practice Provider Responders, N (%)

	Physician Assistant (n = 130)	Nurse Practitioner (n = 278)	Certified Registered Nurse Anesthetist (n = 126)	Total (n = 534)	*P* Value
Gender					<.0001[a]
Male	36 (27.9%)	19 (6.9%)	29 (23.4%)	84 (15.9%)	
Female	93 (72.1%)	256 (93.1%)	95 (76.6%)	444 (84.1%)	
Age					<.0001[b]
25 to 35 years old	71 (55.9%)	96 (34.7%)	32 (25.4%)	199 (37.5%)	
36 to 45 years old	32 (25.2%)	93 (33.6%)	48 (38.1%)	173 (32.6%)	
46 to 55 years old	17 (13.4%)	58 (20.9%)	27 (21.4%)	102 (19.2%)	
56 years old or older	7 (5.5%)	30 (10.8%)	19 (15.1%)	56 (10.6%)	
Ethnicity and Race					
Hispanic	3 (2.3%)	4 (1.4%)	0 (0.0%)	7 (1.3%)	.28[c]
White	117 (90.0%)	264 (95.0%)	119 (94.4%)	500 (93.6%)	.15[c]
American Indian/Alaskan Native	1 (0.8%)	1 (0.4%)	0 (0.0%)	2 (0.4%)	.73[c]
Black or African American	1 (0.8%)	4 (1.4%)	3 (2.4%)	8 (1.5%)	.65[c]
Native Hawaiian/Pacific Islander	0 (0.0%)	1 (0.4%)	0 (0.0%)	1 (0.2%)	1.0[c]
Asian	7 (5.4%)	7 (2.5%)	4 (3.2%)	18 (3.4%)	.32[c]
Other	3 (2.3%)	4 (1.4%)	2 (1.6%)	9 (1.7%)	.90[c]
Specialty					
Allergy	1 (0.8%)	1 (0.4%)	0 (0.0%)	2 (0.4%)	.73[c]
Anesthesiology	3 (2.3%)	4 (1.4%)	117 (92.9%)	124 (23.2%)	<.0001[c]
Breast Clinic	0 (0.0%)	2 (0.7%)	0 (0.0%)	2 (0.4%)	1.0[c]
Cardiology/Vascular	15 (11.5%)	36 (12.9%)	6 (4.8%)	57 (10.7%)	.03[c]
Dermatology	1 (0.8%)	1 (0.4%)	0 (0.0%)	2 (0.4%)	.73[c]
Endocrinology	2 (1.5%)	13 (4.7%)	1 (0.8%)	16 (3.0%)	.08[c]
Family Medicine	3 (2.3%)	36 (12.9%)	0 (0.0%)	39 (7.3%)	<.0001[c]
Gastroenterology	5 (3.8%)	6 (2.2%)	2 (1.6%)	13 (2.4%)	.53[c]
General Surgery	6 (4.6%)	16 (5.8%)	7 (5.6%)	29 (5.4%)	.94[c]
Gynecology	1 (0.8%)	5 (1.8%)	3 (2.4%)	9 (1.7%)	.55[c]
Hematology	10 (7.7%)	19 (6.8%)	1 (0.8%)	30 (5.6%)	.01[c]
Infectious Disease	4 (3.1%)	0 (0.0%)	0 (0.0%)	4 (0.7%)	.006[c]
Internal Medicine	18 (13.8%)	33 (11.9%)	0 (0.0%)	51 (9.6%)	<.0001[c]
Nephrology and Hypertension	2 (1.5%)	5 (1.8%)	0 (0.0%)	7 (1.3%)	.46[c]
Neurology	1 (0.8%)	4 (1.4%)	2 (1.6%)	7 (1.3%)	.89[c]
Obstetrics	2 (1.5%)	1 (0.4%)	4 (3.2%)	7 (1.3%)	.03[c]
Oncology	8 (6.2%)	19 (6.8%)	1 (0.8%)	28 (5.2%)	.02[c]
Orthopedics/PMR/Musculoskeletal/Sports Medicine	13 (10.0%)	7 (2.5%)	1 (0.8%)	21 (3.9%)	.0004[c]
Pain Management	3 (2.3%)	4 (1.4%)	0 (0.0%)	7 (1.3%)	.28[c]
Palliative Medicine	2 (1.5%)	9 (3.2%)	0 (0.0%)	11 (2.1%)	.10[c]
Pediatrics	2 (1.5%)	16 (5.8%)	3 (2.4%)	21 (3.9%)	.09[c]
Preventative, Occupational, and Aerospace Medicine	0 (0.0%)	5 (1.8%)	0 (0.0%)	5 (0.9%)	.18[c]
Psychiatry	2 (1.5%)	5 (1.8%)	0 (0.0%)	7 (1.3%)	.46[c]
Pulmonary and Critical Care Medicine	3 (2.3%)	15 (5.4%)	0 (0.0%)	18 (3.4%)	.008
Rheumatology	1 (0.8%)	1 (0.4%)	0 (0.0%)	2 (0.4%)	.73[c]
Urology	8 (6.2%)	4 (1.4%)	2 (1.6%)	14 (2.6%)	.02[c]
Other	34 (26.2%)	46 (16.5%)	3 (2.4%)	83 (15.5%)	<.0001[c]
Time dedicated to direct patient care, %					.09[b]
0 to 25%	2 (1.5%)	4 (1.4%)	9 (7.1%)	15 (2.8%)	
26 to 50%	11 (8.5%)	9 (3.2%)	8 (6.3%)	28 (5.2%)	
51 to 75%	29 (22.3%)	51 (18.3%)	17 (13.5%)	97 (18.2%)	
76 to 100%	88 (67.7%)	214 (77.0%)	92 (73.0%)	394 (73.8%)	
Years in practice					.0004[b]
0 to 5 years	60 (46.2%)	127 (45.7%)	38 (30.2%)	225 (42.1%)	
6 to 10 years	30 (23.1%)	59 (21.2%)	22 (17.5%)	111 (20.8%)	
11 to 15 years	15 (11.5%)	29 (10.4%)	21 (16.7%)	65 (12.2%)	
16 to 20 years	10 (7.7%)	26 (9.4%)	16 (12.7%)	52 (9.7%)	
Greater than 20 years	15 (11.5%)	37 (13.3%)	29 (23.0%)	81 (15.2%)	

[a]Chi-Square
[b]Kruskal Wallis
[c]Fisher Exact

Note: frequencies may not sum to column total due to missing data. Not included in table or analyses: Certified nurse midwives (n = 5), clinical nurse specialists (n = 16), and 1 of unknown role.