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## ORIGINAL ARTICLE

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### Nurse practitioner and physician assistant students' knowledge, attitudes, and perspectives of chiropractic

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**Objective:** The purpose of this study was to assess nurse practitioner (NP) and physician assistant (PA) students' views of chiropractic. As the role of these providers progresses in primary care settings, providers' views and knowledge of chiropractic will impact interprofessional collaboration and patient outcomes. Understanding how NP and PA students perceive chiropractic may be beneficial in building integrative health care systems.

**Methods:** This descriptive quantitative pilot study utilized a 56-item survey to examine attitudes, knowledge, and perspectives of NP and PA students in their 2nd year of graduate studies. Frequencies and binomial and multinomial logistic regression models were used to examine responses to survey totals.

**Results:** Ninety-two (97%) students completed the survey. There were conflicting results as to whether participants viewed chiropractic as mainstream or alternative. The majority of participants indicated lack of awareness regarding current scientific evidence for chiropractic and indicated a positive interest in learning more about the profession. Students who reported prior experience with chiropractic had higher attitude-positive responses compared to those without experience. Participants were found to have substantial knowledge deficits in relation to chiropractic treatments and scope of practice.

**Conclusion:** The results of this study emphasize the need for increased integrative initiatives and chiropractic exposure in NP and PA education to enhance future interprofessional collaboration in health care.

**Key Indexing Terms:** Chiropractic; Nurse Practitioner; Physician Assistant; Students, Health Occupations; Interprofessional Relations

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### INTRODUCTION

Over the past few decades, the interest in and use of chiropractic and other complementary and alternative medicine (CAM) practices have experienced significant momentum among patients and health care practitioners worldwide.<sup>1–5</sup> Although physicians, nurse practitioners (NPs), and physician assistants (PAs) display expanding interest and favorable perspectives toward integrative therapies, a lack of knowledge regarding treatment options, indications, and referral protocols presents a self-reported formidable barrier for implementation.<sup>6–13</sup> Integration of CAM, particularly in the area of chiropractic, into mainstream health care continues to lag in many countries despite the increasing amount of evidence regarding the safety, effectiveness, public interest, and cost-effectiveness of its use.<sup>14</sup>

Improving integrative medical knowledge is prioritized by the World Health Organization's *Traditional Medicine Strategy 2014–2023* as one of the primary objectives in

improving health and integrating CAM into national health care systems.<sup>1</sup> In accordance with these principles, integrative medicine is now taught, practiced, and researched in nearly half the medical schools in the United States.<sup>13</sup> A recent study by Wong et al<sup>13</sup> showed that Canadian medical students increasingly view chiropractic as a sound evidence-based complementary therapy for low back/chronic pain; however, the students also reported a need for greater understanding of chiropractic for application in future patient referrals. While the results from Wong's study highlight the importance of integrating chiropractic education into mainstream medical education, the knowledge and attitudes of NPs and PAs in the area of CAM integration, particularly chiropractic, remains unclear.

The role of NPs and PAs is progressively expanding as broad efforts to overcome provider workforce challenges and improve access to health care are realized.<sup>15</sup> In the United States alone, NPs are the fastest growing provider workforce at over 9% a year and PAs at nearly 4% a

**Table 1 - Demographic Information**

	No.	%
Age		
≥25	38	41
<25	54	59
Gender		
Female	80	88
Male	11	12
Program		
Physician assistant	61	66
Nurse practitioner	31	34

year.<sup>16</sup> In comparison to the shrinking primary care physician workforce, NPs and PAs are poised to take a pivotal role in the future of primary health care.<sup>17</sup> Thus, understanding the views of NP and PA students regarding chiropractic, in addition to those of medical students, is vital to facilitate future interdisciplinary collaboration among conventional and chiropractic providers.<sup>18</sup> In joining with efforts to promote integrative care among professions, the purpose of this study was to assess the knowledge, attitudes, and perspectives of NP and PA students specifically regarding chiropractic. It is necessary for future mainstream providers to be knowledgeable in the area of chiropractic in order to achieve successful interdisciplinary collaboration and mutual patient outcomes of health promotion, disease prevention, and health restoration.<sup>18-21</sup>

## METHODS

This study utilized a descriptive quantitative design gathering data via survey distribution across 2 disciplines. The sample was taken from 2nd-year graduate students ( $n = 95$ ) enrolled in either the adult NP ( $n = 33$  total 2nd-year students) or PA ( $n = 61$  total 2nd-year students) programs at a small, private college in the northeastern United States. Second-year graduate students were chosen because, at this point, they have received the majority of their formal academic education in their respective programs. Inclusion criteria included willingness to participate, fluency in English, and implied consent with the return of a completed questionnaire. Refusal of consent was assumed with the return of a blank questionnaire. The study underwent expedited human subjects research ethics board review with approval from the Daemen College Human Subjects Research Review Committee.

The self-administered paper-and-pen questionnaires were distributed to NP and PA students at the end of a class in their respective classrooms upon permission from the individual course directors. Demographic and educational information (sex, age, area of study, expected graduation date) were collected to describe the sample population. Participation was voluntary and held no bearing on academic standing. To maintain participants' anonymity, surveys were returned via sealed envelopes at the classroom exit.

## Data Collection Instrument

An adapted version of Wong and Kopansky-Giles' survey *Attitudes, Knowledge, Perspectives of Medical Students to Chiropractic* was used, with permission from the authors, for data collection within this study.<sup>13</sup> The adaptation included substituting the words "nurse practitioner and physician assistant students" to replace the words "medical students." The survey consisted of 56 items: 15 items assessing knowledge of chiropractic, 4 items assessing perspectives toward chiropractic, and 30 items assessing attitude toward chiropractic. The remaining items were used for demographic purposes. Knowledge of chiropractic medicine was assessed using a 5-point Likert scale of (1) strongly disagree, (2) disagree, (3) undecided/don't know, (4) agree, and (5) strongly agree. Agree and strongly agree were considered correct answers. Similarly, attitude-related questions were determined as positive (agree/strongly agree), negative (disagree/strongly disagree), or undecided/don't know.

## Analysis

Descriptive statistics (frequencies) were recorded for sex, age, and graduate program. Analysis pertaining to attitude toward chiropractic was assessed by formulating summary measures for attitude-positive, attitude-negative, and undecided/don't know response totals in addition to a multinomial logistic regression model ( $\alpha < .05$ ) evaluating 2 constructs: level of understanding and awareness of current scientific evidence. Perspective of chiropractic was assessed using frequencies and the 3rd construct: a binomial logistic regression model evaluating self-assessed prior chiropractic experience. Key covariates for each of these constructs pertaining to attitudes and perspectives included the number of positive, negative, and undecided responses (reference category); age defined as <25 years or ≥25 years (reference category); gender (female is the reference category); and program of study comparing nurse practitioner with physician assistant (reference category).

Knowledge of chiropractic was assessed by evaluating the participants' number of correct responses regarding chiropractic scope of practice and effective treatments as well as self-assessed level of understanding of chiropractic medicine in comparison to the number of median correct answers. The correct answers were also compared by program of study using least squares regression. R-Project quantitative software (R Core Team, Vienna, Austria) was used to perform the analysis.<sup>22</sup>

## RESULTS

### Demographics

Of the 95 questionnaires distributed, 92 were returned completed (97% response rate). There was a 100% response rate from the PA students and a 94% response rate from the NP students. The sample (Table 1) consisted largely of females (88%). A  $\chi^2$  analysis of the association between age and program revealed a significant difference in proportion of students' ages and programs ( $\chi^2 [1, n = 92] = 49.4, p < .001$ ). The majority of older (>25 years old)

**Table 2 - Attitude Toward Chiropractic: Binomial Logistic Regression Results**

	Odds Ratio	95% CI	p Value
Prior experience <sup>a</sup>			
Type of response, no.			
Undecided responses	1	-	-
Positive responses	1.08	(1.01–1.16)	<b>.042</b>
Negative responses	1.05	(0.96–1.15)	.28
Age			
≥25	1	-	-
<25	0.15	(0.02–0.62)	<b>.01</b>
Gender			
Female	1	-	-
Male	0.27	(0.03–1.43)	.16
Program			
Physician assistant	1	-	-
Nurse practitioner	0.46	(0.07–2.13)	.34

CI indicates confidence interval. Bold p values indicate statistical significance ( $p < .05$ ).

<sup>a</sup> Reference category is “no prior experience.”

participants were NP students, while most of the PA students were <25 years old.

### Attitude Toward Chiropractic

The highest grouping of participants self-reported a poor “current level of understanding” ( $n = 40$ ; 43%). The majority of participants indicated a lack of awareness of “current scientific evidence for chiropractic treatment” ( $n = 69$ ; 75%). Although most participants ( $n = 58$ ; 63%) indicated a positive interest in learning more about chiropractic, 60 (65%) students disagreed with the statement “I make my own effort, outside of medical school, to learn about chiropractic.” Logistic regression analysis did not identify any significant differences with respect to the level of understanding and key covariates, including type of response (undecided, positive, negative), age (>25 years, <25 years), gender, or program.

### Prior Experience

In examining differences based upon prior experience, 2 key covariates were statistically significant: the number of positive responses for someone having prior experience and age (Table 2). The estimates showed that an increase in 1 positive response had a multiplicative effect in the odds for having had prior experience. Age < 25 years had a negative effect for having prior chiropractic experience. Therefore, students aged >25 years were more likely to have had experience with chiropractic, whether personally or via a family member, academic sources, or mass media, and thus responded more positively toward chiropractic.

### Perspective on Chiropractic

As presented in Table 3, the 4 items assessing NP and PA students’ perspectives on chiropractic were differentiated from attitude items in that “perspective” responses were neutral, without any positive or negative connotation.<sup>13</sup> The overlap in participants’ views indicates there

**Table 3 - Frequencies of Perspectives on Chiropractic**

Statement	Category	No.	% <sup>a</sup>
Chiropractic is a <i>mainstream</i> profession in health care.	Strongly disagree	5	6
	Disagree	14	15
	Undecided/ do not know	31	34
	Agree	31	34
	Strongly agree	10	11
	Strongly disagree	2	2
Chiropractic is a <i>complementary and alternative medicine</i> (CAM) profession.	Disagree	2	2
	Undecided/ do not know	21	23
	Agree	50	55
	Strongly agree	16	18
	Strongly disagree	7	8
	Disagree	17	19
The medically related educators at [the college] are knowledgeable about chiropractic.	Undecided/ do not know	45	50
	Agree	17	19
	Strongly agree	4	4
Is interprofessional education (IPE) important to you?	Yes	74	80
	No	4	4
	Unsure	14	15
Chiropractic treatment is “evidence-based,” ie, use of evidence in research to guide practice.	Yes	33	36
	No	6	7
	Unsure	51	55

<sup>a</sup> Categories will not sum to 100% due to rounding.

were some respondents who recognized chiropractic as both mainstream and alternative. Forty-five percent of students agree/strongly agree that chiropractic is a mainstream profession, while 73% consider chiropractic as a CAM profession.

### Knowledge of Chiropractic

Participants demonstrated a wide spectrum of correct responses for types of treatment and areas where chiropractors can provide effective treatment (Table 4). Survey respondents seemed to lack knowledge that chiropractors can provide acupuncture, medical referral, nutritional education, and exercise prescription and education. Respondents mostly agreed, however, that chiropractors can provide effective treatment for back pain, neck pain, headaches, shoulder pain, strain/sprain of upper and lower extremities, disc herniation, and peripheral nerve entrapment.

Somewhat surprisingly, when stratifying participants by their self-assessed level of understanding of chiropractic, participants with a “satisfactory” level of understanding answered a greater number of items correctly compared to those with a self-assessed “good” level of understanding.

An ordinary least squares regression model showed a significant difference in correct answers between students enrolled in the PA and NA programs. Physician assistant students had a mean of 4.2 fewer correct answers than did NP students. Second, and not surprisingly, participants with self-assessed prior experience demonstrated a mean of

**Table 4 - Correct Responses for Treatment**

	% Correct
Types of treatment	
Joint and spinal manipulation	92
Soft tissue therapy	70
Acupuncture	35
Therapeutic modalities	59
Medical referral	50
Nutritional education	22
Exercise prescription and education	51
Massage	61
Provide effective treatment	
Back pain	91
Neck pain	90
Headaches	79
Shoulder pain	88
Strain/sprain of upper and lower extremities	75
Disc herniation	78
Peripheral nerve entrapment	70
Plantar fasciitis	60

2.6 more correct answers than did participants without prior chiropractic experience (Table 5).

## DISCUSSION

The overlap in participants' views as to whether chiropractic is classified as mainstream or CAM reflects the conflicting perspectives of NP and PA students regarding the chiropractic profession. A large majority of participants (75%) were unaware of current scientific evidence for chiropractic treatment, although most did express a positive attitude for increased learning. Consistent with the findings of this study, there continues to be a lack of understanding among current and future mainstream providers<sup>13,23</sup> despite the emerging evidence supporting chiropractic effectiveness,<sup>24-27</sup> cost-effectiveness,<sup>24,28-30</sup> and patient satisfaction.<sup>31,32</sup>

Results from this study indicated a lack of knowledge of chiropractic scope of practice among future NPs and PAs. While the majority of participants were aware that chiropractic treatments include joint/spinal manipulation and soft tissue therapy, there was a substantial gap in correct responses related to knowledge of chiropractic treatments that extend beyond manipulation and soft tissue therapy. For example, less than a quarter of the participants in this study agreed that chiropractors provided nutritional education even though doctors of chiropractic receive extensive formal training in nutrition that is largely incorporated into chiropractic patient care.<sup>30,33</sup> Awareness that nutrition is an integral part of the chiropractic approach to health promotion might impact future interdisciplinary referrals among NPs and PAs.

The lack of knowledge (and increased desire to learn more) about chiropractic is also found among medical students and has been listed as a barrier to future integrative care.<sup>13</sup> Most NP and PA students agreed that interprofessional integration was important, but lack of knowledge regarding chiropractic scope of practice dem-

**Table 5 - Least Squares Regression Results**

	Estimate	95% CI	p Value
Age $\geq$ 25	-2.24	(-0.61 to 1.58)	.25
Physician assistant	-4.24	(-8.17 to -0.31)	.03
Male	-1.80	(-5.61 to 2.01)	.35
Prior experience	2.63	(0.01 to 5.25)	.05

onstrates a gap in core curricula for this particular modality. This gap in knowledge is reflected in the literature regarding mainstream providers' knowledge of other CAM modalities and contributes toward barriers to application in future practice.<sup>6,7,9-13,18-19,34-37</sup>

The majority of NP and PA students in this study were undecided as to whether chiropractic used evidence-based research to guide practice. Unfortunately, the lack of evidence-based education regarding chiropractic and other CAM therapies within the core curricula or mainstream health care education has also been shown to portray a hidden negative bias regarding integration of this modality.<sup>13,38</sup> In Wong's recent study<sup>13</sup> of medical students, having no experience with chiropractic was significantly associated with negative attitudes toward the profession. Similarly, in the current study of NP and PA students, there was an increased likelihood of positive responses when they had prior chiropractic experience.<sup>13</sup> This correlation between positive attitude and experience is also reflected in the increased patient satisfaction that is reported from patients who have experienced a collaborative approach to their care from their primary care provider and chiropractor.<sup>31,39</sup>

Although there was a significant difference in the number of correct answers between academic programs, consideration must be given to the confounding factors involving age and experience, which contribute to overall knowledge. The majority of older students (>25 years) and those who had more chiropractic experience were in the NP program. The positive significant correlations between age and chiropractic experience contributes to the increase in correct knowledge responses among the NP students rather than correct responses being due to differences in academic programs. Additionally, most NP students have years of clinical experience as registered nurses and have also completed the majority of their graduate clinical experience during their 2nd year of graduate studies, whereas PA students gain the majority of their clinical experience in their 3rd year of study. Although experience affects knowledge, examination of a causative relationship between differences in academic program and knowledge of chiropractic was beyond the scope of this study.

With the largest grouping of participants having reported a poor understanding of chiropractic and low likelihood of making an effort outside of school to learn more about chiropractic, coupled with limited opportunities to acquire appropriate chiropractic-related education after graduation, NPs and PAs in practice naturally resort to the use of personal experience, peers, and mass media as sources for chiropractic information, which then affects patient education and referral.<sup>11,12,40</sup> Lack of scientific rationale for patient counseling is contrary to both medical



and nursing standards and may lead to improper counseling or referral. Although chiropractic referrals are frequently requested by patients, primary care providers list a lack of understanding of chiropractic scope of practice, safety, and evidence-based outcomes as major barriers in communication with patients and in applying integrative care to practice.<sup>6,23</sup>

### **Implications for Practice**

The results from this study highlighted the need for increased knowledge among future NPs and PAs regarding chiropractic in order to diminish barriers in application to practice and integrative care. Although initiatives by the World Health Organization and Institute of Medicine to promote integrative care have contributed to improved overall attitudes of providers toward CAM, studies have shown a decrease, rather than increase, in understanding and comfort in counseling patients regarding chiropractic care.<sup>34</sup> The majority of participants in this study were unaware of the current scientific evidence pertaining to chiropractic. Medical professionals of all backgrounds continue to seek results of high-quality trials to form an opinion about recommendation of integrative therapies. While there is a plethora of published studies highlighting the few side effects or rare complications of CAM therapies in mainstream medical journals, further dissemination of the positive outcomes and cost-related benefits of chiropractic into mainstream medical practice is needed. Easily accessible chiropractic evidence-based research is imperative for future providers to knowledgeably guide and counsel their patients about chiropractic care.

Incorporating a 1-hour lecture delivered by a chiropractic professor within a formal medical curriculum is 1 educational intervention that resulted in improved attitudes and knowledge of medical students regarding chiropractic.<sup>38</sup> This lecture model included current evidence of chiropractic scope of practice, common treatment modalities, and spinal manipulation effectiveness and safety to address the specific barriers reported by practicing physicians. While this intervention was effective among medical students, the effectiveness among NP and PA students and correlation with promoting collaboration in practice has not been evaluated. Incorporating clinical “exchange programs,” offering a well-designed integrative elective, and intertwining chiropractic examples within case studies are other possible educational methods to evaluate for promoting understanding among future NPs and PAs in an effort to increase interdisciplinary collaboration among the mainstream and chiropractic professions.<sup>41</sup> Facilitating interpractitioner relationships may aid in promoting trusting professional relationships for establishing referral networks and recognizing mutual patient health promotion goals.<sup>35</sup>

### **Recommendations for Further Research**

Generalizability of this study is limited due to the convenience sampling method at a single academic setting. Furthermore, the small sample size likely increased the risk of a type II error and affected the statistical power, significance, and effect size, thus further compromising

external validity of the study findings. However, the 97% response rate provides a high level of confidence for the results within this particular setting and suggests the need for further research on a larger scale. Use of a prepiloted survey that was developed using survey methodology, reviewed by an experienced research team, and used for data collection in previous studies was a particular strength of this study.<sup>13,38</sup> According to the authors of the data collection tool, the use of the category “undecided/don’t know” in the survey may be a limitation as “undecided” is not the same as “don’t know,” and there may also be an inherent answer bias due to the Likert scale response options all being in the same direction.<sup>13</sup> Nonetheless, future research should target different student populations from across the nation using this particular survey tool, perhaps with slight modification to account for the tool’s limitations.

Further research is needed on a broader geographic scale among multiple institutions to develop action plans for encouraging future interprofessional understanding among health care providers.<sup>42</sup> Action research and mixed methods approaches, inclusive of qualitative data, interviews, and focus groups, might be particularly beneficial in obtaining a more comprehensive view of the current situation and reveal solutions to increasing interprofessional collaboration and referral.

## **CONCLUSION**

The NP and PA students in this study expressed a desire for increased knowledge regarding chiropractic and acknowledged the importance of interprofessional education. Lack of knowledge has been listed repeatedly as a formidable barrier to integrative care.<sup>7,9,11,13,43</sup> This study highlights the necessity for implementing evidence-based chiropractic education within the core curricula of mainstream health care provider programs. Interprofessional learning enables students to understand one another’s professional value bases, enhance respect between professionals, and improve patient outcomes while minimizing the need to rely on anecdotal sources for chiropractic information.<sup>36,44</sup> Increased knowledge among future providers regarding chiropractic scope of practice, effectiveness, safety, cost-effectiveness, and referral guidelines could break down barriers that are currently inhibiting integration and could contribute toward improved patient outcomes. Research in education is an indispensable first step in moving toward integrative health systems.

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### Author Contributions

Concept development: BB. Design: BB. Supervision: LB. Data collection/processing: BB. Analysis/interpretation: BB, LB. Literature search: BB. Writing: BB. Critical review: LB.

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