ISSN 0008-3194 (p)/ISSN 1715-6181 (e)/2024/98–112/$2.00/©JCCA 2024

Exploration of chiropractic students' motivation toward the incorporation of new evidence on chiropractic maintenance care: a mixed methods study

Kent J. Stuber, DC, MSc, PhD[1,2]
Andreas Eklund, MSc(Chiro), PhD[3]
Katherine A. Pohlman, DC, MS, PhD[1]
Zakary Monier, MS, RD[1]
Ryan Muller, DC, MS[4,5]
Adam Browning, DC[1]
Christopher A. Malaya, DC, PhD[1]
Vanessa Morales, DC, MS[1]
Per J. Palmgren, DC, PhD[6]

Objectives: *This sequential explanatory mixed-method study aimed to explore chiropractic students' attitudes toward incorporating maintenance care (MC) focused evidence.*

Methods: *Attitudes towards using an evidence-based clinical protocol for maintenance care (MC), the MAINTAIN instrument, were assessed via surveys, monologue responses, dialogues, and qualitative feedback. Participants from a single chiropractic*

L'exploration de la motivation des étudiants en chiropratique en vue de l'incorporation de nouvelles preuves sur les soins de chiropratique d'entretien: une étude sur les méthodes mixtes

Objectifs: *Cette étude explicative séquentielle de méthode mixte visait à explorer les attitudes des élèves en chiropratique à l'égard de l'intégration des soins d'entretien (SE).*

Méthodes: *Les attitudes à l'égard de l'utilisation d'un protocole clinique fondé sur des données probantes pour les soins d'entretien (SE), l'instrument d'ENTRETIEN, ont été évaluées au moyen d'enquêtes, de réponses monologues, de dialogues et de commentaires qualitatifs. Les participants d'un seul établissement d'enseignement chiropratique ont rempli des questionnaires évaluant leur point de vue sur la centralité du patient, la douleur chronique et l'incorporation de données probantes.*

[1] Parker University, Dallas, TX
[2] Canadian Memorial Chiropractic College, Toronto, ON
[3] Institute of Environmental Medicine, Unit of Intervention and Implementation Research for Worker Health, Karolinska Institutet, Stockholm, Sweden
[4] Pain Research, Informatics, Multi-morbidities, and Education Center, VA Connecticut Healthcare System, West Haven, Connecticut, USA.
[5] Department of Biomedical Informatics and Data Science, Yale School of Medicine, New Haven, Connecticut, USA.
[6] Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Stockholm, Sweden

Corresponding author: Kent Stuber, Parker University, 2540 Walnut Hill Lane, Dallas, TX 75229
E-mail: kentstuber@parker.edu

The authors have no disclaimers, competing interests, or sources of support or funding to report in the preparation of this manuscript.

educational institution completed questionnaires evaluating their perspectives on patient-centeredness, chronic pain, and evidence incorporation. Descriptive statistics summarized quantitative data, while content analysis was used for qualitative data.

Results: *74.4% (n=419) of students participated, mostly male (57.5%), with an average GPA of 3.15 (out of a maximum of 4.0). Qualitative analysis identified the need to clarify MC terminology and factors motivating students to adopt new evidence, such as quality and alignment with healthcare beliefs.*

Conclusions: *This study's findings emphasize the importance of refining healthcare training strategies, including defining terminology and addressing motivators for evidence incorporation, as evidence for MC for low back pain evolves.*

(JCCA. 2024;68(2):98-112)

KEY WORDS: chiropractic, evidence-based practice, maintenance care, mixed methods, students

Les statistiques descriptives ont résumé les données quantitatives, tandis que l'analyse du contenu a servi à recueillir des données qualitatives.

Résultats: *74,4 % (n=419) des étudiants ont participé à l'étude, principalement des hommes (57,5 %), avec une moyenne de 3,15 (sur un maximum de 4,0). L'analyse qualitative a permis de déterminer la nécessité de clarifier la terminologie des SE et des facteurs qui incitent les élèves à adopter de nouvelles données probantes, comme la qualité et l'harmonisation avec les croyances en matière de soins de santé.*

Conclusions: *Les conclusions de cette étude soulignent l'importance de peaufiner les stratégies de formation en soins de santé, notamment en définissant la terminologie et en répondant aux motivations pour l'incorporation de données probantes, à mesure que les preuves concernant les SE pour les lombalgies évoluent.*

(JCCA. 2024; 68(2) : 98-112)

MOTS CLÉS : chiropratique, pratique fondée sur des données probantes, soins d'entretien, méthodes mixtes, étudiants

Introduction

Management of low back pain (LBP) represents an important clinical challenge. LBP is highly prevalent globally and results in more years lived with disability than any other condition.[1] While some cases of LBP have a favorable natural history, up to two-thirds of people experiencing LBP will have a recurrent episode within 12 months of recovery.[2] Given the prevalence and burden of LBP globally and that much of the LBP burden is a result of recurrences, the research community has communicated a call for a focus on secondary and tertiary prevention.[3]

Chiropractic Maintenance Care (MC) includes assessing and treating patients at regular pre-planned intervals when maximum treatment benefit has been reached from an initial care plan, regardless of symptoms, to prevent future episodes and progression of conditions.[4-6] Although MC has yet to be adequately substantiated by empirical inquiries, traditionally, it has been employed as a long-term management strategy for a wide range of musculoskeletal disorders such as LBP. Considering this scarcity of knowledge, recent inquiry into the effectiveness of MC has demonstrated a net positive effect of MC compared to symptom-based treatment only, noted as a decrease in total number of days with bothersome pain over 52 weeks, albeit with more treatment visits involved on average.[7] Eklund *et al*.[7] investigated the effectiveness of maintenance care for patients with recurrent and persistent low back pain in a pragmatic randomized clinical trial (RCT). In their trial, patients were scheduled for preplanned visits of one-to-three month intervals based on the chiropractor's clinical assessment to either maintain functional status in persistent cases (tertiary prevention) or reduce the recurrence of pain in recurrent cases (secondary prevention). A secondary analysis of this investigation revealed that psychological profiles, as defined by the West Haven-Yale Multidimensional Pain Inventory (WHYMP), adaptive copers, interpersonally distressed, and dysfunctional (see Box 1 for definitions), moderated the effect of maintenance care.8 It was reported that maintenance care increased pain and the number of visits for adaptive copers, suggesting that maintenance care is inappropriate for this subgroup.[8] Interpersonally dis-

Box 1.

West Haven-Yale Multidimensional Pain Inventory (WHYMP) psychological profiles as employed by Eklund et al.[8]

- Adaptive Copers – "low pain severity, low interference with everyday life, low life distress, a high activity level and a high perception of life control"[8];
- Dysfunctional – "high pain severity, marked interference with everyday life, high affective distress, low perception of life control and low activity levels"[8].
- Interpersonally Distressed – "perceive negative responses by spouses or significant others to their pain behavior and complaints, for example not being supportive/helpful, and expressing irritation, frustration, and anger"[8];

tressed patients experienced no additional effect from MC but received slightly more visits.[8] Patients classified as dysfunctional experienced an average of 30.0 (95% CI: 36.6, 23.4) fewer days with activity-limiting pain over a 12-month period, longer pain-free periods, and less acute flareups compared to the control group at an equal number of visits.[8]

The MAINTAIN instrument is a brief clinical assessment tool that trichotomizes patients into "low probability," "moderate probability," and "high probability" of benefiting from maintenance care for LBP. The MAINTAIN instrument has exhibited very good to excellent diagnostic accuracy for selecting patients classified as dysfunctional by the WHYMP in a clinical setting.[9] It allows for identifying high-risk patients early in a plan of care and subsequent stratification of these patients into appropriate interventions. In addition, enhanced prognostic ability allows providers to improve efficiency by treating those who will receive benefits, not those who will not, and potentially reducing individual and community financial burden for chronic non-specific LBP through improved productivity and attendance at work.

Implementing the MAINTAIN instrument into clinical practice may improve patient outcomes and reduce societal costs. However, evidence shows that knowledge gleaned from research findings needs to be better integrated into clinical practice.[10-12] While chiropractors report positive attitudes and interest in evidence-based practice (EBP), there is evidence that many do not use research evidence to guide their clinical decision-making processes[13], similar to other healthcare professions[14].

As findings from research are often not used by clinicians in practice, one strategy is incorporating new evidence into students' clinical rotations. Teaching the principles of EBP is essential in clinician training programs, especially during clinical rotations.[15,16] Swain *et al*.[17] demonstrated that half of chiropractic students value contemporary scientific evidence more than traditional chiropractic principles. Presently, we know little about chiropractic students' attitudes and beliefs towards maintenance care. Exploring students' perceptions regarding the concept of maintenance care and attitudes towards incorporating new evidence on maintenance care may be beneficial in helping researchers and policymakers understand how to facilitate the best implementation of the MAINTAIN instrument, and research in general, into clinical practice.

Therefore, the aim of this study was to explore chiropractic students' attitudes towards incorporating evidence on chiropractic maintenance care. Specifically, the research questions posed were:

1. Is there a relationship between student attitudes toward patient-centeredness, functional expectations of LBP, and their evidence-based practice perspectives?
2. How do students perceive the concept of chiropractic maintenance care?
3. What prompts students to incorporate new evidence on chiropractic maintenance care?

Methods

Study design

This study used a two-phased sequential explanatory mixed methods design that began with collecting and analyzing quantitative data, followed by a qualitative data collection and analysis phase (please see Figure 1 for a study diagram). Subsequently, the data from both phases were integrated to enhance our understanding of the findings. A sequential explanatory mixed methods design with a quantitative priority was selected as it allowed the qualitative data to help provide a deeper understanding and a contextualization of the findings generated from the quantitative data.[18]

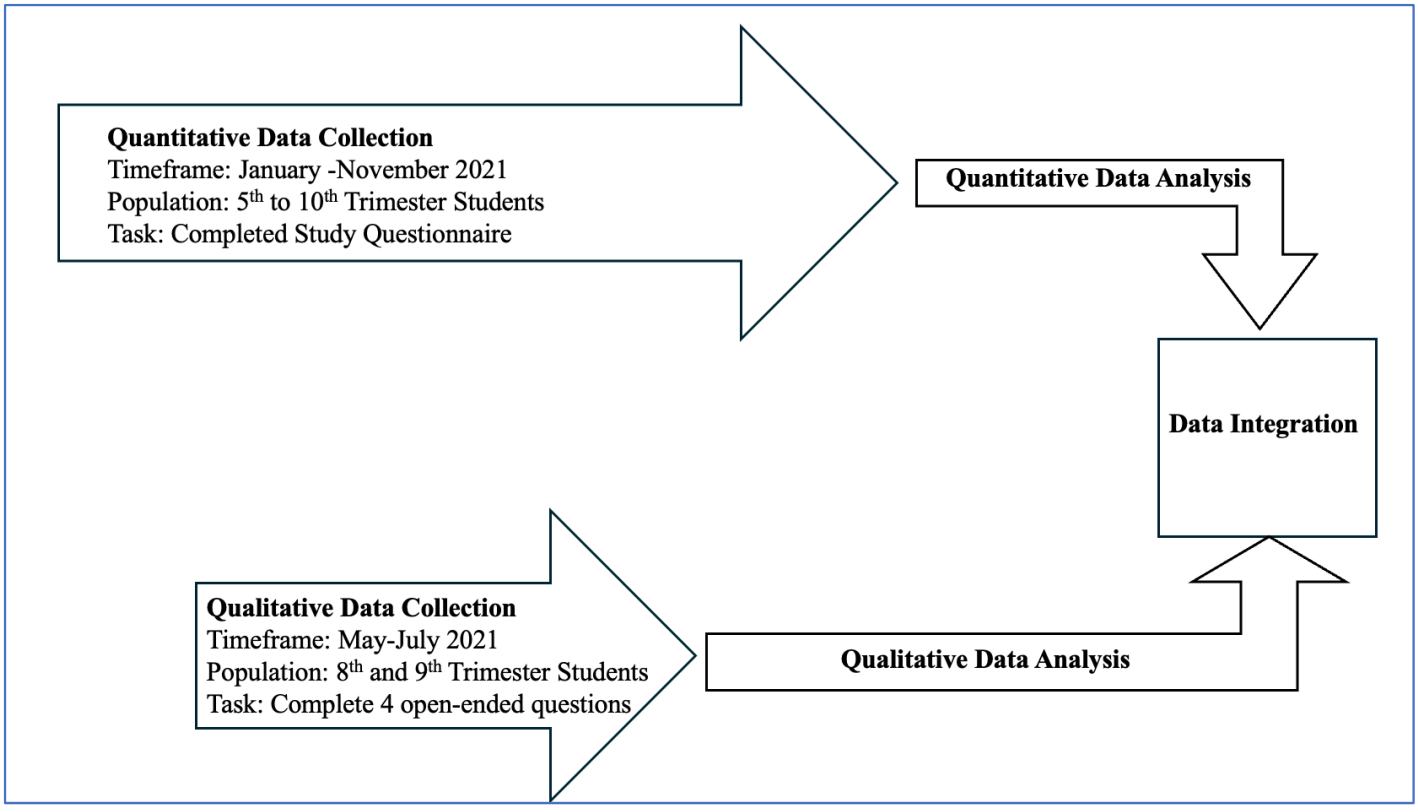

Figure 1.
Study flow diagram

Parker University's Institutional Review Board approved this study's quantitative and qualitative dimensions respectively (Assurance Numbers A-00219 and A-00220). Before data collection, participants were asked to read and sign a consent form for their participation in the study. The consent form also permitted the data to be further utilized for invitations to participate in the qualitative phase of the study. The study was conducted within an interpretative paradigm, assuming that knowledge is situated, relative, and socially constructed. The study's findings are viewed as being shaped during the interaction between the researchers and participants and do not reflect an objective truth.[19] This mixed methods study adhered to the Good Reporting of A Mixed Methods Study (GRAMMS) guidelines (see Appendix 1).[20]

Empirical context

The setting of the study was a 3.3-year graduate Doctor of Chiropractic program (DCP) at Parker University (Dallas, TX, USA). The DCP consists of 10 trimesters, each approximately four months long.

Sample

A non-probability convenience sample of chiropractic students in their fifth to tenth trimester was invited to participate in the quantitative phase of the study using in-person presentations with an invitation to the online survey. Students in those trimesters were considered most suitable as they would at that point have learned about different forms of care, including maintenance care, in their education at the University. Follow-up e-mails were sent to all qualified students at two-day intervals for a maximum of five attempts to maximize student responses. In the qualitative phase, between May and July 2021, a purposeful sample of students in their eighth and ninth trimesters were invited to contribute. Students in these trimesters were selected as they are the first and second terms of the clinical rotation/internship. These students have provided

patient care and would potentially be able to provide more insight into the topics explored in the qualitative phase.

Quantitative data collection

The study questionnaire consisted of demographic questions such as gender, prior education, and self-reported grade point average (GPA), along with the scale of evidence perspectives (SoEP) developed by McGregor *et al*.[21] (2014), the Patient-Practitioner Orientation Scale (PPOS)[22] to assess attitudes toward patient-centeredness, and the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS)[23] to assess attitudes towards chronic pain patients. We hypothesized that higher PPOS scores, thus, more patient-centered attitudes, would correlate with lower HC-PAIRS scores and more evidence-based perspectives. The questionnaire was accessible via QR code distributed by invitations extended to students through e-mail and live presentations between January and November 2021 using the Research Electronic Data Capture (REDCap) data management software.[24,25]

McGregor *et al*.[21] developed and validated the SoEP to elicit divergent perspectives held by chiropractors and categorized chiropractors into six possible subgroups (see Box 2) based on their perceptions of the conditions they treat. The SoEP measures the single question: "Which ONE of the following best describes the predominant view you have of the conditions you treat/you will treat?"

Box 2.

Chiropractic subgroups as defined in the Scale of Evidence Perspectives (SoEP) by McGregor et al.[21]

- (1 - most evidence-based perspective) Biomechanical- "I treat/will treat musculoskeletal or neuromusculoskeletal problems and may include specific disorders such as low back and neck-related pain";
- (2) General Problem/Biomechanical- "I treat/will treat a combination of general problems and biomechanical group complaints";
- (3) Biomechanical/Organic Visceral– "I treat/will treat a combination of biomechanical group and organic/visceral complaints";
- (4) General Problems- "I treat/will treat the broadest spectrum of health concerns, and may include lifestyle and wellness issues";
- (5) Somatic Dysfunction- "I treat/will treat vertebral subluxation as a somatic joint dysfunction and/or related to functional or musculoskeletal problems";
- (6 - least evidence-based perspective) Vertebral Subluxation- "I treat/will treat vertebral subluxation as an encumbrance to the expression of health – vertebral subluxation is seen as an entity in and of itself, which is corrected to benefit patient well-being."

The Patient-Practitioner Orientation Scale (PPOS) is an 18-item, self-administered, closed-ended inventory relating to various topics directly pertinent to attitudes toward patient-centeredness and the doctor-patient relationship.[22] Each item is scored by respondents using a six-point Likert response ranging from "strongly agree" = 1 to "strongly disagree" = 6. The values from all the items are averaged to determine the Overall PPOS score.[22] Higher Overall PPOS scores indicate more patient-centered attitudes, while lower scores indicate more doctor-centered attitudes. Krupat *et al*.[22] previously described respondents holding patient-centered attitudes when PPOS scores were greater than 5.0, medium when scores were between 4.57 and 5.0, and doctor-centered when scores for 4.57 or lower. The validity of the PPOS has been supported by Shaw *et al*.[26], who showed that healthcare practitioners whose encounters with patients devoted more attention to lifestyle issues and rapport building and less to biomedical matters had more patient-centered views on the PPOS when compared with other practitioners whose encounters with patients did not demonstrate those characteristics.

The HC-PAIRS is a 15-item measurement tool developed to assess healthcare providers' attitudes, beliefs, and understanding regarding functional expectations for patients with chronic low back pain (CLBP).[23] The HC-PAIRS uses a seven-point rating response (1=completely disagree; 7=completely agree) with higher scores indicating a greater belief that CLBP justifies disability and

the limiting of activities.[27] The internal consistency of the HC-PAIRS has routinely been measured at acceptable levels with Cronbach's alpha ranging between 0.69-0.92 and demonstrating acceptable test-retest reliability, construct validity, and criterion validity.[23,28-32]

Qualitative data collection

We developed a survey that consisted of four open-ended, reflective questions. The authors developed reflective questions based on the research questions. Specifically, student comprehension of maintenance care and other types of care was explored by asking how they would select patients for active care, maintenance care, and wellness care. There were no prompts or definitions of those different types of care were provided. Additionally, there was a question that explored what motivates students to incorporate new evidence into patient care plans as follows:

1. How would you select a patient for active care?
2. How would you select a patient for maintenance care?
3. How would you select a patient for wellness care?
4. What would motivate you to incorporate new evidence on how you select a patient for a care plan?

The open-ended questions were sent to participants via a text message or e-mail with a link to a REDCap data collection form. The reflective question responses were linked to the student's initial quantitative questionnaire results.[24,25] We did not provide participants with definitions of active, maintenance, or wellness care. Thus, their understanding would be based on information gleaned from previous coursework, that learned during their clinical rotations, and external sources of information such as the scientific literature or personal experiences with those forms of care.

Analysis

Descriptive statistics were reported for the demographic data, SoEP, PPOS, and HC-PAIRS. A Spearman's correlation was conducted to assess the strength of the relationships between the three scales because of the non-parametric findings. Survey scores were treated as ordinal variables. Non-parametric difference comparisons were conducted using the Mann-Whitney U test to assess if the differences between groups on the SoEP were significant. A Bonferroni-adjustment was included in the calculation to account for the increased possibility of type -I error due to multiple tests.

Qualitative data were analyzed using an inductive approach to conventional qualitative content analysis guided primarily by the method outlined by Graneheim and Lundman.[33,34] Responses to the open-ended questions were initially entered into tables for review in Microsoft Excel. The responses were individually reviewed line by line several times by multiple team members (KS, ZM, KAP). Two team members (KS, ZM) individually generated codes *de novo* for the responses. KS is a health professional with experience in mixed methods research, qualitative data analysis, and coding, while ZM is a health professional with a graduate degree. The team members met on numerous occasions to establish a coding tree and determine a coding agreement. A third team member (KAP) was available to resolve differences if needed, while a fourth team member (PP), an experienced qualitative researcher, provided oversight, advice, and guidance to the analysis. We identified frequently used codes and significant sentences. Central concepts were inductively grouped into emerging themes through manifest content analysis33 using an iterative process of going back and forth among the responses, significant sentences, and themes. Throughout the analytical process, constant comparisons between the categories and the original data transcripts were made to ensure a good fit between the data and the findings. Consequently, as described by Patton[35], there was attentive devotion toward internal homogeneity and external heterogeneity. To further consolidate the analysis, frequent debriefing sessions among all investigators ensued throughout the process.

Data integration

To integrate quantitative and qualitative data and determine coherence between instrument scores related to student understanding of maintenance care and barriers and facilitators towards incorporating new evidence, the qualitative data coding results were contrasted against the Evidence Perspective Scale, PPOS, and HC-PAIRS scores. Upon finalizing the qualitative data analysis, one team member (KS) searched for patterns of code distribution among participants with higher and lower PPOS and HC-PAIRS scores, respectively, as well as among those distributed to the different chiropractic subgroups described by McGregor *et al*.[21] Where such coding patterns

were identified, representative quotes were extracted into a joint display. Other team members (ZM, KP, AE, PP) reviewed these findings with additional discussion to resolve differences when necessary.

Results

Quantitative questionnaire

The quantitative questionnaire was completed by 74.4% of all students in their fifth to tenth trimester (n=419/563). The response rate by trimester ranged from 53.1% to 90.3%. Table 1 displays the response rates and descriptive data for participants' characteristics and questionnaire findings by trimester. The majority of students previously received a Bachelor's degree (84.5%, trimester range: 82.4%-88.5%), were male (57.5%, trimester range: 50.4%-70.6%), and had a mean self-reported grade point average (GPA) of 3.15/4.0 (SD: 0.369, trimester range: 3.06-3.26).

Table 1.

Descriptive data for student participant demographics and quantitative and qualitative questionnaires.

	Trimester 5 (n=117)	**Trimester 6 (n=65)**	**Trimester 7 (n=65)**	**Trimester 8 (n=69)**	**Trimester 9 (n=52)**	**Trimester 10 (n=51)**	**TOTAL (n=419)**
Quantitative response rate (%)	88.6%	90.3%	76.5%	53.1%	68.4%	75.0%	74.4%
Qualitative response rate (%)	-	-	-	53.1%	76.5%	-	-
Gender-female, n (%)	58 (49.6%)	27 (41.5%)	30 (46.2%)	31 (44.9%)	17 (32.7%)	15 (29.4%)	178 (42.5%)
Bachelor's degree received, n (%)	97 (82.9%)	56 (86.2%)	55 (84.6%)	58 (84.1%)	46 (88.5%)	42 (82.4%)	354 (84.5%)
GPA, mean (SD)	3.26 (0.32)	3.11 (0.37)	3.06 (0.33)	3.16 (0.39)	3.06 (0.41)	3.12 (0.40)	3.15 (0.37)
Evidence Perspective Scale (SoEP), n (%)							
1 - Biomechanical	26 (22.2%)	27 (41.5%)	19 (29.2%)	27 (39.1%)	17 (32.7%)	24 (47.1%)	140 (33.4%)
2 - General Problem/ Biomechanical*	6 (5.1%)	3 (4.6%)	2 (3.1%)	3 (4.4%)	1 (1.9%)	3 (5.9%)	18 (4.3%)
3 - Biomechanical/ Organic Visceral*	2 (1.7%)	1 (1.5%)	1 (1.5%)	1 (1.5%)	1 (1.9%)	0	6 (1.4%)
4 - General Problems	37 (31.6%)	17 (26.2%)	19 (29.2%)	13 (18.8%)	16 (30.8%)	8 (15.7%)	110 (26.3%)
5 - Somatic Dysfunction	11 (9.4%)	10 (15.4%)	9 (13.9%)	8 (11.6%)	7 (13.5%)	4 (7.8%)	49 (11.7%)
6 - Vertebral Subluxation	35 (29.9%)	7 (10.8%)	15 (23.1%	17 (24.6%)	10 (19.2%)	12 (23.5%)	96 (22.9%)
Patient-Practitioner Orientation Scale – PPOS (1-6; high score desired), mean (SD)							
Overall PPOS	3.99 (0.549)	3.97 (0.621)	4.03 (0.557)	3.88 (0.496)	3.88 (0.650)	3.74 (0.586)	3.93 (0.578)
Health Care Providers' Pain and Impairment Relationship Scale - HC-PAIRS (1-7; low score desired), mean (SD)							
Overall HC-PAIRS	4.36 (0.785)	4.21 (0.680)	4.30 (0.698)	4.11 (0.633)	3.94 (0.687)	3.98 (0.666)	4.19 (0.718)
HC-PAIRS Factor 1 (Functional Expectations)	4.22 (0.928)	4.05 (0.822)	4.03 (0.886)	3.92 (0.729)	3.82 (0.799)	3.80 (0.796)	4.01 (0.850)
HC-PAIRS Factor 2 (Social Expectations)	3.86 (0.878)	3.76 (0.779)	3.77 (0.864)	3.65 (0.788)	3.23 (0.922)	3.69 (0.803)	3.71 (0.852)

	Trimester 5 (n=117)	Trimester 6 (n=65)	Trimester 7 (n=65)	Trimester 8 (n=69)	Trimester 9 (n=52)	Trimester 10 (n=51)	TOTAL (n=419)
HC-PAIRS Factor 3 (Need for Cure)	4.29 (1.191)	4.19 (1.163)	4.38 (1.070)	4.08 (1.059)	3.62 (1.237)	3.71 (1.143)	4.09 (1.171)
HC-PAIRS Factor 4 (Projected Cognition)	5.47 (1.007)	5.37 (0.954)	5.63 (0.796)	5.26 (1.043)	5.33 (1.119)	5.24 (0.965)	5.40 (0.989)

*- Combined subgroups for analysis because of small individual cell sizes.
Legend: HC-PAIRS- Health Care Providers' Pain and Impairment Relationship Scale; PPOS- Patient-Practitioner Orientation Scale

As shown in Table 2, differences between the PPOS and HC-PAIRS survey by the SoEP were small and only statistically significant for HC-PAIRS (p=0.03), albeit likely not clinically meaningful. No statistically significant correlations between any of the questionnaires were found (p>0.113), as shown in Table 3.

Table 2.
PPOS and HC-PAIRS scores (n, median, Interquartile Range) based on SoEP.

	1 – Biomechanical	2 and 3 – General Problem/ Biomechanical/ Organic Visceral	4 – General Problems	5 – Somatic Dysfunction	6 – Vertebral Subluxation
Overall PPOS (1-6; high score desired)	n=126 3.89 (3.56-4.28)	n=20 4.03 (3.56-4.50)	n=104 4.00 (3.75-4.39)	n=40 3.89 (3.58-4.22)	n=79 4.11 (3.67-4.33)
Overall HC-PAIRS (1-7; low score desired)**	n=119 4.00 (3.60-4.47)	n=23 4.13 (3.87-4.93)	n=96 4.40 (3.90-4.77)	n=40 4.17 (3.87-4.73)	n=92 4.13 (3.67-4.60)

** - Statistically significant difference
Legend: HC-PAIRS- Health Care Providers' Pain and Impairment Relationship Scale; PPOS- Patient-Practitioner Orientation Scale

Table 3.
Correlation between quantitative questionnaires (rho, n, p-value).

	PPOS	HC-PAIRS	SoEP
PPOS	1.00 n=369 -		
HC-PAIRS	-0.02 n=334 0.732	1.00 n=370 -	
SoEP	0.08 n=369 0.159	0.08 n=370 0.121	1.00 n=419 -

Qualitative questionnaire findings

The qualitative questionnaire was completed by students in their eighth and ninth trimesters; 134 of the 215 eligible students responded (62.3%), with 69 students in their first clinical term (53.1%) and 65 in their second term (76.5%). Most of these respondents were males (n=71, 53.0%) with an average self-reported GPA of 3.1/4.0.

Student understanding of chiropractic maintenance care (MC)

We identified two themes during the content analysis of student responses to the open-ended reflective questions regarding their understanding of how to select patients for MC and how they relate to higher and lower PPOS and HC-PAIRS scores, respectively (see Figure 2 for a joint display depicting representative quotes). There was no pattern of responses identified among different SoEP categories and how they select patients for MC, partially because some of the EBP categories were under-represented among students.

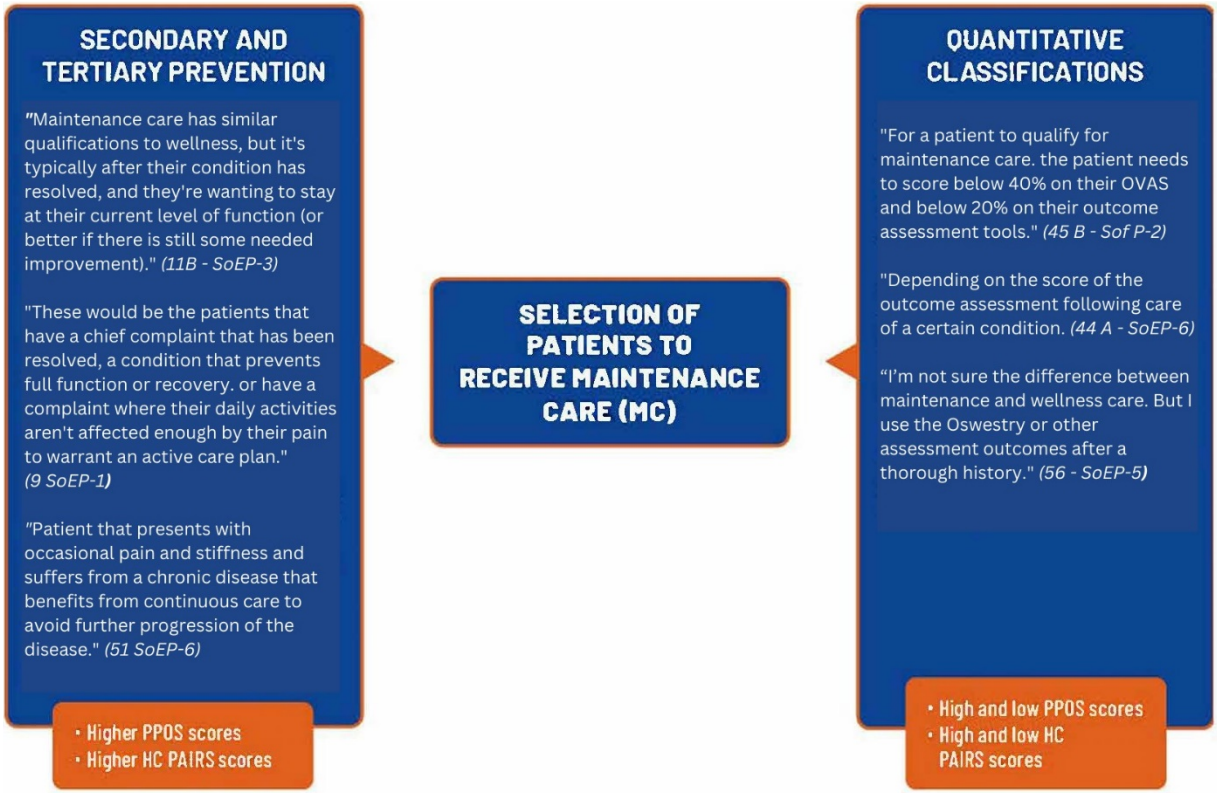

Figure 2.

Joint display depicting themes identified from student responses to open-ended reflective questions regarding how they select patients to receive Maintenance Care (MC) and their relationships with PPOS and HC-PAIRS scores.

The first theme identified was "Secondary and tertiary prevention." This theme related to students describing maintenance care as best suited to patients with no or minimal symptoms or trying to prevent the progression or recurrence of a condition. Respondents indicated that some patients would benefit from maintenance care to continue improvement of their function and overall health, prevent symptom recurrence, and other patients may express a preference for or elect to receive maintenance care. Responses coded under this theme were frequently provided by students with more patient-centered attitudes (higher PPOS scores) and students with lower functional expectations (higher HC-PAIRS scores).

The second theme identified was "Quantitative classifications," and it was related to students determining that MC was appropriate in response to patient scores on quantitative outcome measures performed during patient assessments. Responses to how students would select patients for 'active', 'maintenance', or 'wellness' care were frequently based on patient scores from paper-based outcome measures completed during patient intake, such as the Visual Analog Pain Scale (QVAS or Quadruple Visual

Analog Scale) and the Oswestry Disability Questionnaire. Responses coded under this theme were frequently provided by students with scores at both extremes of PPOS and HC-PAIRS scores. In selecting patients for 'active' care, respondents also articulated one or several other clinical elements, such as a patient's subjective presentation, ability to complete their activities of daily living, presence of any functional limitations, or examination findings.

> *"Depending on how much their complaint affects their activities of daily living and what is scored on the QVAS." - (36T8)*

For 'maintenance' care, respondents stated they selected patients who improved past 'active' care.

> *"These would be the patients that have a chief complaint that has been resolved, a condition that prevents full function or recovery, or have a complaint where their daily activities aren't affected enough by their pain to warrant an active care plan. Outcome assessments would play an equally important role in determining maintenance care, as in active care." - (9QO)*

'Wellness' care patients were commonly selected using the same criteria as 'maintenance' care. Respondents pointed to "Wellness Care" for patients with no or minimal symptoms. Some students mentioned it was challenging to articulate the difference between maintenance and wellness care.

> *"I consider maintenance and wellness very similar and would use "wellness" as a term to describe patients with no complaints and good function overall wanting to prevent issues in the future." - (38T8)*

Motivation for incorporating new evidence

We identified four themes during the content analysis of student responses to the open-ended reflective question regarding what motivates them to incorporate new evidence when they select a care plan for a patient and how they relate to higher and lower PPOS and HC-PAIRS scores, respectively (see Figure 3 for a joint display depicting representative quotes). Again, no pattern of responses was identified among different SoEP categories or motivators for incorporating new evidence when selecting patients for a care plan.

The first theme was "Modern, high-quality evidence," which related to students' motivation to incorporate new evidence into practice when selecting patients for care plans if that evidence was contemporary and notably if it demonstrated internal validity and supporting studies were well-conducted and readily available to them. Responses coded under this theme were frequently provided by students with more patient-centered attitudes (higher PPOS scores) and those with both extremes of HC-PAIRS scores.

The second theme was "Improved outcomes," which related to students' motivation to incorporate new evidence when selecting patients for care plans if it increased the likelihood of improved patient outcomes. Responses coded under this theme were frequently provided by students with more patient-centered attitudes (higher PPOS scores) and those with lower functional expectations (higher HC-PAIRS scores).

The third theme was "Categorizing patients and quantifying findings," which related to students' motivation to incorporate new evidence if it allowed them to determine how patients responded to care and aligned with other outcome measures and could aid with making care decisions. Responses coded under this theme were frequently provided by students with more doctor-centered attitudes (lower PPOS scores).

The fourth theme was "Healthcare beliefs," which related to students' motivation to incorporate new evidence if it aligned with their healthcare views, specifically their approach to providing chiropractic care. Responses coded under this theme were frequently provided by students with higher functional expectations (lower HC-PAIRS scores).

Discussion

This study explored chiropractic students' attitudes towards incorporating evidence on chiropractic maintenance care. Advancements in scientific research can offer new knowledge and patient care techniques that can help clinicians offer the best possible care. Nevertheless, new findings are not always adopted by practicing clinicians

Figure 3.

Joint display depicting themes identified from student responses to open-ended reflective questions regarding what motivates them to incorporate new evidence for selecting patients for care plans and their relationships with PPOS and HC-PAIRS scores.

and attempts to bridge this gap present an ongoing challenge for many clinical professions. Teaching practicing clinicians how to incorporate new evidence could start while they are still students.

In our quantitative exploration of student attitudes, we did not identify any association between final-year chiropractic students' attitudes toward patient-centredness, functional expectations for patients with chronic LBP, and evidence-based practice perspectives. Additionally, this study's qualitative data revealed that while the concept of chiropractic MC could hold multiple definitions for chiropractic students, they would be motivated to incorporate chiropractic MC evidence that was new and high-quality, could be used to improve patient outcomes, helps them categorize patients and quantify their response to care, and aligns with their healthcare beliefs.

Overall, the students had more doctor-centered attitudes towards care based on the PPOS scores, had lower functional expectations of patients with chronic pain based on the HC-PAIRS scores, and espoused a wide range of evidence-based practice perspectives. In a systematic review of patient-centered attitudes in healthcare students, Bejarano and colleagues[36] reported participants to be more doctor-centric, potentially because healthcare

students continually learn new information and may have limited time to focus on other aspects of patient care. This can be further supported by an educational empirical investigation that explored chiropractic students' knowledge, attitudes, and beliefs before and after one of three educational interventions focused on new academic information and one on patient-centeredness; the study found that studying the new academic information led to a decrease in patient-centeredness using the same PPOS instrument.[37]

As interdisciplinary healthcare is no longer an innovation but a way of life, understanding healthcare and public health terminology will ensure optimal interdisciplinary communication.[38,39] Our study found chiropractic students interpret and apply MC in two ways: based on prevention strategies or patient-centered outcomes. The students who portrayed MC as a prevention strategy described care plans based on the public health concepts of secondary (preventing reoccurrence of a previous condition that a patient recovered from) or tertiary (management of an ongoing chronic condition or disease) prevention strategies; however, the public health terms of secondary or tertiary prevention were not explicitly mentioned, indicating some potential for miscommunication with terminology. These findings are in line with previous research among experienced clinicians. In a systematic review it was reported that patients who had experienced previous episodes of low back pain and had improved with treatment were more likely to be recommended MC as a clinical strategy by their chiropractor.[40]

The MAINTAIN instrument was developed based on a clinical trial that collected data with WHYMP and patient-reported outcomes for pain and disability.[9] From these outcomes, the MAINTAIN classification group found a clinically significant correlation with patient-reported pain and disability.[8] In our study, some students described deciding on an MC treatment plan using quantitative patient-reported outcome measures to determine what care plan was best for their patients. However, they described that differentiating between patients who were eligible for different prevention strategies based on these outcomes was difficult. As such, training on psychological profiles found within a screening tool like the MAINTAIN instrument could assist with the better use of patient-reported outcome measures that optimize goal-setting and improve patient outcomes.[41,42]

Over the past 30 or more years there has been increasing integration of research person-centred healthcare.[43] In congruence, this study found several different identified motivators for incorporating new evidence when selecting care plans for patients. Among students with more patient-centered attitudes and lower functional expectations of chronic pain patients, one desire was to improve patient-reported outcomes. Conversely, students who had higher functional expectations of chronic pain patients were frequently described as being more motivated to incorporate new evidence if it aligned with their healthcare beliefs. Students with more doctor-centered attitudes often mentioned a desire to categorize patients and use outcome measures to gauge their progress. Finally, students with more patient-centered attitudes, as well as those with either higher or lower functional expectation of chronic pain patients, considered the quality of new evidence an important consideration before implementation of a new procedure.

Limitations

While this mixed method analysis gave a unique perspective into chiropractic students' motivation to incorporate new evidence, implications from this study should be viewed considering its limitations. Foremost, this was a cohort of students from a single educational institution. Completion of the initial quantitative questionnaire items, specifically any or all the SoEP, PPOS, and HC-PAIRS may have led to student reflection that could have influenced their responses to the subsequent qualitative questions. Additionally, while the quantitative survey had prior property measures conducted, the qualitative questions were not pilot tested. Within qualitative studies, pilot testing has been argued to provide more confidence in the interview schedules and methods used for data collection[44], which may be relevant to these study findings as some responses did not reflect comprehension of the questions. Our study also examined the qualitative data from a manifest rather than a latent angle. Therefore, it is possible that if other forms of analysis (e.g., Phenomenography or Grounded theory) would have been used or if data were looked at using other lenses (e.g., post-positivism), other concepts and/or latent notions could have surfaced. Nonetheless, the research team held recurrent discussions regarding preconceived assumptions while collecting, analyzing, and interpreting the qualitative data.

Future work

Several key findings from this study could assist healthcare educational institutions in considering strategies to motivate the use of these concepts by their students. Our study findings indicate that additional work is needed to determine the need for and content of tailored implementation strategies that will encourage students to incorporate new evidence into their future clinical interactions with patients. Our findings did not suggest one explicit implementation strategy, it is possible that multimodal implementation strategies may be more suitable. Implementation research in healthcare training settings is less advanced than in healthcare provision sectors.[45] Lessons learned in the healthcare provision sector could assist with implementation strategies in educational settings, such as tailored plans that are iteratively adapted as educational interventions are implemented. An example of a tailored program for educational settings is the School Implementation Strategies, Translating ERIC Resources (SISTER) project.[46] SISTER had educational experts adapt the Expert Recommendations for Implementing Change (ERIC) project to assist with implementation research specifically in school settings.

Conclusions

This study did not identify significant associations between chiropractic students' attitudes toward patient-centeredness, functional expectations of LBP, or their evidence-based practice perspectives. The concept of maintenance care was found to be unclear to participants and in need of an operational definition used throughout training programs. The exploration of chiropractic students' attitudes identified a desire to incorporate new evidence on chiropractic maintenance care if the evidence was high quality, aligned with their healthcare beliefs, or could affect patient management or outcomes. Emerging evidence for MC, including that on the development and use of the MAINTAIN tool, could prove useful in this regard as it meets several of these needs.

References

1. Murray CJ, Lopez AD. Measuring the global burden of disease. New Engl J Med. 2013;369(5): 448-457.
2. Da Silva T, Mills K, Brown BT, *et al*. Risk of recurrence of low back pain: a systematic review. J Orthopaed Sports Phys Ther. 2017;47(5): 305-313.
3. Foster NE, Anema JR, Cherkin D, *et al*.; Lancet Low Back Pain Series Working Group. Prevention and treatment of low back pain: evidence, challenges, and promising directions. Lancet. 2018;391(10137): 2368-2383. doi: 10.1016/S0140-6736(18)30489-6.
4. Breen AC. Chiropractors and the treatment of back pain. Rheumatol Rehabil. 1977;16(1): 46–53.
5. Mitchell M. Maintenance care. Some considerations. ACA J Chiropr. 1980;17: 53–55.
6. Rupert RL. A survey of practice patterns and the health promotion and prevention attitudes of US chiropractors. Maintenance care: part I. J Manip Physiol Ther. 2000;23(1): 1–9.
7. Eklund A, Jensen I, Lohela-Karlsson M, *et al*. The Nordic Maintenance Care program: effectiveness of chiropractic maintenance care versus symptom-guided treatment for recurrent and persistent low back pain—a pragmatic randomized controlled trial. PLoS ONE. 2018;13:1–20.
8. Eklund A, Hagberg J, Jensen I, *et al*. The Nordic maintenance care program: maintenance care reduces the number of days with pain in acute episodes and increases the length of pain free periods for dysfunctional patients with recurrent and persistent low back pain-a secondary analysis of a pragmatic randomized controlled trial. Chiropr Man Ther. 2020;28: 19.
9. Eklund A, Palmgren PJ, Jakobsson U, Axén I. Development and evaluation of the MAINTAIN instrument, selecting patients suitable for secondary or tertiary preventive manual care: the Nordic maintenance care program. Chiropr Man Ther. 2022;30(1): 15.
10. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. Implement Sci. 2012;7(1):1-7.
11. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. Med Care. 2001: II46-54.
12. McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, Kerr EA. The quality of health care delivered to adults in the United States. New Engl J Med. 2003;348(26): 2635-2645.
13. Bussières AE, Terhorst L, Leach M, Stuber K, Evans R, Schneider MJ. Self-reported attitudes, skills and use of evidence-based practice among Canadian doctors of chiropractic: a national survey. J Can Chiropr Assoc. 2015;59(4): 332-348.
14. Portela Dos Santos O, Melly P, Hilfiker R, *et al*. Effectiveness of educational interventions to increase skills in evidence-based practice among nurses: the EDITcare Systematic Review. Healthcare (Basel). 2022; 10(11): 2204. https://doi.org/10.3390/healthcare10112204
15. Radack KL, Valanis B. Teaching critical appraisal and application of medical literature to clinical problem-solving. Acad Med. 1986;61(4): 329-331.
16. Ferwana M, Al Alwan I, Moamary MA, Magzoub ME,

Tamim HM. Integration of evidence based medicine into the clinical years of a medical curriculum. J Fam Commun Med. 2012;19(2): 136.
17. Swain MS, Gliedt JA, de Luca K, Newell D, Holmes M. Chiropractic students' cognitive dissonance to statements about professional identity, role, setting and future: international perspectives from a secondary analysis of pooled data. Chiropr Man Ther. 2021;29(1).
18. Ivankova NV, Creswell JW, Stick SL. Using mixed-methods sequential explanatory design: from theory to practice. Field Methods. 2006; 18(1): 3–20. https://doi.org/10.1177/1525822X05282260
19. Watzlawick P, Bavelas JB, Jackson DD. Pragmatics of human communication: a study of interactional patterns, pathologies and paradoxes: WW Norton & Company; 2011.
20. O'Cathain A, Murphy E, Nicholl J. The quality of mixed methods studies in health services research. J Health Serv Res Policy. 2008;13(2): 92-98. doi: 10.1258/jhsrp.2007.007074.
21. McGregor M, Puhl AA, Reinhart C, Injeyan HS, Soave D. Differentiating intraprofessional attitudes toward paradigms in health care delivery among chiropractic factions: results from a randomly sampled survey. BMC Complement Altern Med. 2014;14:51. doi: 10.1186/1472-6882-14-51.
22. Krupat E, Rosenkran SL, Yeager CM, Barnar K, Putnam SM, Inui TS. The practice orientations of physicians and patients: the effect of doctor-patient congruence on satisfaction. Pat Educ Counsel. 2000; 39: 49-59.
23. Rainville J, Bagnall D, Phalen L. Health care providers' attitudes and beliefs about functional impairments and chronic back pain. Clin J Pain. 1995;11(4): 287-295. doi: 10.1097/00002508-199512000-00006.
24. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42(2): 377-381. doi: 10.1016/j.jbi.2008.08.010. Epub 2008 Sep 30.
25. Harris PA, Taylor R, Minor BL, et al; REDCap Consortium. The REDCap consortium: building an international community of software platform partners. J Biomed Inform. 2019;95: 103208. doi: 10.1016/j.jbi.2019.103208.
26. Shaw WS, Woiszwillo MJ, Krupat E. Further validation of the Patient-Practitioner Orientation Scale (PPOS) from recorded visits for back pain. Patient Educ Couns. 2012;89(2): 288-291. doi: 10.1016/j.pec.2012.07.017.
27. Bishop A, Thomas E, Foster NE. Health care practitioners' attitudes and beliefs about low back pain: a systematic search and critical review of available measurement tools. Pain. 2007;132(1-2):91-101. doi: 10.1016/j.pain.2007.01.028.
28. Houben RM, Vlaeyen JW, Peters M, Ostelo RW, Wolters PM, Stomp-van den Berg SG. Health care providers' attitudes and beliefs towards common low back pain: factor structure and psychometric properties of the HC-PAIRS. Clin J Pain. 2004;20(1): 37-44. doi: 10.1097/00002508-200401000-00008.
29. Chen G, Tan BK, Jia HL, O'Sullivan P, Burnett A. Questionnaires to examine back pain beliefs held by health care professionals: a psychometric evaluation of Simplified Chinese versions. Spine. 2011;36(18): 1505-1511. doi: 10.1097/BRS.0b013e3181f49eec.
30. Domenech J, Sánchez-Zuriaga D, Segura-Ortí E, Espejo-Tort B, Lisón JF. Impact of biomedical and biopsychosocial training sessions on the attitudes, beliefs, and recommendations of health care providers about low back pain: a randomised clinical trial. Pain. 2011;152(11): 2557-2563. doi: 10.1016/j.pain.2011.07.023. 7.
31. Moran RW, Rushworth WM, Mason J. Investigation of four self-report instruments (FABT, TSK-HC, Back-PAQ, HC-PAIRS) to measure healthcare practitioners' attitudes and beliefs toward low back pain: reliability, convergent validity and survey of New Zealand osteopaths and manipulative physiotherapists. Musculoskelet Sci Pract. 2017;32: 44-50. doi: 10.1016/j.msksp.2017.08.008.
32. Roitenberg N. Translation and psychometric evaluation of the Hebrew version of the Health Care Providers' Pain and Impairment Relationship Scale. Physiother Res Int. 2019;24(1): e1759. doi: 10.1002/pri.1759.
33. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2): 105-112. doi: 10.1016/j.nedt.2003.10.001.
34. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15(9): 1277-1288. doi: 10.1177/1049732305276687.
35. Patton M. Qualitative Research and Evaluation Methods.3rd ed. Thousand Oaks, CA: Sage Publications; 2002.
36. Bejarano G, Csiernik B, Young JJ, Stuber K, Zadro JR. Healthcare students' attitudes towards patient centred care: a systematic review with meta-analysis. BMC Med Educ. 2022;22(1): 324. doi: 10.1186/s12909-022-03371-1.
37. Miller K, Boylan P, Mullen C, Randolph, Kettner N, Pohlman KA. Evaluation of chiropractic students' knowledge and attitudes following pain interventions: a randomized educational trial. J Chiropr Educ (under review).
38. Reeves S, Pelone F, Harrison R, Goldman J, Zwarenstein M. Interprofessional collaboration to improve professional practice and healthcare outcomes. Cochrane Database Syst Rev. 2017;6(6):CD000072.
39. O'Leary KJ, Buck R, Fligiel HM, *et al*. Structured interdisciplinary rounds in a medical teaching unit:

improving patient safety. Arch Int Med. 2011; 171(7): 678–684. https://doi.org/10.1001/archinternmed.2011.128
40. Axén I, Hestbaek L, Leboeuf-Yde C. Chiropractic maintenance care - what's new? A systematic review of the literature. Chiropr Man Therap. 2019; 27: 63.
41. Rao JK, Anderson LA, Inui TS, *et al*. Communication interventions make a difference in conversations between physicians and patients: a systematic review of the evidence. Med Care. 2007;45(4):340-349.
42. Hyland CJ, Mou D, Virji AZ, *et al*. How to make PROMs work: qualitative insights from leaders at United States hospitals with successful PROMs programs. Qual Life Res. 2023;32(8): 2259-2269. doi:10.1007/s11136-023-03388-z
43. Sacristán JA. Clinical research and medical care: towards effective and complete integration. BMC Med Res Methodol. 2015;15: 4. doi: 10.1186/1471-2288-15-4.
44. Malmqvist, J., Hellberg, K., Möllås, G., Rose, R., Shevlin, M. Conducting the pilot study: a neglected part of the research process? Methodological findings supporting the importance of piloting in qualitative research studies. International J Qual Method. 2019; 18. https://doi.org/10.1177/1609406919878341
45. Sanetti LMH, Charbonneau S, Knight A, Cochrane WS, Kulcyk MCM, Kraus KE. Treatment fidelity reporting in intervention outcome studies in the school psychology literature from 2009 to 2016. Psychol School. 2020;57: 901–922. doi: 10.1002/pits.22364.
46. Cook CR, Lyon AR, Locke J, Waltz T, Powell BJ. Adapting a compilation of implementation strategies to advance school-based implementation research and practice. Prev Sci. 2019;20(6): 914-935. doi: 10.1007/s11121-019-01017-1.

Appendix 1.
Good Reporting of A Mixed Methods Study (GRAMMS)20

GRAMMS item	**Location in Paper**
(1) Describe the justification for using a mixed methods approach to the research question	Methods section
(2) Describe the design in terms of the purpose, priority and sequence of methods	Methods section
(3) Describe each method in terms of sampling, data collection and analysis	Methods section
(4) Describe where integration has occurred, how it has occurred and who has participated in it	Methods section, Integration subsection
(5) Describe any limitation of one method associated with the presence of the other method	Discussion section, Limitations subsection
(6) Describe any insights gained from mixing or integrating methods	Discussion section