



Original Article

Engaging with evidence-based practice in the osteopathy clinical learning environment: A mixed methods pilot study

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ABSTRACT

Introduction: Evidence-based medicine (EBM) requires that patient management decisions include deliberations on the best available evidence. However, engagement with EBM appears to be inconsistent. This pilot study used a mixed-methods approach to evaluate clinical educator and learner engagement with evidence in the clinical learning environment (CLE) through the SNAPPS-Plus clinical supervision model.

Methods: Southern Cross University (Australia) senior osteopathy students and their clinical educators were invited to complete the Evidence-Based Practice Questionnaire (EBPQ) and participate in a series of focus groups following use of the SNAPPS-Plus model in the CLE. Inferential statistics were used to explore EBPQ responses and focus groups were transcribed and thematically analysed.

Results: Attitudes to EBM and practice were largely positive. The student EBPQ *Practice* subscale was significantly improved pre-post intervention. None of the other subscales were significantly different. Focus groups confirmed the increased use of EBM and the SNAPPS-Plus model provided a structure that improved the efficiency and effectiveness of students' literature searches. Focus groups highlighted the different value educators and students placed on research evidence and clinical experience.

Conclusion: This pilot study suggests learners and clinical educators engage with evidence in the CLE, including co-learning. PICO, within the SNAPPS-Plus model, may be an appropriate vehicle for promoting learner use of EBM. This work suggests the SNAPPS-Plus model is a promising strategy for encouraging evidence-based practice behaviours and could be used to inform future research. Further research is required to evaluate whether the model creates a sustained habit of searching for evidence to inform practice.

1. Introduction

Translating scientific discoveries into clinical practice is a priority of many health systems to overcome the long time it takes for research evidence to move from 'benchtop' to 'bedside' [1]. Estimates of 17 years on average are common for research evidence to change the way healthcare is practised [2–5]. It is the responsibility of researchers to disseminate their findings; it is also the responsibility of health practitioners to access and consider the relevance of research when making clinical decisions. Consequently, health professionals are expected to engage in evidence-based medicine (EBM) in the course of patient-care. The use of EBM is thought to improve patient outcomes and reduce costs associated with care [6]. While attitudes towards EBM are largely positive across professions [7], practitioner engagement with evidence in practice is variable [8–10]. Sackett et al. [6] argued that evidence-

based medicine comprises 'three-prongs': research evidence, the practitioner's clinical experience and the patient's values and preferences. If practitioners rely on their clinical experience and their patients' preferences for treatment without considering the best available evidence, then they are not practising EBM. A recent Lancet series on low back pain [11–13] highlighted the gap between what is known about evidence-based approaches to managing low back pain and what actually occurs in practice.

Learning to use and implement EBM can be challenging for health professionals and students [14–16]. Numerous authors have described approaches to teaching and implementing EBM in pre-professional health education programs including a 20-h, 2-week duration course of small group tutorials and didactic lectures [17] and small group intensive courses for practising health professionals [18]. There have also been many evaluations of these approaches using both quantitative

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[17,19–22] and qualitative studies [23,24]. These studies typically demonstrate positive effects with respect to increased knowledge about EBM and its use. Recent studies suggest that even with training, students' confidence with EBM can deteriorate within a short time after they enter professional practice [25]. This appears to be true in many health professions, including osteopathy [26]. Consequently, practitioners and students need strategies that can embed the lifelong habit of using the current best evidence to inform their clinical decisions.

Engaging students in EBM as part of their clinical learning may be a useful strategy [24,27–29]. One approach is the SNAPPS-Plus model of clinical supervision. SNAPPS stands for *Summarise the case, Narrow the differential, Analyse the differential, Probe the clinical educator, Plan the management, and Select and research an aspect of the case for self-directed learning* [30]. It has been advocated as a model of clinical learning that is easy to implement and student-led [31–34]. Most importantly, it is designed to enhance clinical reasoning [35,36] through the use of research evidence to inform clinical decisions [33,37].

To successfully complete the *Select* step of the SNAPPS model, students need to identify an aspect of a case that they would like to research, frame a research question, to conduct efficient and effective searches, and critically appraise the literature that they find. The 'Plus' component of the model was added by Nixon et al. [37] to include a PICO strategy (*Patient or population, Intervention, Comparator, Outcomes*) that would assist students to frame their research question and to search the literature. These authors demonstrated the feasibility of this approach and its usefulness in generating answerable clinical questions.

The Master of Osteopathic Medicine program at Southern Cross University (SCU), Australia, is subject to review through accreditation [38]. Feedback from accreditors recommended strengthening translation of research into practice, particularly in the clinical learning environment. Consequently, the SNAPPS-Plus clinical supervision model [37] was introduced into the clinical education program for fourth and fifth year osteopathy students in 2018. The choice of this model for both implementation into the SCU program was informed by the literature with respect to effective clinical teaching models and the limited knowledge of effective clinical teaching models in osteopathy clinical education. The purpose of this pilot study was to evaluate student and clinical educator engagement with evidence in the clinical learning environment in the Master of Osteopathic Medicine program at SCU through the SNAPPS-Plus clinical supervision model.

2. Methods

The study was approved by the SCU Human Research Ethics Committee (ECN-17-806) and was designed using a mixed-methods approach, given both qualitative and quantitative approaches have previously been used to evaluate EBP.

2.1. Participants

A cohort of 52 students in Year 4 and 5 of the osteopathy program at SCU who were treating and managing patients in the on-campus student-led clinics were invited to participate. The 12 clinical educators who were supervising students in the student-led clinics were also invited to participate. Participation in the study was voluntary.

2.2. Measures

The Evidence-Based Practice Questionnaire, in both the student version (S-EBPQ) [39] and practitioner version (EBPQ) [21], was used to evaluate attitudes, use and self-rated skills in evidence-based practice. Evaluation of the measurement properties in Australian nursing students suggested that the S-EBPQ is a 'psychometrically robust measure of evidence-based practice use, attitudes, and knowledge and skills ...' (p. 73) [40]. Both the practitioner and student versions of the EBPQ contain 24-item and four subscales: *frequency of use of EBP, attitudes*

towards EBP, self-rated knowledge and skills in retrieving and reviewing the literature, and self-rated knowledge and skills in sharing and applying the evidence in practice. Subscale scores were calculated for each of the student and practitioner versions of the EBPQ [21,39]. Students completed the EBPQ before and after the teaching session and clinical educators completed the EBPQ at the start of the teaching session only.

2.3. Design

This mixed methods pilot study was informed by a similar study reported by Nixon et al. (2014). Our pilot study expanded the previous one to capture students' attitudes towards EBM, and students' and clinical educators' opinions on the effectiveness of the SNAPPS-Plus model for improving the practice of EBM in the clinical learning environment.

The pilot study occurred in three phases:

2.3.1. Phase 1: collection of baseline data

Eight clinical educators and 30 students agreed to participate in the study and completed the EBPQ and the S-EBPQ respectively to collect baseline data.

2.3.2. Phase 2: pilot

2.3.2.1. Student and clinical educator training. A training workshop was conducted by a University librarian for students to learn how to use PICO to guide searches for clinically relevant information. PICO is a commonly used approach to formulate a search question in an evidence-based practice setting. It is a highly structured strategy for searching medical literature for information about clinically-relevant questions. PICO, which stands for *Patient, Intervention, Comparison intervention and intended Outcome*, provides a systematic way for practitioners to frame research questions [41,42]. A second training workshop for clinical educators to learn about the SNAPPS-Plus supervision model was conducted by one of the researchers (BV) and follow-up individual training was provided by another member of the researcher team (BG). Training sessions were undertaken before data collection commenced.

2.3.2.2. Implementing the SNAPPS-Plus supervision model. In the second teaching session (July–September 2018) student participants conducted five PICO searches on no more than one aspect of one case per fortnight in their clinical practice sessions at the SCU Health Clinics over a period of 10 weeks. They recorded the results of their PICO searches on a template which they presented to their educators for discussion.

2.3.3. Phase 3: evaluation

At the end of the teaching session, students and clinical educators were invited via email to complete the S-EBPQ and EBPQ respectively and all participants were invited to focus groups. Two focus groups of nine students each and one of six clinical educators were facilitated by two of the researchers (SG and BG). All focus groups were conducted in tutorial rooms on the SCU campus and lasted for between 30 and 60 min. Both researchers were members of the osteopathy academic staff at SCU and known to participants. Semi-structured interview questions are presented in Table 1.

2.4. Analysis

Data from each of the EBPQ questionnaires was entered into SPSS for analysis. Descriptive statistics were generated for the student and clinical educator EBPQ responses. Inferential non-parametric statistics (Sign test) were used to explore differences between the administration time points. Effect sizes (r) [43] were calculated where appropriate and α set at 0.05. Lack of effect size reporting has been identified by a number of authors as an issue when evaluating EBP/EBM educational interventions [44,45].

Table 1
Semi-structured interview guide for focus groups.

Student focus groups
• Were there aspects of the SNAPPS-Plus supervision model that you liked? Why/why not? • Were there aspects of the SNAPPS-Plus supervision model that could be improved? • Did using the SNAPPS-Plus model change your interaction with your supervisor? If so, in what ways? Is the model worth continuing? • Did using the model help your database searching skills? Was the recommended database a useful tool for the PICO searchers? Why/why not? Do you need more support in searching databases more effectively? • Did using the model improve your use of evidence in clinical practice? If so, why/why not? • Would you continue to use PICO searches to help you make clinical decisions after you graduate? Why/why not?
Supervisor focus group
• Were there aspects of the SNAPPS-Plus supervision model that you liked? Why/why not? • Were there aspects of the SNAPPS-Plus supervision model that could be improved? • Did using the model have any influence on the way you supervise students? If so, in what ways? Is the model worth continuing? • Did using the model develop students' database searching skills? Was the recommended database a useful tool for their PICO searchers? • Did using the model improve students' use of evidence in clinical practice? If so, why/why not? • How successful was using the model in changing students' behaviour?/Were they practising EBM? • Did you learn anything when students looked up information that might have influenced the way you think or approach a case?

Focus group data were transcribed and coded using an interpretive qualitative approach [46,47] that was informed by a process described by Braun and Clarke [46]. First, the transcripts were read and re-read many times. Next, initial concepts or codes were identified and data allocated to relevant codes. Codes were then clustered into potential themes that were reviewed, refined or discarded. Each of the four researchers independently analysed transcripts in this way and final themes were agreed through discussion.

3. Results

3.1. Quantitative data

Data were received from 30 students on initial administration (male: $n = 17$, 56.7%) and matched data for 16 students representing 30.8% of the total year 4 and 5 cohort was available following the second administration. Eight EBPQs were received from the clinical educators (male: $n = 5$, 62.5%) representing a response rate of 75%. Descriptive statistics for the educator group are presented in Table 2 and the students in Table 3. Descriptive statistics for each individual item are at Supplementary File 1. There was no significant difference for any of the subscales for students with matched versus unmatched data pre-session ($p > 0.05$). However, a significant difference for the *Frequency of Practice (Practice)* subscale was observed pre-to post-

Table 2
Descriptive statistics for the clinical educator Evidence Based Practice Questionnaire.

Subscale	Mean (SD)	Median	Range
Practice ^a	28.8 (8.2)	28.0	15–38
Attitude ^b	20.8 (3.1)	21.0	16–26
Knowledge and Skills ^c	80.4 (8.5)	84.0	64–89

^a min. score = 7, max. score = 42.

^b min. score = 7, max. score = 28.

^c min. score = 14, max. score = 98.

session with a *medium* effect size ($p = 0.03$, $r = 0.51$) on the S-EBPQ. None of the other subscales were significantly different. Descriptive statistics for the matched data are presented in Table 3.

3.2. Qualitative data

Three focus groups (two student focus groups of nine students each and one focus group of six clinical educators) of between 30 and 60 min were conducted. Four key themes were identified across the three groups: Building a culture of EBM in student-led clinic; Helping students develop research skills; Weighing up the value of clinical practice and research evidence in clinical decision making; and, Creating a learning environment for students and clinical educators.

3.2.1. Building a culture of EBM in student-led clinic

Educators and students reported that the SNAPPS-Plus model helped to instil the habit of researching clinically-relevant questions during clinical practice. Some students became aware that they had not been referring to the current best evidence when they were developing their treatment plans. Although there was limited research into osteopathic management of many conditions, their searches helped them understand other disciplinary approaches, including information that they could pass on to their patients. For example, the PICO searches instilled confidence in communicating exercise prescription for the management of common musculoskeletal presentations:

After, when I talked to my patient, I ... can be confident communicating about all the treatments available to them in that setting ... Exercise rehabilitation - when you look at some conditions, it gave me the ability to give exercises confidently in some discussions with patients, like when that occurs for low back pain, for example. It was really beneficial for me to give specific exercise for a specific condition. (Student 9)

Having a search strategy engaged students in the clinical learning process and provided a platform for students to explore alternative approaches to treatment.

I like that you have to [do PICO searches]. It made you think about what options for treatment there are. (Student 2)

The PICO search directed an evidence-informed strategy for treatment and management to overcome clinical practice knowledge gaps.

When you don't know where you're going, you'd use [a PICO search]. If I don't know what to do for a certain treatment, I can find out what information is out there. (Student 4)

Educators identified the SNAPPS-Plus model as a pragmatic tool to help develop the student's clinical reasoning process.

[Students find] useful information which then helps to inform what the students are able to do and the way they approach the situation. (Clinical Educator 4)

Students appreciated developing the habit of looking for relevant research to support their clinical decisions and that this habit would serve them well in their future practices.

So I'd still do that [searching for evidence] in clinic and I'd still do that because there's new evidence and there's always going to be something new, and a change, or just deeper understanding of it. I think that's having an inquiring mind and you're not going to lose that. (Student 7)

You know how to first approach that patient, then go home, do some research, not very long but just see what the evidence says about how to approach it for next time. You can make a note for when they come in next time. (Student 10)

The capacity of the educatory model to promote research

Table 3
Descriptive statistics for the student Evidence Based Practice Questionnaire.

Subscale	Mean (SD)	Time 1		Mean (SD)	Time 2		p-value
		Median	Range		Median	Range	
Practice ^a	26.6 (8.2)	28.0	12–41	31.2 (6.1)	29.0	23–42	0.03 ($r = 0.51$)
Attitude ^b	17.8 (2.6)	18.0	11–21	17.0 (4.5)	18.5	6–21	0.87
Retrieving & reviewing evidence ^c	30.9 (7.5)	34.5	18–39	33.4 (4.8)	34.5	26–41	0.12
Sharing & applying EBP ^d	22.9 (5.5)	24.0	11–29	25.6 (2.7)	25.5	22–32	0.15

^a min. score = 6, max. score = 42.

^b min. score = 3, max. score = 21.

^c min. score = 7, max. score = 49.

^d min. score = 5, max. score = 35; r –effect size.

engagement was also acknowledged by clinical educators:

As far as implementing a culture of evidence-based practice goes, these exercises and this protocol are an excellent way of establishing, inculcating, encouraging, and teaching students to engage in the literature ... Being able to consume the evidence in an informed manner is fundamental to being a good practitioner, and so engaging in literature in this way, I think, would be an essential activity that our graduates need to be proficient at. (Clinical Educator 3)

3.2.2. Helping students develop research skills

The search engine that was recommended for students was PICO Linguist in the BabelMeSH database (<https://babelmesh.nlm.nih.gov/pico.php>). Students rapidly became frustrated with the limitations of this search engine and replaced it with others, including Google Scholar and EBSCO Host. Students learned to refine their search strategy and developed their skills for more effective and efficient database searching:

For me, the big education came in understanding the hierarchy of research, not just what makes it a gold standard article and what is relevant but how to access a journal on the psychosocial aspects about a patient's osteo-arthritic knee and why she's potentially malingering – and we haven't covered that as fourth years. (Student 2)

One learner also commented towards the end of their focus group about another potential learning strategy however this was not a universal viewpoint:

I think an assignment task around a research question and writing a review about an article and how it's influenced your practice would be more useful. (Student 3)

3.2.3. Weighing up the value of clinical practice and research evidence in clinical decision making

Clinical educators demonstrated varying levels of engagement with the SNAPPS-Plus model. Notwithstanding that implementing this model of supervision added to the numerous responsibilities that they were already fulfilling, attitudes towards research evidence varied. Some educators always prioritised their clinical experience over research evidence. Two students commented:

I feel there are two group - you have osteopaths who are evidence-based and others who are not, and some educators did put a stand on years of research but ... you have some other osteopaths - they're like, 'Oh I've been doing this and it works'. (Student 9)

I definitely find that when it comes time to present a case and get feedback from a [clinical] educator, it's more their experience that comes into how you should be treating that patient. For example, you present a patient with lower back pain. You're always told to make sure you look at piriformis: 'from my experience, make sure

you look at piriformis as opposed to what the evidence says' or 'whatever the evidence is, based on my experience I'd definitely do find that ...'. (Student 12)

Other supervisors enjoyed the opportunity to discuss research findings with students:

The first week we had a patient who was a competitive kickboxer and [the student] was looking at exercises for this kickboxer. It was a very specific population - kickboxing and the best intervention, what exercises are good for his stability? And for me it was perfect for a PICO. Much of what I see I think I could do PICO searches but this one was brilliant because it was something very specific. It was a particular interest for the student and he hadn't really realised his interest in [looking up evidence] so it really helped to bring it out. (Clinical Educator 1)

In some cases, I had really good discussions with the students about what they found and where they found it. (Clinical Educator 4).

3.2.4. Creating a learning environment for students and clinical educators

The SNAPPS-Plus model was predominantly student-led, that is, students were responsible for conducting the searches and for prompting discussion with their educators. These discussions provided opportunities for both the clinical educator and the student to learn from the activity. Students reported that some clinical educators relied heavily on their extensive clinical experience to inform their clinical decisions and were not necessarily engaged with current EBP. The SNAPPS-Plus model could create a learning environment where current evidence, identified via the student's PICO searches, and the clinical experience of the educator and student could be discussed.

But when I searched, for example, manual therapy versus surgery, [the educator] got very surprised to learn about surgery. (Student 9)

One thing with this PICO search is I think that we're definitely teaching our educators what the evidence says. It has definitely been a bit of a learning experience for the educators. (Student 12)

They were intrigued to see what you learn from it and how you would interpret it to them. (Student 14)

However, some students reported that their supervisors lacked the search skills or the time required to assist them with their PICO searches. Student 7 commented:

I'm not sure if they [supervisors] understood the training to help us with our searches but I felt that the supervisors that I've had were a little bit lost with helping me to work it out.

4. Discussion

The purpose of this pilot was to evaluate the engagement of learners and clinical educators with evidence to inform patient care in the osteopathy clinical learning environment through the use of the SNAPPS-

Plus model. Using a mixed-method approach, this pilot suggested that the SNAPPS-Plus model facilitated an increase in the frequency with which students used evidence to inform their clinical decisions in a clinical learning environment. The S-EBPQ results showed a significant change in the *Practice* subscale with a medium effect size, suggesting more frequent consideration of research evidence to inform their practice. The focus group data provided additional evidence to support the potential effectiveness of the model in embedding the habit of looking for research evidence to support clinical decisions. The timing of the implementation (in conjunction with patient care) may also be important [48] in that it provides a context for the practice of EBM with a direct influence on patient care [44]. We are, however, unable to comment on the impact of these practices on patient outcomes [44] as they were not evaluated in the current work. It is also possible that just being exposed to EBP teaching could account for increases in this subscale [49].

Changes in the other S-EBPQ subscales were not significantly different although the *Retrieving and reviewing evidence* and *Sharing and applying EBP* subscales were more positive at the end of the teaching session. The *Retrieving and reviewing evidence* subscale captured self-reported ability to seek sources of evidence and evaluate them. It may be that the workshop with the librarian provided students with the skills to both retrieve and review evidence, and the improved attitude related to using these skills in the clinical learning environment. The *Sharing and applying EBP* explored self-rated reflective ability and information dissemination. Reflective practice occurs in other parts of the osteopathy course so this may have been a normal part of their practice. Engaging in the SNAPPS-Plus model may have extended the students' reflective practice to include how research evidence intersects with clinical practice.

Conversely, the *Attitudes* subscale was slightly more negative, albeit not significantly pre-post. The items here captured student attitudes towards their practice and impression of the value of EBP. Wong et al. [45] in a systematic review of evidence-based practice training, found variable effect sizes with respect to attitudes towards EBP across multiple health professions in entry level training. Changes in attitudes with respect to this subscale may be a result of the challenges with database use and the influence of a small cohort of clinical educators who placed greater emphasis on experience over use of evidence to inform patient management [26]. Engaging clinical educators in modelling EBP and positive attitudes towards it may also reinforce its value to students. Further, evaluation of these attitudes over time would be valuable to explore changes in attitude in the post-professional training environment.

4.1. Training in conducting literature searches and critical appraisal of the literature

Wong et al. [45] suggested that training has a variable impact on student EBP behaviours. In our study, although students were challenged by a number of aspects of the SNAPPS-Plus model, results suggested an ability to adapt. For example, students overcame the perceived limitations of the search tool (PICO Linqvist in the BabelMeSH database) by replacing it with other databases like Google Scholar and EBSCO Host to conduct searches. They also reported refining their search terms. For example, in many searches the terms 'OMT', 'osteopathic manipulative therapy', 'osteopathic manipulative treatment' and 'osteopathy' returned no results. However, if students used the term 'spinal manipulation' their searches yielded results. Therefore, the students appeared to develop their search skills through trial and error. The SNAPPS-Plus model may go some way towards learning how to conduct effective and time-efficient database searches and critical appraisal of the literature. This is important given the findings of Jette et al. [50] that "training, familiarity with and confidence in search strategies, use of databases, and critical appraisal tended to be associated with younger [physical] therapists with fewer years since they

were licensed [registered]" (p.786). That is, the greater duration in practice, the less likely a practitioner was to use database searches in patient management. Access to databases may also prove challenging for students after graduation as they will most likely work in private practice settings where they can no longer make use of university libraries. Scaffolded learning strategies that assist students to develop the level of skill required for effective retrieval, review and application of research evidence needs to be included in pre-professional education [44].

4.2. Clinical educators' engagement with EBM

A strength of the current work is the inclusion of the clinical educator voice. Variable levels of clinical educator engagement with EBP were apparent when students consulted them. Many clinical educators found the approach beneficial for their own learning although some always prioritised the clinical experience of the practitioner over research evidence, a disconnect identified in South African medical educators [51]. This may be a result of the low quality or lack of relevance of the evidence to the particular case, limited EBP self-efficacy [51], or from their own professional education which may have had little focus on research evidence. Many clinical educators in the current work had completed their education before evidence-based curricula and electronic databases were available. Previous training for clinical educators in the search strategies students use has been shown to increase confidence and encouragement of student use of EBP [51]. In the current work, all clinical educators attended a 3-h workshop on the SNAPPS-Plus model and on conducting PICO searches. However, students' comments suggest that further training may have been required to ensure proficiency in PICO searching in all clinical educators.

The lack of high-quality research in osteopathy beyond low back pain is also a potential issue [52]. Students frequently called on research in the chiropractic, physiotherapy or broader manual therapies literature when their searches for osteopathy-specific research returned no results. But even when appropriate research is available it is always tempered by the clinical experience of the practitioner, and patient preference for treatment approach [6]. Our findings suggested differences in the value placed on research evidence compared to clinical experience by educators and students – the former typically leaning toward clinical experience, consistent with the literature [53]. We posit that the model of supervision that was in place before the introduction of the SNAPPS-Plus model cultivated clinical decision-making based on patient preference, and the combined clinical experience of students and educators. The SNAPPS-Plus model had introduced the 'third leg' of Sackett's three-legged stool so that clinical decisions were more frequently based on patient preference, clinical experience and research evidence – implementing EBP as it was originally proposed. However, a potential limitation of using PICO may be that evidence exploring patient care preferences, values and expectation, and practitioner clinical reasoning for particular complaints, may not be captured in literature searches. How to incorporate these elements of evidence-based practice into the EBP framework underpinning the current study is an opportunity for further research.

4.3. A co-learning environment

Compared to other models of clinical supervision, such as the 1-min preceptor model [33], the SNAPPS-Plus model was student-led [32] in that in most instances, it was the students who framed clinically-relevant research questions in the PICO format, conducted the searches, located and read relevant research and who prompted discussions with their clinical educators. Those discussions provided opportunities for both students and educators to develop their knowledge and skills in appraising and sharing research evidence. Students also commented on the opportunity to educate their clinical educators, and the pleasure both parties took in discussing the best management for patients. In

many cases, students were more skilled in locating relevant evidence than their educators. This highlights that further professional development is required for educators to become more conversant with literature searches in the context of the SNAPPS-Plus model, and EBP more broadly, to facilitate deeper co-learning.

4.4. Limitations

There are a number of limitations in this pilot study. First, this was a single institution study, therefore the generalisability to other osteopathy institutions is limited given differences in teaching and implementation of EBP within the clinical learning environment. How this result correlates with the classroom, and translates to professional practice requires further investigation. The use of focus groups also introduces a limitation in that those who are likely to be more positive or more negative about a particular topic may choose to participate, thereby biasing the subsequent themes. In the context of the current work, it is possible that participant recruitment resulted in a more positive view of evidence engagement and the clinical supervision model.

The response rate for the students was small, and the availability of matched data was 30.8% of the cohort. The results may be biased if the students who chose to complete the questionnaires at both time points were more interested in an EBP approach, or had a positive experience with implementing EBP. This small sample and drop-out rate presents a challenge with respect to interpreting the results given the aforementioned bias. Further, the statistically significant difference identified in the *Practice* subscale could be the result of a type I statistical error and the conclusions drawn should be considered in this context. Although data were available for the clinical educators, post-session teaching data were only available for two clinical educators and for this reason, not described here. How these educators' perceptions of EBP change, if at all, will be the topic of investigation in further work.

This study is also the first to use the EBPQ/S-EBPQ in an osteopathy cohort and the measurement properties in this population are not known. Further work is currently underway with larger cohorts and this data may assist in developing a clearer picture of the measurement properties.

Future work could be directed towards longitudinal evaluations of attitudes towards EBP, and whether these attitudes remain positive when students enter their professional practice. Consistently engaging students in EBP in their pre-professional training may reduce the deterioration in confidence with it that was identified by Klaic et al. [25]. The confidence in EBP could also be evaluated in clinical educators as they participate in the supervision model. Further training could also be directed towards the clinical educators to ensure that they are modelling EBP and/or engaging with the student in this practice [51]. Additional qualitative data may shed light on whether the themes identified in the focus groups are consistent with the experiences in other osteopathy clinical learning environments when using the same, or similar models of clinical supervision.

5. Conclusion

The EBM movement has been well-established in health programs since the 1990s. However, the extent to which students practise EBM in their clinical training is variable. Results of this pilot study suggest that the use of the PICO search strategy within the context of the SNAPPS-Plus model may have assisted in increasing the frequency with which research evidence was considered when clinical decisions were made: clinical experience, patient preference for treatment *and* research evidence now contributed to clinical decisions. Osteopathy students drew on research from the chiropractic, physiotherapy and manual therapies literature when relevant, high-quality osteopathy research was unavailable. Development of a co-learning environment for students and their educators was also reported and whether this was a result of using

the SNAPPS-Plus framework or other factors needs to be explored. Further work with larger cohorts and longitudinal studies are also required to evaluate if the positive changes towards practising EBM identified in the current work carry forward to the post-professional training clinical environment.

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Statement of competing interests

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Ethics approval

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijosm.2019.09.001>.

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