



Original Article

UK trained osteopaths' relationship to evidence based practice - An analysis of influencing factors



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ABSTRACT

Background: Use of evidence based practice (EBP) remains controversial amongst UK osteopaths and developing an understanding of factors that influence EBP implementation is important for the profession. This study aimed to explore factors that influence the use of EBP amongst UK osteopaths and to compare these with other healthcare professionals.

Design: We used the JQ37 questionnaire to survey UK registered osteopaths (n = 2010). Logistic regression analyses measured associations between attitudes/beliefs, education, knowledge, EBP skills, and clinical guideline access with osteopaths' age, years since graduation, undergraduate and postgraduate degree level, attention to literature, and use of clinical guidelines.

Results: 370 respondents (18.4%) completed the questionnaire: UK osteopaths generally had positive attitudes about EBP. They agreed that EBP was necessary, improved quality of care and assisted clinical decision-making. They also agreed that literature/research findings were useful in their practice and were interested in learning/improving EBP skills necessary to incorporate EBP into practice. Critical appraisal, professional database use, training and familiarity with search strategies were positively associated with younger osteopaths and those with higher levels of degree, or held a research or educational position in addition to clinical practice. Perceived barriers to utilising EBP were lack of time, inapplicability and uniqueness of their osteopathic patient population.

Discussion and conclusion: Generally UK osteopaths had positive attitudes about EBP and interested in improving skills needed to implement EBP into practice. However, respondents did not search or use available online practice guidelines, believing guidelines were inapplicable to osteopathic patients, who were unique.

1. Introduction

Within his landmark paper, published in the mid-nineties, David Sackett stated that evidence based medicine (EBM) “requires a bottom up approach that integrates the best external evidence with individual clinical expertise” [1]. Four years later, Guyatt *et al.* [2] advanced the idea that the term ‘clinical expertise’ was more than simply clinical experience. They proposed that the ‘expertise’ manifests as the ability to: (1) recognise gaps in knowledge; (2) formulate clinically relevant questions to fill those gaps; (3) carry out an efficient literature search; (4) apply rules of evidence, including a hierarchy of evidence, to determine the validity of studies; (5) apply the literature findings appropriately to the patient problem; and to (6) consider the patient's values and how they affect the balance between potential risks and benefits of the available management options, whilst suitably involving the patient in clinical decision making.

Acquiring and adopting evidence based practice (EBP) skills into every day clinical work is not without its challenges. Two main factors known to influence adoption of EBP are underpinning professional attitudes and beliefs about EBP. These have been identified across a variety of healthcare settings: complementary and alternative (CAM) therapists [3–5]; nurses [6,7], emergency medicine residents [8]; physiotherapists [9,10]; chiropractors [11]; and general practitioners [12,13]. Additional barriers to adopting EBP within CAM includes the lack of evidence underpinning claims for clinical effectiveness and/or lack of evidence of risks associated with these approaches [14]: Sutcliffe *et al.* [15], for example, commented that the majority of manual therapy effectiveness trials were “of such poor quality that it is generally impossible to tell whether these therapies are successful”.

To date little research on this area exists within osteopathy, despite Fryer opining in 2008 that osteopaths' failure to adopt and integrate EBP approaches “may lead to the osteopathic profession becoming

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progressively irrelevant in the sphere of manual medicine and healthcare” [16]. In 2011, Humpage thematically analysed public documents and uncovered differing attitudes and beliefs amongst osteopaths, which implied negative attitudes towards research and EBM in general [17]. She also found the use of research and EBP is viewed as controversial for a large part of practising UK osteopaths with some osteopaths seeing EBP as a threat to the profession and their clinical practice. It appears that, in contrast to other healthcare professions, EBM may not be well accepted in the osteopathic profession.

The notion that practitioner attitude is the main factor related to implementation of EBP into clinical practice was posited nearly 15 years ago [18]. It is also known that undergraduate education as well as continual professional development can positively modify attitudes towards EBP. This attitudinal shift leads to improved integration of research into practice, and appears to be in addition to the expected increase in knowledge and competences from education [19].

In order to explore underpinning factors related to physical therapists' attitudes towards using EBP in the clinical arena, Jette *et al.* developed a questionnaire [10]. Her team found that underpinning attitudes and beliefs were dependent on multiple factors, amongst which was degree accomplishment as well as the number of years since graduation.

Within the UK, the academic level of an osteopathic qualification appears related to practitioners attitudes, beliefs, and critical thinking competences, and appears associated with an ability to manage uncertainty within research [20]. Academic level of the undergraduate osteopathic degree is rising within the UK: the majority of Osteopathic Educational Institutes (OEIs) have now moved from a level five/six undergraduate degree (B-level) to a level seven (M-level) Professional Masters of Osteopathy (M.Ost) degree [21,22]¹. The M.Ost curriculum teaches subjects such as critical thinking, reflective portfolios, research methods at level seven, with students required to produce a level seven research project. Ideally this should improve students' knowledge and attitudes towards research and EBP, as well as develop those skills necessary to develop competence and ‘expertise’ in EBP [16].

1.1. Aims and objectives

Using a version of Jette *et al.*'s JQ37 questionnaire amended for the osteopathic profession, we captured data on the beliefs, attitudes, knowledge, and behaviours of UK osteopaths towards EBP. The JQ37 is widely used in the literature to capture these factors in other healthcare practitioners [23–26]. To allow comparison with results from Jette *et al.*, we explored the following associations: (1) Personal attitudes and perceived benefits and limitations of EBP with practitioner age, educational level at time of entry into the osteopathic course, years since graduation and prior degrees; (2) Reported attention to literature with items measuring attitudes towards EBP; (3) Personal use and understanding of clinical practice guidelines with items measuring age, osteopathic entry level, years since graduation, prior degrees, attention to literature and attitudes towards EBP; (4) Availability of resources to access information and personal skills in using those resources with items measuring age, osteopathic entry level, years since graduation and prior degrees; (5) Establish the main barriers to using EBP in clinical practice.

2. Methods

We gained consent to modify the JQ37 questionnaire to fit the osteopathic profession and to distribute this via online survey software. The questionnaire collects information on seven main areas:

- Attitudes and beliefs about EBP
- Interest in and motivation to engage in EBP
- Educational background and knowledge and skills related to assessing and interpreting information
- Level of attention to and use of the literature
- Access to and availability of information to promote EBP
- Perceived barriers to using evidence in practice
- Use of and access to practice guidelines

2.1. Study population

At the time of the survey, (2015), there were 4976 osteopaths (2497 female) registered with the General Osteopathic Council (GOsC), the UK statutory regulatory body. GOsC also maintains a list of osteopaths who have consented to be contacted for research purposes. All osteopaths on this list who had an email address were sent an invitation that contained a link to the online questionnaire (SurveyGizmo, Widgix LLC, Colorado, United States). Two reminder emails were sent on a monthly basis to these osteopaths to encourage responses.

2.2. Data management and analysis

Data analyses followed the methodology used by Jette *et al.* Data from the online questionnaire was downloaded as a spreadsheet file (Excel, Microsoft Corporation, Washington, US) and imported into a statistical package (SPSS v21.0, IBM Corporation, New York, US) for analysis, significance was set at $p < 0.05$. Demographic data were summarised, tabulated and are presented below. Univariate binomial logistic regression was used to explore potential predictors to practitioner attitudes/beliefs. We calculated odds ratios with 95% confidence intervals and highlighted models with significant factors ($p < 0.05$). Results describe the odds of a particular group of respondents displaying a particular attitude, behaviour or belief in comparison with another group (the so-called ‘reference’ group). To allow meaningful comparison of these data, we used the same reference groups in our analyses as Jette *et al.*

Consistent with Jette *et al.*, all 5-point Likert scale data on agreement that were used as dependent variables in the regression analyses were dichotomised as follows: 1) for positive phrased questions, the items ‘Strongly Agree’ and ‘Agree’ were labelled as ‘Agree’ 2) the items ‘Neutral’, ‘Disagree’ and ‘Strongly Disagree’ were labelled ‘Disagree’. For negatively phrased items, the reverse process was used (*i.e.* ‘Strongly Disagree’ and ‘Disagree’ labelled ‘Disagree’ *etc.*). Similarly, data on frequency of database access were dichotomised into ‘less than 2’ and ‘more than 2’, which accord with the threshold values related to EBP principles [11,27]. All time-related data were conflated as follows: practitioner age was grouped into: 18–30 years; 31–40 years; 41–50 years; 51–60 years and 61 and above. Age since graduation was categorised as: less than 5 years; 5–10 years; 11–15 years and more than 15 years. Pair-wise deletion was used for missing data.

3. Results

We invited a total of 2010 osteopaths to take part in the questionnaire and had responses from 378 (18.8%) 8 of whom did not complete any data entry. Demographic data for the 370 subjects are found at Table 1. *Post-hoc* sample size calculations indicated that 357 responders was the minimum suggested sample size for a 95% confidence level. Results for each category are presented as descriptive data (frequency counts or responses) followed by the results from inferential analyses.

3.1. Attitudes and beliefs

The majority of respondents displayed positive attitudes towards EBP and agreed that: EBP was necessary in the practice of osteopathy

¹ To compare UK academic levels with the various European Qualification Frameworks please see <https://ec.europa.eu/ploteus/en/compare>.

Table 1
Participant characteristics.

Characteristic	n (%)
Gender	
Male	188 (50.8)
Female	180 (48.6)
non-responders	2 (0.5)
Age range	
18–30	32 (8.6)
31–40	87 (23.5)
41–50	140 (37.8)
51–60	77 (20.8)
61 and above	30 (8.1)
non-responders	4 (1.1)
Entry-level osteopathic qualification	
M.Ost	45 (12.2)
B.Sc	181 (48.9)
Other	140 (37.8)
non-responders	4 (1.1)
Highest degree	
BA	36 (9.7)
BSc other than osteopathy	84 (22.7)
PGC	58 (15.7)
Masters other than M.Ost	47 (12.7)
PhD	2 (0.5)
Other	64 (17.3)
non-responders	79 (21.4)
Other role outside practice	
Research	45 (12.2)
Education	132 (35.7)
other	23 (6.2)
non-responders	170 (45.7)
Setting	
Rural	78 (21.1)
Regional	73 (19.7)
Suburban	206 (55.7)
non-responders	13 (3.5)
Years since registration	
≤ 5	53 (14.3)
6–10	110 (29.7)
11–15	59 (15.9)
> 15	139 (37.6)
non-responders	9 (2.4)
Clinical work hours/week	
≤ 20	59 (15.9)
21–30	98 (26.5)
31–40	127 (34.3)
> 41	81 (21.9)
non-responders	5 (1.4)
Patients seen/day	
≤ 5	52 (14.1)
6–10	158 (42.7)
11–15	112 (30.3)
16–20	20 (5.4)
21–30	7 (1.9)
31–40	4 (1.1)
> 41	7 (1.9)
non-responders	10 (2.7)

(67%); literature and research findings were useful to their day-to-day practice (76%); EBP improved care quality (53%) and helped decision making in relation to that care (66%). However, nearly a quarter of respondents felt that adopting EBP placed unreasonable demands on osteopaths (24%). Almost two thirds were interested in learning or improving skills necessary to incorporate EBP into their practice (62%). Fig. 1 charts the distribution of responses related to respondents' attitudes and beliefs about EBP.

There appears to be a weak association between respondents' age, years since graduation and academic degree level, with certain aspects of respondents' attitudes and beliefs about EBP. Younger osteopaths were more likely to agree that adopting EBP was necessary, improved patient care and helped inform decision making on patient care (Table 2). Those with a level seven degree and those who had a research or educational component in addition to their role as a practicing

osteopath, were least likely to think that adopting EBP placed unreasonable demands on osteopaths (Table 3).

3.2. Attention to research literature

This category assessed respondents' behaviour in the following areas: access of research databases to search for practice relevant literature, read clinically relevant research literature and use such literature to inform decision making. The majority of respondents used research databases up to a maximum of once a month (57%) and about a quarter used databases between two and five times a month (27%). Half of respondents read between two to five items of clinically relevant research literature each month (50%) and 42% used professional and research literature between two to five times a months to inform clinical decision making (Fig. 2).

Respondents who agreed to the statement that literature and research findings were useful in day-to-day osteopathic practice were twice as likely to access research databases at least twice a week for clinic related literature. They were also three times more likely to read relevant literature more than twice monthly and nearly six times more likely to use this information in clinical decision making at least twice a month than those that did not agree with this statement (Table 4). Additionally, those respondents who agreed that EBP helped inform patient care decisions were one and a half times more likely to access research databases, twice as likely to read clinically relevant literature at least twice a month and five times more likely to use this information to inform clinical decision than those who did not agree with this statement (Table 5).

3.3. Use of clinical practice guidelines

Although more than two thirds of respondents were aware that practice guidelines were available online and nearly 80% agreed they were able to access these resources, more than two thirds reported that they did not actively seek practice guidelines relating to areas of their practice and less than half used practice guidelines within their clinical work (Fig. 3).

Those respondents who did use practice guidelines generally had positive attitudes to EBP. This group were three times more likely than those who did not use practice guidelines, to agree that EBP was necessary to the practice of osteopathy. They were also nearly three times as likely to agree that research literature findings were: useful in clinical practice; improved quality of patient care and helped them make clinical decisions about care (Table 6).

Compared with those who did not actively seek out guidelines, active guideline seekers were over two and a half times more likely to use guidelines in their practice and over three and a half time more likely to be able to incorporate patient preferences with guidelines. The active guideline seekers were also three and a half times more likely to agree that EBP helped them make decisions about patient care and over twice more likely to agree that EBP improved the quality of patient care (Tables 7 and 8).

3.4. Education, knowledge and skills

Education clearly appeared to impact on adoption of EBP (Fig. 4). Several key factors increased the likelihood of an osteopath adopting EBP: academic level of undergraduate degree (which is directly reflected in the length of time since graduating); respondent's age; possession of post-graduate qualification and involvement in an educational/research role in addition to practice. Less than half of respondents agreed that they received undergraduate education in EBP (45%) and a similar proportion reported receiving formal training in utilising search strategies to identify relevant clinical literature (46%). Despite this, more than three quarters of respondents were familiar with the medical research databases (79%) and half received formal

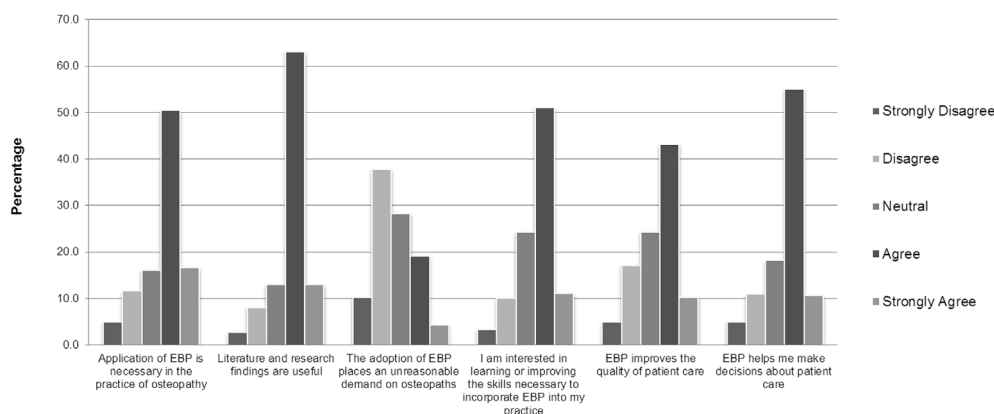


Fig. 1. Self reported attitudes and beliefs about evidence based practice (EBP).

undergraduate training in critically appraising research literature (52%)

In general the responses to statement within this category were associated with the following factors: age; years graduated; level of undergraduate degree; post-graduate degree and presence of any additional research educational roles. The youngest group of respondents (aged 18–30 years) were more than sixteen times more likely to have received undergraduate training in foundations of EBP, nearly twenty times more likely to have received undergraduate training in critical literature appraisal and over six times more likely to have received undergraduate training in search strategy training than our oldest group of respondents (≥ 61 years). The youngest group was also nearly ten times more likely to be familiar with research databases and four times more likely to be confident in their critical appraisal compared with those aged 61 years and above. Interestingly, however, our group of 51–60 year old osteopaths reported being almost as confident finding answers to clinic questions as the youngest group; both about three times more likely to report confidence in this skill than the oldest group (Table 9).

Within this category we also found predictable relationships between education, knowledge and skills linked to time since graduation as well as level of undergraduate degree. Recent graduates (graduated less than five years) appeared over eleven times more likely to have learned EBP in their undergraduate course, seven times more likely to have been trained in using search strategies and three times more likely to be familiar with the research databases than those who graduated more than fifteen years ago. Recent graduates were also some twelve times more likely to have been trained in critical literature appraisal,

although just twice as likely to feel confident doing so (Table 10).

The academic level of entry into the profession appeared to predict respondents' positive alignment with statements about being trained in EBP, search strategies, and critical appraisal. The odds ratios for positive alignment were highest for those with a M-level undergraduate qualification and with holders of a B-level compared with those who held a non-degree level award (Diploma in osteopathy - DO) (Table 11). Those with an M- or B-level qualification were significantly more likely to report: learning EBP at undergraduate level, times; being trained in search strategies and receiving formal training in critical literature appraisal when compared to those with a DO. Furthermore, we noted osteopaths who gained post-graduate degrees, diplomas or certificates, or held an educational or research role in addition to their clinical practice were also more likely to report being confident in their ability to critically review literature (Table 12).

3.5. Barriers to EBP

Our respondents ranked the number one barrier to using EBP in clinical practice as 'insufficient time' (61%). The two second highest ranked barriers to using EBP were an inability to apply research findings typically derived findings from a group of patients to: 1) individual patient's 'unique' presentation (46%); 2) individual practitioner's population of patients (46%). Those barriers ranked as least important to using EBP in osteopathic practice were: lack of interest (24%), lack of research skills (18%), poor ability to critically appraise the literature (13%) and lack of collegial support (10%) (Fig. 5).

Table 2
Demographic factors associated with attitudes and beliefs about EBP.

Attitude or Belief	Factor	Age range	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing data]
				Lower	Upper		
Application of EBP is necessary in the practice of osteopathy	Age	18–30	5.79*	1.74	19.22	32 (8.9)	358 [12]
		31–40	2.30	0.97	5.44	85 (23.7)	
		41–50	2.24	0.99	5.05	136 (38)	
		51–60	2.19	0.91	5.22	76 (21.2)	
		61 and above	Reference ^b			29 (8.1)	
EBP improves the quality of patient care	Age	18–30	3.12*	1.10	8.89	32 (8.9)	359 [11]
		31–40	1.71	0.72	4.06	86 (24)	
		41–50	1.95	0.86	4.45	136 (37.9)	
		51–60	2.13	0.89	5.12	76 (21.2)	
		61 and above	Reference ^b			29 (8.1)	
EBP helps me make decisions about patient care	Age	18–30	3.15*	1.09	9.10	32 (9)	354 [16]
		31–40	2.33	0.99	5.51	84 (23.7)	
		41–50	2.58*	1.14	5.83	133 (37.6)	
		51–60	2.84*	1.18	6.84	76 (21.5)	
		61 and above	Reference ^b			29 (8.2)	

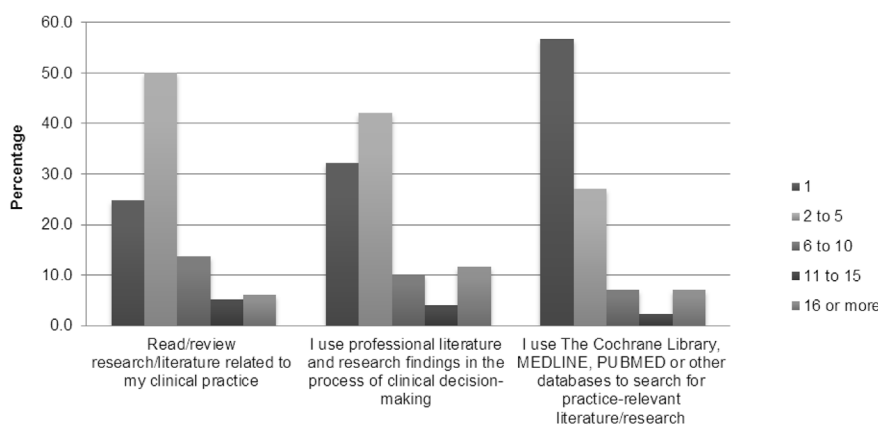
*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

Table 3

Other factors associated with attitudes and beliefs about EBP.

Attitude or Belief	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
The adoption of EBP places an unreasonable demand on osteopaths	Masters other than M.Ost	Yes	0.27*	0.13	0.54	47 (13.1)	359 [11]
		No	Reference ^b			312 (86.9)	
EBP improves the quality of patient care	Masters other than M.Ost	Yes	2.57*	1.30	5.05	47 (13.1)	360 [10]
		No	Reference ^b			313 (86.9)	
EBP helps me make decisions about patient care	Masters other than M.Ost	Yes	2.78*	1.25	6.16	46 (13.0)	355 [15]
		No	Reference ^b			309 (87)	
The adoption of EBP places an unreasonable demand on osteopaths	Educational role	Yes	0.60*	0.39	0.9	132 (36.8)	359 [11]
		No	Reference ^b			227 (63.2)	
The adoption of EBP places an unreasonable demand on osteopaths	Research role	Yes	0.34*	0.17	0.67	44 (315)	359 [11]
		No	Reference ^b			315 (87.7)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

**Fig. 2.** Self reported attention to literature (per month).

4. Discussion

We invited 2010 osteopaths to complete a modified online version of the JQ37 questionnaire, which explores various components associated with their attitudes, beliefs and behaviours towards EBP: 370 osteopaths responded and their data were analysed. In general our respondents seemed to have positive attitudes and beliefs about EBP and were interested in learning or gaining skills to incorporate EBP into their clinical practice. Our findings align with those from other healthcare professions including physiotherapists, chiropractors, primary care professionals, allied therapists and physicians, as detailed below.

4.1. Attitudes and beliefs

Associations were found between participants' age and time since graduation with their attitudes and beliefs; younger osteopaths were

more likely to have positive views of EBP, which compare with findings from physiotherapists [10], chiropractors [11], physicians [28–30] and other allied therapists [31,32]. Similarly, participants who attained a level seven degree (full Masters or M. Ost) generally had better attitudes and beliefs about EBP. This aligns with findings from research from other professions [9,33–36].

4.2. Attention to literature

Database access of less than twice a month has been deemed by some to be inconsistent with EBP [11,27]. The majority of respondents read between two to five journal articles each month and used these to inform clinical decision making; this is similar to literature usage reported by both chiropractors [11] and physiotherapists [27]. In terms of using online databases to search for practice related literature, osteopaths commonly consulted these up to once a month. This appears consistent with chiropractors [11] and physiotherapists [10], although

Table 4

Associations between attention to literature and agreeing that literature and research are useful to clinical practice.

Attention to literature	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing data]
				Lower	Upper		
Read/review research/literature related to my clinical practice	Literature and research findings are useful in my day-to-day practice	Agree	3.06*	1.80	5.21	271 (76.8)	353 [17]
		Disagree	Reference ^b			82 (23.2)	
I use professional literature and research findings in the process of clinical decision-making	Literature and research findings are useful in my day-to-day practice	Agree	5.92*	3.50	10.00	266 (75.6)	352 [18]
		Disagree	Reference ^b			86 (24.4)	
I use The Cochrane Library, MEDLINE, PUBMED or other databases to search for practice-relevant literature/research	Literature and research findings are useful in my day-to-day practice	Agree	2.08*	1.24	3.49	268 (75.7)	354 [16]
		Disagree	Reference ^b			86 (24.3)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

Table 5

Associations between attention to literature and agreeing that EBP helps make decisions about patient care.

Attention to literature	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
Read/review research/literature related to my clinical practice	EBP helps me make decisions about patient care	Agree	2.06*	1.25	3.39	266 (75.6)	352 [18]
		Disagree	Reference ^b			86 (24.4)	
I use professional literature and research findings in the process of clinical decision-making	EBP helps me make decisions about patient care	Agree	5.07*	3.13	8.24	229 (65.4)	350 [20]
		Disagree	Reference ^b			121 (34.6)	
I use The Cochrane Library, MEDLINE, PUBMED or other databases to search for practice-relevant literature/research	EBP helps me make decisions about patient care	Agree	1.59*	1.01	2.50	231 (65.6)	352 [18]
		Disagree	Reference ^b			121 (34.4)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

more recently evidence of increased usage of databases by physiotherapists was reported [27].

4.3. Use of clinical practice guidelines

There was an interesting juxtaposition of views in this area; although the majority of participants viewing EBP as a necessary feature of osteopathic practice, less than half reported using clinical guidelines in their practice. These rates are lower than chiropractors, physiotherapists and allied health professionals [9,11,37]. This apparent contradiction might be explained by differences between underlying beliefs and manifest behaviours: although one can believe EBP is necessary, it appears that in our participants, this belief was not strong enough to generate congruent behaviour [38]. The reasons for this may be explained by a variety of well-established social psychological phenomena: naïve-realism [39], confirmation bias [40], biased assimilation [41] or motivated reasoning [42], which we propose, might be linked to osteopaths' pre-existing beliefs formed by traditional precepts of osteopathy and the uniqueness of patients [43]. Conversely, those who agreed that EBP helped them make decisions, (*i.e.* displayed an existing behaviour), were more likely to actively seek guidelines and use these in clinical decision making.

The underlying attitudes and beliefs of UK osteopaths have recently started to be explored via qualitative research. Thomson *et al.* [44] has modelled osteopaths' conception of their practice, noting that attitudes, beliefs and level of education may underpin a propensity towards upholding traditional models of practice. Kasiri & Bright [45] also captured tensions between so-called 'osteopathic principles' and EBP. Osteopaths who eschewed published guidelines on managing low back pain were interviewed by Figg-Latham & Rajendran [46], who modelled these participant's underlying beliefs as a lens that appeared to

invert the EBM evidence pyramid model. The inversion of the pyramid implied that this group of osteopaths held expert opinion as the highest form of evidence.

4.4. Education knowledge and skills

Confidence in critically reviewing literature and in finding relevant research, involvement in formal training in critical appraisal and foundations for EBP as part of undergraduate education, and participation in formal training in search strategies for finding research relevant to clinical practice were associated to age, years since graduation, post-graduate education, and role in education or research outside of clinical practice.

Jette *et al.* postulated that age may explain ability to engage in internet search skills; this idea may also explain our finding that younger osteopaths (18–30 years of age) appeared more skilful in using the internet and computers to inform clinical decisions compare to older osteopaths (> 60 years). Osteopaths with a full Master's degree or who had roles in research or education, all of which are recent developments within osteopathic education, were also most likely to agree they had skills necessary to apply EBP than any other participants. Finally we found osteopaths with an M. Ost degree and who were also younger were more likely to claim to have the skills necessary to apply EBP in clinical practice and to critically review current literature. This might be, in part, due to the implementation of critical thinking and research method classes as part of the M. Ost curriculum.

4.5. Implications of this study

Our study finds that newly graduated and younger GOSc registered osteopaths have a belief that they have skills in critically appraising

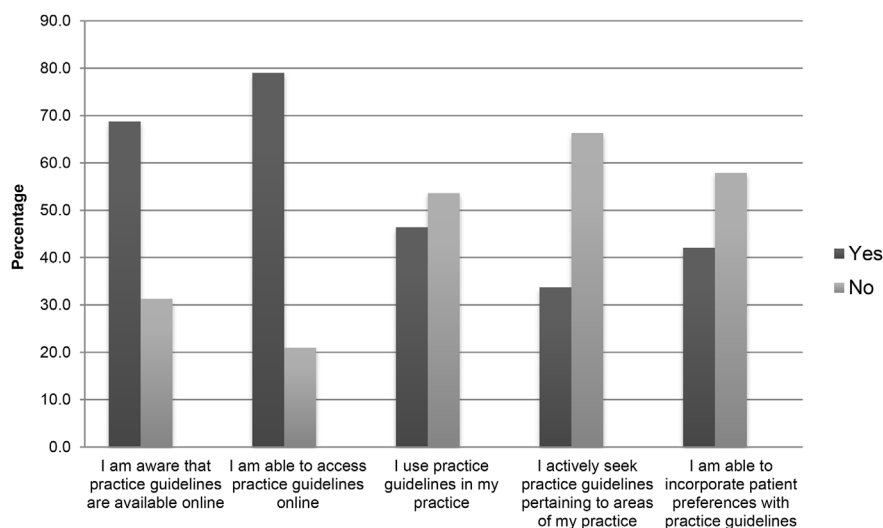


Fig. 3. Self-reported use of clinical practice guidelines.

Table 6
Associations between attitudes and beliefs about EBP and use of practice guidelines.

Attitude or Belief	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		Total n [missing]
				Lower	Upper	
Application of EBP is necessary in the practice of osteopathy	I use practice guidelines in my practice	Agree	3.12*	1.99	5.16	356 [14]
Literature and research findings are useful in my day-to-day practice	I use practice guidelines in my practice	Disagree	Reference ^b			
		Agree	0.37*	0.22	0.62	355 [15]
The adoption of EBP places an unreasonable demand on osteopaths	I use practice guidelines in my practice	Disagree	Reference ^b			
		Agree	2.73*	1.78	0.56	356 [14]
I am interested in learning or improving the skills necessary to incorporate EBP into my practice	I use practice guidelines in my practice	Disagree	Reference ^b			
		Agree	0.51*	0.33	0.79	354 [16]
EBP improves the quality of patient care	I use practice guidelines in my practice	Disagree	Reference ^b			
		Agree	0.39*	0.26	0.61	357 [13]
EBP helps me make decisions about patient care	I use practice guidelines in my practice	Disagree	Reference ^b			
		Agree	0.38*	0.24	0.61	353 [17]

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

Table 7
Associations between attitudes and beliefs about EBP and actively seeking practice guidelines.

Attitude or Belief	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		Model R ^{2c}	n (%)	Total n [missing]
				Lower	Upper			
Application of EBP is necessary in the practice of osteopathy	I actively seek practice guidelines pertaining to areas of my practice	Agree	2.29*	1.38	3.81	0.04	120 (33.6)	357 [13]
		Disagree	Reference ^b				237 (66.4)	
Literature and research findings are useful in my day-to-day practice	I actively seek practice guidelines pertaining to areas of my practice	Agree	4.53*	2.30	8.92	0.10	120 (33.6)	356 [14]
		Disagree	Reference ^b				237 (66.4)	
The adoption of EBP places an unreasonable demand on osteopaths	I actively seek practice guidelines pertaining to areas of my practice	Agree	0.36*	0.23	0.57	0.07	121 (33.9)	357 [13]
		Disagree	Reference ^b				236 (66.1)	
I am interested in learning or improving the skills necessary to incorporate EBP into my practice	I actively seek practice guidelines pertaining to areas of my practice	Agree	1.88*	1.17	3.01	0.03	121 (34.1)	355 [15]
		Disagree	Reference ^b				234 (65.9)	
EBP improves the quality of patient care	I actively seek practice guidelines pertaining to areas of my practice	Agree	2.18*	1.38	3.43	0.04	121 (33.8)	358 [12]
		Disagree	Reference ^b				237 (66.2)	
EBP helps me make decisions about patient care	I actively seek practice guidelines pertaining to areas of my practice	Agree	3.52*	2.06	6.02	0.09	119 (33.6)	354 [16]
		Disagree	Reference ^b				235 (66.4)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

Table 8
Associations between use of practice guidelines and agreeing that EBP helps make decisions about patient care.

Attitude or Belief	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
I actively seek practice guidelines pertaining to areas of my practice	EBP helps me make decisions about patient care	Agree	3.52*	2.06	6.02	232 (65.5)	354 [16]
		Disagree	Reference ^b			122 (34.5)	
I use practice guidelines in my practice	EBP helps me make decisions about patient care	Agree	2.61*	1.64	4.14	231 (65.4)	353 [171]
		Disagree	Reference ^b			122 (34.6)	
I am able to incorporate patient preferences with practice guidelines	EBP helps me make decisions about patient care	Agree	3.65*	2.23	5.99	231 (65.6)	352 [18]
		Disagree	Reference ^b			121 (34.4)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Jette *et al.* (2003); c) - Nagelkerke R².

literature to inform clinical practice. This was not found in older respondents and those who have been graduated longer, nonetheless most respondents claimed to be interested in upskilling in EBP. In part, the provision of continuing professional development (CPD) education in this area may provide osteopaths with EBM skills [47,48]. We note that from 2018 a new scheme from the GOsC obliges osteopaths to explicitly reflect, record and review their CPD, and also require osteopaths to obtain external feedback on their CPD [49]. Perhaps this new scheme will help to positively influence the EBP skills gap we identified within the UK osteopathic profession.

4.6. Limitations and strengths

There are several limitations to our study that must be born in mind whilst interpreting our results. Subjects understanding of the

terminology used in the survey was not verified and this might have impacted on subjects' answers - validation of the English language version of the JQ37 would address these issues. A Spanish version of the JQ37, however, has been validated [50]. In addition our sampling was non-random and limited to a list of osteopaths who had agreed to be contacted for the purposes of research. Arguably since all responses were from osteopaths who were already research minded, our data may be subject to non-responder bias, not representative of the profession at large and be overly optimistic.

Another limitation occurred in our data handling and analyses. Dichotomisation of multiple categories of data would reduce statistical power, nonetheless, in order to be able to directly compare our finding with other studies using the JQ37 questionnaire, this was deemed necessary. In addition, although pair-wise deletion for missing data maximised data available for analyses, it assumes missing data were

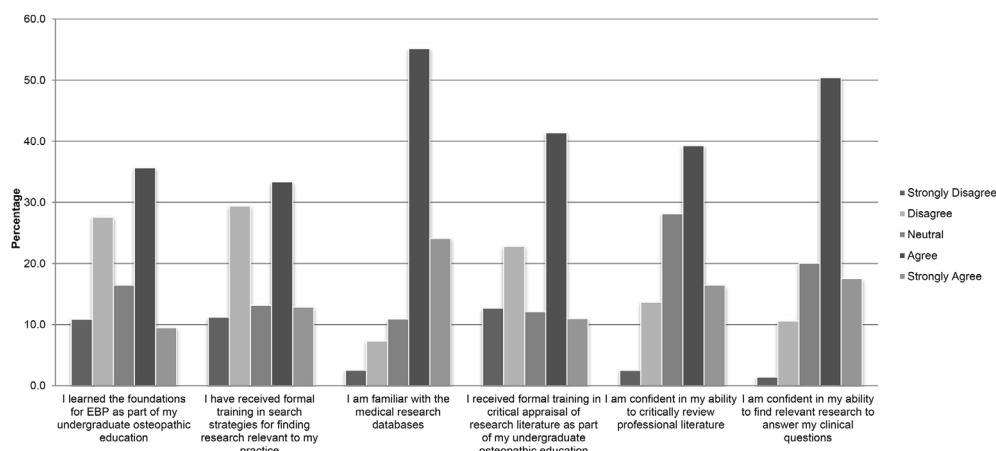


Fig. 4. Self-reported education, knowledge, and skills.

Table 9

Associations between age with self-reported education, knowledge, and skills.

Education and Skills	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
I am confident in my ability to find relevant research to answer my clinical questions	Age	18–30	3.33*	1.10	10.12	32 (9)	356 [14]
		31–40	1.87	0.79	4.40	84 (23.6)	
		41–50	1.87	0.83	4.20	135 (37.9)	
		51–60	2.80*	1.14	6.85	76 (21.3)	
		≥ 61	Reference ^b			29 (8.1)	
I am confident in my ability to critically review professional literature	Age	18–30	4.00*	1.34	11.96	32 (9)	356 [14]
		31–40	2.10	0.88	5.00	85 (23.9)	
		41–50	1.44	0.63	3.26	135 (37.9)	
		51–60	1.48	0.62	3.55	76 (21.3)	
		≥ 61	Reference ^b			28 (7.9)	
I received formal training in critical appraisal of research literature as part of my undergraduate osteopathic education	Age	18–30	19.07*	5.12	71.06	31 (8.8)	352 [18]
		31–40	6.07*	2.23	16.57	85 (24.1)	
		41–50	4.39*	1.67	11.51	134 (38.1)	
		51–60	2.11	0.76	5.84	74 (21)	
		≥ 61	Reference ^b			28 (8)	
I am familiar with the medical research databases (eg, MEDLINE, PUBMED, CINAHL, The Cochrane Library)	Age	18–30	9.71*	1.92	49.04	32 (9)	354 [16]
		31–40	4.29*	1.60	11.54	84 (23.7)	
		41–50	3.15*	1.31	7.61	135 (38.1)	
		51–60	1.15	0.47	2.81	75 (21.2)	
		≥ 61	Reference ^b			28 (7.9)	
I have received formal training in search strategies for finding research relevant to my practice	Age	18–30	6.11*	1.93	19.34	32 (9)	354 [16]
		31–40	3.93*	1.45	10.67	85 (24)	
		41–50	3.72*	1.42	9.77	133 (37.6)	
		51–60	2.02	0.73	5.59	76 (21.5)	
		≥ 61	Reference ^b			28 (7.9)	
I learned the foundations for EBP as part of my undergraduate osteopathic education	Age	18–30	16.61*	4.70	58.74	32 (9)	356 [14]
		31–40	4.64*	1.71	12.56	84 (23.6)	
		41–50	3.46*	1.32	9.02	135 (37.9)	
		51–60	1.28	0.45	3.61	76 (21.3)	
		≥ 61	Reference ^b			29 (8.1)	

* - Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

random. If these were not random, estimates of standard errors may be either over or under estimated [51]. Finally, we conducted a total of 52 regression analyses, and as per Jette *et al.*, did not correct for multiple testing. Any statistically significant results, therefore, may be subject to Type 1 errors (*i.e.* false positives); the presentation of 95% confidence intervals with all odds ratios does provide readers with some context.

An over-riding strength of this study is that it is the first to capture quantitative data on the attitudes and beliefs of UK registered osteopaths to EBP and use of clinical guidelines. It is also the first to compare and contrast these with data captured using the same tool from other professions and could act as a line in the sand to benchmark current attitudes of the UK osteopathic profession to EBP.

4.7. Areas for future research

We recommend that future studies contemplating using the English version of the JQ37 consider validating the questionnaire first, do not dichotomise data and consider using structural equation modelling to testing relationships between variables. Repeating this survey with the full register of osteopaths would be very useful to benchmark the current attitudes and beliefs of osteopaths. Once the new GOsC CPD scheme has run a full cycle of four years, re-running the survey would allow a valuable comparison on whether this scheme has created change in the beliefs and skills of UK osteopaths towards EBP.

Table 10
Associations between years since graduation and self-reported education, knowledge, and skills.

Education and Skills	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
I am confident in my ability to critically review professional literature	Years since registration	< 5	2.35*	1.20	4.59	52 (14.7)	354 [16]
		5–10	2.31*	1.37	3.90	109 (30.8)	
		11–15	0.92	0.49	1.72	56 (15.8)	
		> 15	Reference ^b			137 (38.7)	
I received formal training in critical appraisal of research literature as part of my undergraduate osteopathic education	Years since registration	< 5	12.08*	5.55	26.32	51 (14.6)	350 [20]
		5–10	9.61*	5.34	17.31	109 (31.1)	
		11–15	3.83*	1.98	7.43	56 (16)	
		> 15	Reference ^b			134 (38.3)	
I am familiar with the medical research databases (eg, MEDLINE, PUBMED, CINAHL, The Cochrane Library)	Years since registration	< 5	3.69*	1.55	8.81	52 (14.8)	352 [18]
		5–10	6.26*	2.91	13.46	107 (30.4)	
		11–15	3.45*	1.51	7.87	56 (15.9)	
		> 15	Reference ^b			137 (38.9)	
I have received formal training in search strategies for finding research relevant to my practice	Years since registration	< 5	6.82*	3.37	13.80	52 (14.7)	353 [17]
		5–10	4.58*	2.65	7.91	108 (30.6)	
		11–15	2.82*	1.47	5.41	56 (15.9)	
		> 15	Reference ^b			137 (38.8)	
I learned the foundations for EBP as part of my undergraduate osteopathic education	Years since registration	< 5	11.59*	5.49	24.46	52 (14.7)	354 [16]
		5–10	7.98*	4.46	14.26	109 (30.8)	
		11–15	3.20*	1.62	6.32	56 (15.8)	
		> 15	Reference ^b			137 (38.7)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

Table 11
Associations between professional qualification level and self-reported education, knowledge, and skills.

Education and Skills	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		Total n [missing]
				Lower	Upper	
I am confident in my ability to critically review professional literature	Undergraduate qualification	M-level	2.66*	1.25	5.68	351 [19]
		B - level	1.73	1.06	2.83	
		DO	Reference ^b			
I received formal training in critical appraisal of research literature as part of my undergraduate osteopathic education	Undergraduate qualification	M-level	60.24*	19.69	184.37	347 [23]
		B - level	21.87*	9.62	49.71	
		DO	Reference ^b			
I am familiar with the medical research databases (eg, MEDLINE, PUBMED, CINAHL, The Cochrane Library)	Undergraduate qualification	M-level	5.86*	1.93	17.82	349 [21]
		B - level	2.98*	1.71	5.21	
		DO	Reference ^b			
I have received formal training in search strategies for finding research relevant to my practice	Undergraduate qualification	M-level	7.25*	3.26	16.12	349 [21]
		B - level	3.61*	2.07	6.30	
		DO	Reference ^b			
I learned the foundations for EBP as part of my undergraduate osteopathic education	Undergraduate qualification	M-level	14.46*	6.02	34.78	351 [19]
		B - level	7.99*	4.12	15.51	
		DO	Reference ^b			

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator - non degree qualification.

Table 12
Associations other factors and self-reported education, knowledge, and skills.

Education and Skills	Factor	Level	Odds Ratio	95% CI ^a for Odds ratio		n (%)	Total n [missing]
				Lower	Upper		
I am confident in my ability to critically review professional literature	Masters - other than M Ost	Yes	2.97*	1.46	6.05	47 (13.1)	358 [12]
		No	Reference ^b			311 (86.9)	
I am familiar with the medical research databases (eg, MEDLINE, PUBMED, CINAHL, The Cochrane Library) ^a	Masters - other than M Ost	Yes	3.15*	1.09	9.08	47 (13.2)	356 [14]
		No	Reference ^b			309 (86.8)	
I have received formal training in search strategies for finding research relevant to my practice	Masters - other than M Ost	Yes	2.46*	1.29	4.70	46 (12.9)	356 [14]
		No	Reference ^b			310 (87.1)	
I am confident in my ability to critically review professional literature	Post Graduate Certificate	Yes	2.10*	1.14	3.87	57 (15.9)	358 [12]
		No	Reference ^b			301 (84.1)	
I am confident in my ability to find relevant research to answer my clinical questions	Education role outside of clinical practice	Yes	1.75*	1.08	2.84	130 (36.3)	358 [12]
		No	Reference ^b			228 (63.7)	
I am confident in my ability to critically review professional literature	Education role outside of clinical practice	Yes	1.89*	1.21	2.95	130 (36.3)	358 [12]
		No	Reference ^b			228 (63.7)	
I am confident in my ability to critically review professional literature	Research role outside of clinical practice	Yes	2.35*	1.17	4.72	44 (12.3)	358 [12]
		No	Reference ^b			314 (87.7)	

*-Significant finding; a) - 95% confidence interval; b) - Reference or comparator as used by Ref. [10].

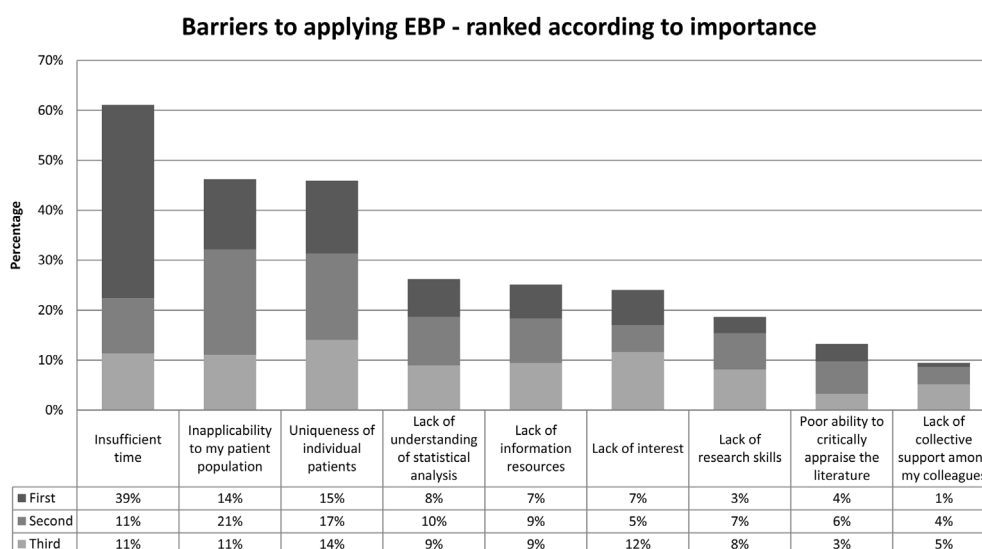


Fig. 5. Self-reported barriers to EBP ranked according to importance.

5. Conclusion

GOsC registered osteopaths that participated in this study generally had positive attitudes and beliefs about EBP, thought EBP was useful in their day-to-day practice, and were interested in improving their skills in order to implement EBM into their practice. Younger participants (between 18 to 30 years of age), and those who had graduated for less than five years, exhibited more positive attitudes and beliefs about EBP. However, despite having positive attitudes and generally good access to scientific literature, respondents did not seem to use or actively search practice guidelines on a regular basis. More research is warranted to establish specific barriers to use of EBP and clinical practice guidelines in the osteopathic practice setting and impact of practitioners' attitudes, beliefs, and adherence to clinical guidelines on patient outcomes. These results suggest that osteopathic institutions and continuing professional development programs should improve and develop the teaching of EBP and use of clinical guidelines in order to facilitate their use in clinical practice.

Ethical approval

Obtained from the European School of Osteopathy Research Ethics Committee.

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Conflicts of interest

DR is employed as a researcher and clinical tutor at the European School of Osteopathy, Boxley House, The Street, Boxley, Maidstone, Kent ME14 3DZ; he also works as an osteopath in private practice.

VW is a non-practicing osteopath and currently a full-time medical student.

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