Attitudes and Perceived Barriers to Evidence-Based Practice in Optometry Educators

Catherine M. Suttle[1,2] PhD, MCOptom, Kirsten L. Challinor[1] PhD, Rachel E. Thompson[3] MBChB, MSc., Konrad Pesudovs[4] PhD, Leanne Togher[5] BAppSc (Speech Path), PhD, Neville Chiavaroli[6] MPhil, MEd, Adrian Lee[1] PhD, Barbara Junghans[1] PhD, Fiona Stapleton[1] PhD, Kathleen Watt[1] BOptom, Isabelle Jalbert[1] OD, MPH, PhD

[1] School of Optometry and Vision Science, UNSW Australia, Sydney, Australia

[2] School of Health Sciences, City University, London, UK

[3] UNSW Medicine, Sydney, Australia

[4] Optometry and Vision Science, School of Health Sciences, Flinders University, Adelaide, Australia

[5] Faculty of Health Sciences, University of Sydney, Sydney, Australia

[6] Medical Education Unit, Melbourne Medical School, University of Melbourne, Melbourne, Australia

Date submitted: 14 July 2014

Number of tables: 2; Number of figures: 4

Correspondence to:

Isabelle Jalbert, School of Optometry and Vision Science, UNSW Australia, Sydney, Australia NSW 2052

Tel: +61-2-9385-9816 / Fax: +61-2-9313-6243

21 Email: i.jalbert@unsw.edu.au

22

Purpose: Evidence-based practice (EBP) is an essential component of good quality, patient-centred health care. This requires practitioners to acquire EBP skills and knowledge during undergraduate and continuing education. EBP education exists in a range of health care disciplines, including optometry. EBP education, however, depends on relevant skills and knowledge in educators. Courses and workshops exist for the development of EBP teaching skills in some areas of health care, but not in optometry. Here we describe a pilot workshop designed to enhance the teaching of EBP and to investigate the perspectives of optometric educators on EBP including their attitudes and perceived barriers to EBP and its teaching. **Methods:** Twenty-seven optometric educators including 8 facilitators participated. Of these, 14 were academics (including the 8 facilitators) and 13 were practitioners. EBP attitudes were assessed using the Evidence-Based Practice Attitude Scale (EBPAS)-50 with appropriate modifications for optometry. Workshop design incorporated strategies to trigger discussion among participants. A nominal group technique was used to identify, prioritize and reach consensus on barriers to EBP. **Results:** Whilst some participants expressed reservations about EBP, a common understanding of the contemporary definition of EBP emerged in educators. Thirty-five barriers to EBP were identified; 'time' was selected in the top 5 barriers by most participants and attracted the highest total score, well above any other barrier (negative attitude to EBP, volume of evidence, integration with clinical practice and lack of lifelong learning mindset). Attitudes toward EBP were generally positive and negatively correlated with age and time since graduation, respectively. **Conclusions:** A group of optometrists and academics new to implementing education in EBP displayed positive attitudes to EBP but considered that its application and teaching could be significantly hindered by a lack of time to access and appraise the large volume of available research evidence in the field of eye care.

Key words: Evidence-based practice, optometric education

Introduction

Evidence-based practice (EBP) involves clinical decision-making that is based on the current best evidence in consultation with the patient and informed by the expertise of the practitioner.[1-3] The 'best' evidence is the most reliable and valid and can be obtained from sources ranging from critical summaries, evidence-based synopses and systematic reviews of high level, high quality research such as randomized controlled trials, to less reliable research such as individual case reports and expert opinions.[4] The process of EBP involves the five steps of: asking answerable questions, searching for evidence, critically appraising evidence, making decisions, and evaluating outcomes.[2, 3, 5] This process is sometimes referred to as the 5 A's for 'Ask', 'Acquire', 'Appraise', 'Apply' and 'Audit'.

EBP is increasingly recognized in allied health disciplines including optometry.[2, 3, 6-15] However, recognition of the need for EBP is only one step toward it becoming a reality for a profession; this cannot occur unless practitioners are properly trained and know how to practice in this way. EBP requires a set of skills and knowledge including the ability to find and appraise evidence and to apply the best evidence at the point of clinical decision-making.[2, 5] These attributes must be taught in undergraduate and continuing optometry education, acquired by students and practitioners and hopefully maintained throughout practice life. Recent work on the design of undergraduate and continuing optometric education has resulted in EBP being a core part of many optometry curricula. For example, a survey of North American optometry and ophthalmology educators provided recommendations for enhanced EBP learning and teaching in these disciplines.[16] In Australia and New Zealand, schools and departments of optometry collaborated on a project that aimed to ensure that all optometry students in that region graduate with the skills and knowledge needed for EBP.[17] This in turn requires teachers and educators who are equipped for this task.

EBP skills and knowledge may not, however, be enough to ensure EBP practice.[18] EBP may not be adopted by educators, students and practitioners unless they understand the need for and significance of this approach and hold a positive attitude to EBP. Thus, evidence-based optometry depends in part on education and training including the EBP skills, knowledge and attitude of the educators themselves, and their ability to teach EBP. In medicine and some allied health disciplines, the importance of high quality EBP teaching has been widely recognized and workshops and courses have been developed and implemented to ensure that teachers have the skills and attributes required to teach EBP. McMaster University has offered a two-day course in evidence-based medicine (EBM) that has evolved over the past 20 years and includes interactive sessions, role playing and mentoring.[19] A different format has been employed by the EBM Unity project team whose course is available online for teachers of EBM.[20] The course was designed to allow practitioner-teachers to undertake sessions at their convenience, such as during breaks in clinical work, and to encourage teachers to use clinical situations to teach EBM.[20] The Critical Appraisal Skills Program (CASP) provides workshops that aim to develop skills in critical appraisal and in teaching EBP for any health care discipline.[21] In allied health, a two-day train-the-trainers workshop has been devised for podiatry educators, with face-to-face delivery of lectures and discussions as well as exercises relevant to EBP. The workshop was found to improve self-reporting of EBP skills, though some changes in practitioner-teacher behavior were not maintained in the longer term due to a range of factors including a lack of necessary resources.[22]

Australian and New Zealand optometrists recently reported that their clinical decision-making is based more heavily on sources of knowledge and information such as undergraduate and continuing education than on evidence they have sourced and appraised themselves, such as from scientific journals that may

include recent, peer-reviewed research.[10] Similarly, recent findings from a UK study indicate that optometrists rely largely on non peer-reviewed professional journals for evidence to support advice for patients with age-related macular degeneration.[23] Taken together, these findings suggest that optometrists may not always look for the best available evidence via the EBP process of search and appraisal. This may reflect a lack of EBP skills and knowledge, and/or a failure to appreciate the need for an evidence-based approach to clinical decision-making, as well as other factors such as lack of time or access to evidence. These barriers are commonly reported in other health fields including medicine.[24-27]

Discussion on the outlooks and approaches of academics and health care practitioners points to differences in their communities and cultures and suggests a divide between the two.[28] However, these diverse perspectives and experiences are acknowledged as important components in the teaching of EBP for health care.[9] The EBP skills, knowledge and attitudes of the academics and practitioners responsible for teaching optometrists have not been explored to date. There are also no published reports of training in EBP for educators in optometry. Without such training, it is feasible that optometric teachers, who themselves have not necessarily received education in EBP, do not have the skills and knowledge needed for EBP, nor an understanding of the need for EBP in clinical decision-making, and may not have experience or expertise in teaching EBP. The work described here is part of a larger collaborative project involving optometry schools and departments in Australasia.[17] In the part of the project described here, our goal was to design and deliver a pilot workshop to enhance the teaching of EBP in an undergraduate optometry curriculum. As part of the workshop, we investigated the perspectives of optometric educators on EBP including their attitudes and any barriers to EBP perceived by them. The workshop intended to focus on both the practice and the teaching of EBP, with a primary focus on teaching because it was created for and attended by optometric educators.

Methods

A one-day workshop was designed based in part on the published description of existing face-to-face workshops for teachers of EBP[19] and by drawing on the experience of authors AL and NC in medical education. The workshop design took into account the fact that participants would be experienced in teaching within either a classroom or clinical setting but that their EBP knowledge, skills and attitude were unknown and may vary. We used a blend of didactic and non-didactic methods such as lectures, small-group discussions, facilitated and interactive sessions and panel discussions. This was intended to enhance learning and to allow the participants to actively discuss the issues presented, to reach their own conclusions on any discussion topics,[29] and broadly follows the format of the McMaster EBP workshops.[19] Twenty-four of 27 participants including the facilitators signed an appearance release agreeing for audio, video and statements recorded during the day to be used for educational, promotional and editorial purposes. While ethical approval was not required for the overall workshop as this was deemed curriculum improvement, it was obtained for one part of the workshop in which ~~to~~ educators' attitudes to EBP prior to and following completion of the workshop were sampled.

EBP experts from outside of optometry (authors RT and LT; medicine and speech pathology respectively) and within optometry were invited to co-facilitate the workshop alongside an education expert with experience of teaching medicine from an EBP perspective (author AL). Each facilitator brought extensive experience of teaching EBP in their field. All academic teachers in the host institution's optometry program (UNSW Australia) who were not facilitators received an invitation to attend. Clinical teachers were selected for invitation from a larger pool of external visiting clinicians regularly delivering optometric education at the UNSW Optometry Clinic. Six of 12 invited (non-facilitator) academics and 13

of 18 invited clinical teachers participated in the workshop. Selection was guided by the Optometry School's clinic director (author KW), and in line with maximum variation sampling strategies was intended to ensure that the workshop attendees included a mix of optometric educators with different levels of perceived familiarity and interest in EBP and education. Of the 27 optometric educators who participated in the workshop, 14 were academics (including the 8 facilitators) and 13 were clinical supervisors.

Optometric educators were divided into small groups of four to five non-facilitator participants for discussions at the workshop. Each small group included approximately equal numbers of academic and clinical teachers with the intention of including different perspectives in each group.[19] Eight facilitators including five optometrists attended the workshop and were seated separately from other groups, so that all facilitators participated in all sessions and made contributions to discussions throughout the workshop, but did not contribute directly to small-group discussion among optometric educators. In line with the McMaster recommendations, the workshop adopted the characteristics of small group interactive sessions, high educator to learner ratio, heterogeneity of learners and feedback.[19] The content of the workshop is summarized in Table 1 and, as outlined above, included a mix of activities such as didactic presentations, interactive discussions and self-directed exploration.

EBP attitudes can be measured qualitatively[30] or using one of a few existing tools.[31-33] Attitudes toward EBP were assessed before and after the workshop using a modified version of the Evidence-Based Practice Attitude Scale (EBPAS – 50[31]), which has previously been validated for use by mental health practitioners[31] and physicians[34] (see Table, Supplemental Digital Content 1, which contains the Evidence-Based Practice Attitude Scale (EBPAS) for optometry). The modifications involved changes to wording so

that terminology was relevant for optometrists. These modifications included, for example, replacing the word *clients* with *patients*. Modifications were proposed and reviewed using an iterative process and feedback from a panel of 12 EBP experts (including 8 optometrists). The modified EBPAS is a 50-item questionnaire that samples optometrists' attitudes towards EBP across 12 sub-scales or domains (see Table, Supplemental Digital Content 1, which contains the Evidence-Based Practice Attitude Scale (EBPAS) for optometry).

A score for each domain is obtained by averaging the responses to individual sub-scale items scored on a five-step 0 to 4 categorical scale where 0 = "not at all" and 4 = "to a very great extent" with a value of 4 representing a positive attitude and a value of 0 a negative attitude. The domains of divergence, limitations, monitoring, and burden were reversed to calculate the composite score EBPAS-50. All domains were combined to form the EBPAS-50 score.

The workshop included a number of small group (four to five participants in each) discussions, one of which opened the workshop with discussion on perceptions and attitudes to EBP. Participants were asked the questions: "*What does evidence-based practice mean to you, and what is its significance to optometry?"* (Table 1, Session 1). In a second discussion, participants were asked the question: "*What strategies do you use to teach optometry students to be evidence-based practitioners?"* (Table 1, Session 5). Responses were collected and the strategies discussed with the whole group including facilitators. The aim of this session was to provoke thought and generate discussion on teaching strategies that could potentially be used to teach EBP in optometry, with input from facilitators with related experience.

The workshop included a lecture on the internationally accepted expert consensus view of EBP including its definition, the EBP process and its significance to health care (Table 1, Session 2).[2] The rationale for including this lecture was to ensure that, once individuals' thoughts on the meaning of EBP had been gathered, all were made aware of the widely accepted meaning and significance of EBP. The Sicily statements[1,8] were outlined in this lecture, focusing not only on the Sicily group's definition of the meaning and significance of EBP but also on its emphasis on the importance of effective teaching of EBP. Two additional lectures were delivered during the workshop describing experiences of teaching EBP in medicine (author RT) and teaching EBP in ophthalmology and optometry (author KP) (Table 1, Sessions 3 and 4). These lectures were intended to illustrate teaching approaches and methods that have been used to develop skills and knowledge needed for EBP in these areas, and to outline the nature and resolution of any difficulties encountered in teaching EBP.

During the workshop, a structured qualitative interactive session was conducted [35] with the aim of identifying barriers to EBP in optometry (Table 1, Session 6), as a basis for a discussion on overcoming such barriers. An approach combining the nominal group technique[35] with a fishbowl technique[36] was used to elicit, prioritize and semi-quantify barriers to EBP. A highly experienced health education expert facilitated this session (author AL).[37] The nominal group technique is a qualitative method of data collection that enables a group to generate and prioritize a large number of issues with a structure that gives everyone an equal voice. It has been used in a number of health contexts to generate ideas and allow a group to reach consensus on barriers and facilitators to health practices.[38, 39] The 25 participants at this session were given an individual card and asked to record silently their responses to the question "*What are the main difficulties and challenges you face in teaching & applying EBP*?" The participants

included the 19 non-facilitators, four optometrist facilitators and two non-optometrist facilitators (authors LT and RT). Thus, the responses include a small contribution from a non-optometry perspective. Eight non-facilitator attendees were pseudo-randomly selected (the first to return to the room after a break) to form the "fishbowl" with the remaining 17 participants forming an outer group seated behind them. Participants in the fishbowl took turns to read aloud a single response from their card with each response recorded on a flip chart. This continued in a round robin fashion until all responses from the fishbowl were exhausted. Omissions were identified by asking participants in the outer group to contribute any responses from their cards that had not already been nominated. A facilitated discussion followed in which responses were reviewed and clarified. Group consensus was reached on the meaning of each individual contribution and similar items were amalgamated, to ensure that all responses were accurately represented. Participants were then asked to individually choose, rank and record five responses they personally considered most important with the most important granted a score of five and the least important a score of one. The rankings were summed for each barrier and displayed on the flip chart for the group to see. The barriers were subsequently reviewed (post workshop) by two authors (IJ, CS) who identified themes individually and reviewed their findings collaboratively to reach consensus. For each barrier, the number of votes it received (maximum 25) and its total (maximum possible score of 125 if top rank of 5 was given by all 25 participants) and average score (total score divided by the number of votes) were recorded (see Table, Supplemental Digital Content 2, which lists the identified barriers to EBP in optometry and their associated scores).

Once barriers had been identified, a moderated panel discussion featuring four EBP educators with backgrounds in optometry (authors KP, FS), medicine (author RT) and speech pathology (author LT) allowed participants to raise questions and to discuss points that may have arisen following the lectures

and interactive sessions held prior. Discussions focused largely on possible solutions to the top five barriers identified in the previous session of the workshop. Feedback on the workshop was gathered by inviting the 19 non-facilitator participants to complete a short semi-structured evaluation questionnaire at the conclusion of the workshop.

Data analysis involved a combination of quantitative and qualitative methods as described above. Qualitative data analysis was carried out using a grounded theory approach by identifying themes. Statistical analysis was carried out using SPSS for Windows Version 22 (SPSS for Windows, Chicago, IL). Non-parametric statistics were used for analyzing the EBPAS score because of the categorical nature of the data. Associations were tested using Spearman's rho correlation. Statistical significance was set at 5%.

Results

The demographic characteristics of 18 of the 19 non-facilitator workshop participants who completed the EBPAS and of the 25 participants in the nominal group sessions are shown in Table 2. Participants' attitudes toward EBP were generally positive with a mean EBPAS-50 score of 2.7 ± 0.3 (range 2.3 to 3.1) out of a possible four. Figure 1 displays the boxplots of responses from the 18 participants across the twelve EBPAS domains. No difference was found between EBPAS-50 scores in the six non-facilitator participants who categorized themselves as 'academic' and the 12 who categorized themselves as 'clinical supervisor/practitioner' (Mann-Whitney test, p=0.3). A negative correlation was found between attitudes to EBP measured by the EBPAS-50 score and age (Spearman's rho=-0.57, p=0.01) (Figure 2A) and time since graduation (Spearman's rho=-0.57, p=0.01) (Figure 2B). Gender, education and self-

perceived EBP expertise level had no effect on attitudes to EBP (group t-test or one-way ANOVA; $p>0.05$).

Non-facilitator participants' responses to the questions "*What does evidence-based practice mean to you, and what is its significance in optometry?"* and "*What strategies do you use to teach optometry students how to be evidence-based practitioners?"* are summarized in Table 3. All groups of optometric educators indicated that EBP means the application of the best available research to clinical decision-making, while approximately half the groups indicated that it means the patient is informed as part of the decision making process. Although this qualitative data cannot be analyzed quantitatively, this demonstrates that at least one educator in each of these groups understood that high quality / level research is integral to EBP and that EBP involves the patient in clinical decision making. Educators made a range of other positive points about EBP. Some participants expressed reservations about EBP, namely that it could mean a delay in treatment while awaiting evidence and may stifle creativity.

The nominal group process identified 35 distinct barriers to practicing or teaching EBP and these were segregated into the following four themes: time, knowledge / curriculum, attitude and access (see Table, Supplemental Digital Content 2, which lists the identified barriers to EBP in optometry and their associated scores). Fourteen of the 35 barriers pertained specifically to EBP teaching and not to EBP practice. The remaining 21 barriers could apply to both EBP practice and EBP teaching. The average score for each barrier varied from 0.0 to 4.4. Figure 3 illustrates the most frequently cited barriers including the five that attracted the highest total scores. These represent the greatest perceived impediments to EBP teaching and/or practice for our sample of optometry educators. While a number of barriers to teaching and practicing EBP in optometry were identified, the frequency at which the *lack*

of time barrier was cited was much greater than for all other barriers. *Lack of time* was selected in the top 5 by most participants (17 out of 25) and attracted the highest total score of 75, well above the total score of any other nominated barrier (Figure 3). In fact, *lack of time* was ranked as the top barrier (attracting a score of 5) by 13 participants. Although well behind, other important barriers consisted of *negative attitude to EBP* (9 votes, total score 29), *volume of evidence* (8 votes, total score 26), *integration with clinical practice* (6 votes, total score 24) and *lack of lifelong learning mindset* (6 votes, total score 21) (Figure 3). An additional two barriers were nominated by many participants but generally attracted low rankings and these were *understanding statistics* and *lack of evidence* (Figure 3). These last two items attracted 9 and 8 votes, respectively, but low total scores of only 15. We speculate that this low ranking may be because these items are considered very important to good EBP practice but perhaps perceived by our group of educators as easier to overcome than other barriers such as time. Interestingly, none of the 14 barriers specific to EBP teaching (see knowledge/ curriculum in Table, Supplemental Digital Content 2) were rated as highly by workshop participants as those related to practice.

Responses to the feedback questionnaire indicated that most (17/19; 89%) participants found the workshop discussions extremely or very useful. Some participants indicated that they would have liked more focus on the process of EBP, suggesting that, for our sample of optometry educators, enhanced EBP knowledge and skills would have been helpful. For example: "*All helpful but still not sure how to actually apply…"* and "*I thought we would learn to search [for evidence] ourselves" and "Didn't really find out how to effectively do EBP"*. Attendees appreciated the multidisciplinary input: "*It was good to have representatives from [optometry], medicine [and] speech therapy here and to share their experiences"* and "*It was great to see how other professions do this, e.g. speech pathology and*

medicine" and "*Good to have multidisciplinary inputs"*. Educators also felt that the panel discussion was helpful: "*The discussion on overcoming barriers was very helpful"* and "*Good ideas of teaching methods [and] how to overcome barriers"* although one respondent stated that the "*Panel discussion was interesting but lacked detail to be useful"*. This feedback will inform the development of future iterations of the workshop.

Finally, while all 18 participants who had completed the EBPAS prior to the workshop were invited to complete it a second time, one week after the conclusion of the workshop, responses were received from only 11. Attitudes to EBP did not change significantly following the workshop (Wilcoxon signed ranks test, p=0.76) in these 11 participants. This may reflect the relatively positive attitude measured at the outset, but may also be due to the small sample size. The interval between evaluations may also have been too short (one week) to allow for a significant change in attitudes to occur. There was no significant difference in baseline EBPAS scores between the 11 participants who completed the questionnaire both before and after the workshop and the seven who only completed it prior to the workshop (Mann-Whitney test, p=0.33).

Discussion

EBP cannot be implemented effectively without health practitioners having the competency required to practice it. This is facilitated in part by education to develop relevant knowledge, skills and attitudes in this area. However, EBP education requires educators who themselves understand and have adopted EBP. The workshop described here is a pilot intended as a basis for designing of future workshops or

courses of this kind for optometry educators, including practitioners teaching within optometry curricula.

The workshop was designed to explore perspectives of EBP and develop understanding of the meaning of EBP using a mix of activities. A proportion of our educators arrived at the workshop with a high level of understanding of the concept of EBP and teaching methods for EBP. The EBP-related learning and teaching strategies identified by this group of optometric educators include those requiring students to present and discuss findings in grand round format, and encouraging students to ask questions, as well as alignment with the five EBP steps . Interactive learning of this kind is thought to be an important part of effective learning and teaching for EBP[40] and alignment of EBP teaching with the five steps of the EBP process has been recommended for EBP teaching.[2]

This was not a skills development workshop, so EBP knowledge and skills were not measured and the extent to which we can comment on participants' understanding of EBP is limited. However, we measured attitudes toward EBP before and in some participants also after the workshop.[31] Overall, optometry educators' attitudes towards EBP were positive. We chose to use the 50-items version of the EBPAS scale over the initial (truncated) EBPAS-15,[41] which would have sampled the domains of divergence, openness, requirements, and appeal only. Had we used the EBPAS-15, our sample of optometrists would have yielded similarly positive values of 2.8 ± 0.4 (range 1.8 to 3.8).

We have previously reported similar findings[30] from a qualitative study of optometry practitioners. Studies conducted on other health professionals have also shown largely positive attitudes towards EBP

and research use in practice.[15, 33, 42] Negative comments about EBP (e.g., "*treatment may be delayed* and *may stifle creativity"*) were made by at least one optometric educator. In our survey of Australian and New Zealand optometrists, 14 (20%) respondents who made comments on EBP also voiced broadly negative comments, indicating that evidence-based practice is unimportant or unhelpful to optometry.[10] Interestingly, the present findings suggest that younger optometrists and those recently trained may have more positive attitudes to EBP than older educators or those who have trained a long time ago. Similarly, a negative correlation between age and EBPAS score was demonstrated in physicians.[34] A systematic review previously suggested that physicians who have been in practice longer may be at risk for providing lower-quality care.[43] This may simply be a reflection of the relatively recent introduction of an EBP focus to the healthcare professions and their associated educational facilities.[1-3, 5]

We were unable to demonstrate improved attitude to EBP following workshop attendance. The very positive attitude towards EBP measured in our participants prior to the workshop and the small sample size (11 participants completed EBPAS post workshop) may have limited the potential to measure a significant improvement. The interval of one week between the pre and post workshop assessments may also have been too short for a detectable change in attitude to occur. These findings should also be viewed in light of the fact that we did not validate the modified EBPAS prior to its use; it may therefore simply lack sufficient validity to measure and detect changes in EBP attitudes when used in optometrists. In fact, the questionnaire may be limited by a potential mismatch between individual items of the EBPAS-50 and the contemporary definition of EBP.[1, 2] In particular the *Appeal* sub-scale includes item 9 "*If you received training in a therapy or intervention that was new to you, how likely would you be to adopt it if it was intuitively appealing?*" indicates a positive attitude to EBP on the EBPAS scale. Yet, such a response suggests blind acceptance of therapies based on nothing but intuitive

appeal. This appears contrary to the accepted definition of EBP which requires practitioners to integrate the best research evidence with findings from their clinical examinations and the patient's values and preferences.[1, 2] In addition, the Appeal subscale items are intended to assess the extent to which EBP appeals to the respondent, but refer to 'therapy' in general rather than specifying EBP. Thus, there is a need for validation of the EBPAS scale before any wider application of the questionnaire in optometry. While the EBPAS indicated that our sample of optometry educators held a favourable attitude toward EBP, this finding should be viewed in light of the limitations outlined above.

Participants' views on the most important factors that prevent them from teaching and/or practicing EBP were also gathered. The advantage of the nominal group technique over other qualitative methods such as focus groups and individual interviews is that it allows some quantitative data to be collected in the form of ranking. When using this technique all participants are offered an opportunity to participate and no one participant is allowed to dominate discussions as could perhaps occur in focus group studies. Previous work on barriers to EBP has repeatedly shown that in a range of health disciplines 'time' is a significant barrier to EBP.[15, 33, 42] Our results in this small group suggest that the same applies in optometry: at least in this small group, time is the biggest factor preventing educators and practitioners from teaching and practicing EBP.

This raises the question of how such barriers can be overcome. In other health disciplines, a range of approaches have been used. For example, Allied Health Evidence is an online database through which practitioners can gain rapid access to up-to-date research evidence relevant to speech pathology, occupational therapy, psychology and physiotherapy, with each piece of evidence rated independently in terms of validity.[44] No such database exits for optometry, but other resources are available. Examples

include the Cochrane Eyes and Vision Group systematic reviews,[45] the Translating Research Into Practice (Trip) database[46] and evidence-based clinical guidelines such as those maintained by the American Optometric Association,[47] the British College of Optometrists[48] or the Australian Government's National Health and Medical Research Council (NHMRC).[49] Recent qualitative research suggests that optometrists could make more extensive use of existing guidelines.[30, 50, 51] Further, existing resources are unlikely to address the wide range of clinical questions faced by optometrists. A resource like the Allied Health Evidence may ultimately be needed for optometry.

The generalizability of our workshop findings to other optometry institutions in the region and worldwide is uncertain. However, the findings outlined above have formed the basis of further workshops of this kind being developed and delivered for optometry educators internationally, including both face-to-face and online delivery. The findings also led to the instigation of an Australian EBP Optometry Interest Group whose meetings include activities aimed at sharpening EBP skills and knowledge (such as critical appraisal, finding evidence, and the application of evidence in clinical decision making). With appropriate modification the workshop described here may be applied in any optometric education setting, to raise awareness of the significance of EBP and factors related to educational practice in optometry, to generate discussion on EBP teaching methods for optometry, and also as a precursor to further development of the relevant skills, knowledge and attitudes in optometric practitioners and educators.

Acknowledgements

Funding was provided by the Australian Government Office for Learning and Teaching Grant Project ID11-1988. This work was presented in part at the American Academy of Optometry Annual meeting held in Seattle, USA on 23-26 October 2013. We thank Mr. Duncan Smith and Mr Tim Salmon from the School of Mathematics and Statistics at the University of New South Wales for providing the facilities and IT support for the workshop. Professor Rob Jacobs, Associate Professor Peter Hendicott and Dr Michael Pianta provided expert feedback on the EBPAS scale.

References

1. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: What it is and what it isn't. BMJ 1996;312:71-2.
2. Dawes M, Summerskill W, Glasziou P, Cartabellotta A, Martin J, Hopayian K, Porzsolt F, Burls A, Osborne J, Second International Conference of Evidence-Based Health Care T, Developers. Sicily statement on evidence-based practice. BMC Med Educ 2005;5:1-7.
3. Hoffmann T, Bennett S, Del Mar C. Evidence-based practice across the health professions, 2nd ed. Sydney: Elsevier, 2013.
4. Haynes RB. Of studies, syntheses, synopses, summaries, and systems: The "5s" evolution of information services for evidence-based healthcare decisions. Evid Based Med 2006;11:162-4.
5. Tilson JK, Kaplan SL, Harris JL, Hutchinson A, Ilic D, Niederman R, Potomkova J, Zwolsman SE. Sicily statement on classification and development of evidence-based practice learning assessment tools. BMC Med Educ 2011;11:78.
6. Adams AJ. The role of research, evidence and education in optometry: A perspective. Clin Exp Optom 2007;90:232-7.
7. Anderton PJ. Implementation of evidence-based practice in optometry. Clin Exp Optom 2007;90:238-43.
8. Adams AJ. Whither goes evidence-based optometry? Optom Vis Sci 2008;85:219-20.
9. Hawkins-Walsh E, Crowley A, Mazurek Melnyk B, Beauschesne M, Brandt P, O'Haver J. Improving health-care quality through an AFPNP national nursing education collaborative to strengthen PNP curriculum in mental/behavioral health and EBP: Lessons learned from academic faculty and clinical preceptors. J Prof Nurs 2011;27:10-8.
10. Suttle CM, Jalbert I, Alnahedh T. Examining the evidence base used by optometrists in Australia and New Zealand. Clin Exp Optom 2012;95:28-36.

11. Elliott DB. Evidence-based optometry and in-practice research. Ophthalmic Physiol Opt 2012;32:81-2.

12. Asokan GV. Evidence-based practice curriculum in allied health professions for teaching-research-practice nexus. J Evid Based Med 2012;5:226-31.

13. Keller PR. The evidence in evidence-based practice. Why the confusion? Clin Exp Optom 2012;95:618-20.

14. Suttle C, Jalbert I, Alnahedh T. Re: The evidence in evidence-based practice. Why the confusion? Clin Exp Optom 2013;96:130.

15. Scurlock-Evans L, Upton P, Upton D. Evidence-based practice in physiotherapy: A systematic review of barriers, enablers and interventions. Physiotherapy 2014;100:208-19.

16. MacDonald KA, Hrynchak PK, Spafford MM. Evidence-based practice instruction by faculty members and librarians in North American optometry and ophthalmology programs. J Med Libr Assoc 2014;102:210-5.

17. Jalbert I, Suttle C, Challinor K, Junghans BM, Pianta M, Murray E, Thompson R, Jacobs R, Togher L. Curriculum renewal for evidence-based practice in Australasian optometry (Evidence-based optometry project). Final Report 2014. Sydney: Office for Learning and Teaching, 2014: 1–77. Available at: http://www.olt.gov.au/resource-curriculum-renewal-evidence-based-practice-Australasian-optometry. Accessed September 30, 2014.

18. Melnyk BM, Fineout-Overholt E, Feinstein NF, Sadler LS, Green-Hernandez C. Nurse practitioner educators' perceived knowledge, beliefs, and teaching strategies regarding evidence-based practice: Implications for accelerating the integration of evidence-based practice into graduate programs. J Prof Nurs 2008;24:7-13.

19. Murad MH, Montori VM, Kunz R, Letelier LM, Keitz SA, Dans AL, Silva SA, Guyatt GH. How to teach evidence-based medicine to teachers: Reflections from a workshop experience. J Eval Clin Pract 2009;15:1205-7.

20. Thangaratinam S, Barnfield G, Weinbrenner S, Meyerrose B, Arvanitis TN, Horvath AR, Zanrei G, Kunz R, Suter K, Walczak J, Kaleta A, Oude Rengerink K, Gee H, Mol BW, Khan KS. Teaching trainers to incorporate evidence-based medicine (EBM) teaching in clinical practice: The EU-EBM project. BMC Med Educ 2009;9:59.

21. Critical appraisal skills project (CASP) [resource online]. Oxford. Available at: http://www.casp-uk.net/. Accessed September 4, 2014.

22. Green ML. A train-the-trainer model for integrating evidence-based medicine training into podiatric medical education. J Am Podiatr Med Assoc 2005;95:497-504.

23. Lawrenson JG, Evans JR. Advice about diet and smoking for people with or at risk of age-related macular degeneration: A cross-sectional survey of eye care professionals in the UK. BMC Public Health 2013;13:564.

24. Iles R, Davidson M. Evidence based practice: A survey of physiotherapists' current practice. Physiother Res Int 2006;11:93-103.

25. McKenna K, Bennett S, Dierselhuis Z, Hoffmann T, Tooth L, McCluskey A. Australian occupational therapists' use of an online evidence-based practice database (OTseeker). Health Info Libr J 2005;22:205-14.

26. Toulkidis V, Donnelly NJ, Ward JE. Engaging Australian physicians in evidence-based medicine: A representative national survey. Intern Med J 2005;35:9-17.

27. Gagnon MP, Legare F, Labrecque M, Fremont P, Cauchon M, Desmartis M. Perceived barriers to completing an e-learning program on evidence-based medicine. Inform Prim Care 2007;15:83-91.

28. Kernick D. Life on the exponential curve--time to rattle the academic cage? A view from the street. J Eval Clin Pract 2005;11:1-6.

29. Forsetlund L, Bjorndal A, Rashidian A, Jamtvedt G, O'Brien MA, Wolf F, Davis D, Odgaard-Jensen J, Oxman AD. Continuing education meetings and workshops: Effects on professional practice and health care outcomes. Cochrane Database Syst Rev 2009:CD003030.

30. Alnahedh T, Suttle CM, Alabdelmoneam M, Jalbert I. Optometrists show rudimentary understanding of evidence-based practice but are ready to embrace it: Can barriers be overcome? Clin Exp Optom 2014; Under review.

31. Aarons GA, Cafri G, Lugo L, Sawitzky A. Expanding the domains of attitudes towards evidence-based practice: The Evidence Based Practice Attitude Scale-50. Adm Policy Ment Health 2012;39:331-40.

32. Hendricson WD, Rugh JD, Hatch JP, Stark DL, Deahl T, Wallmann ER. Validation of an instrument to assess evidence-based practice knowledge, attitudes, access, and confidence in the dental environment. J Dent Educ 2011;75:131-44.

33. Stronge M, Cahill M. Self-reported knowledge, attitudes and behaviour towards evidence-based practice of occupational therapy students in Ireland. Occup Ther Int 2012;19:7-16.

34. Melas CD, Zampetakis LA, Dimopoulou A, Moustakis V. Evaluating the properties of the Evidence-Based Practice Attitude Scale (EBPAS) in health care. Psychol Assess 2012;24:867-76.

35. Van de Ven AH, Delbecq AL. The nominal group as a research instrument for exploratory health studies. Am J Public Health 1972;62:337-42.

36. Sutherland R, Reid K, Kok D, Collins M. Teaching a fishbowl tutorial: Sink or swim? Clin Teach 2012;9:80-4.

37. Lee A. Guidelines on learning that inform teaching [resource online]. Sydney. Available at: http://guidelinesonlearning.com/. Accessed September 30, 2014.

38. Nicklas TA, Jahns L, Bogle ML, Chester DN, Giovanni M, Klurfeld DM, Laugero K, Liu Y, Lopez S, Tucker KL. Barriers and facilitators for consumer adherence to the dietary guidelines for Americans: The health study. J Acad Nutr Diet 2013;113:1317-31.

39. Dreer LE, Girkin CA, Campbell L, Wood A, Gao L, Owsley C. Glaucoma medication adherence among African Americans: Program development. Optom Vis Sci 2013;90:883-97.

40. Khan KS, Coomarasamy A. A hierarchy of effective teaching and learning to acquire competence in evidenced-based medicine. BMC Med Educ 2006;6:59.

41. Aarons GA. Mental health provider attitudes toward adoption of evidence-based practice: The Evidence-Based Practice Attitude Scale (EBPAS). Ment Health Serv Res 2004;6:61-74.

42. Chan S. Taking evidence-based nursing practice to the next level. Int J Nurs Pract 2013;19 Suppl 3:1-2.

43. Choudhry NK, Fletcher RH, Soumerai SB. Systematic review: The relationship between clinical experience and quality of health care. Ann Intern Med 2005;142:260-73.

44. Allied Health Evidence [resource online]. Brisbane. Available at: http://www.alliedhealthevidence.com/. Accessed September 4, 2014.

45. Cochrane Collaboration. Cochrane eyes and vision group [resource online]. London. Available at: http://eyes.cochrane.org/. Accessed September 4, 2014.

46. Turning Research Into Practice (Trip) [database online]. Available at: http://www.tripdatabase.com/. Accessed September 18, 2014.

47. AOA Optometric Clinical Practice Guidelines. St Louis: American Optometric Association. Available at: http://www.aoa.org/optometrists/tools-and-resources/clinical-care-publications/clinical-practice-guidelines?sso=y. Accessed September 4, 2014.

48. Clinical management guidelines. London: College of Optometrists. Available at: http://www.college-optometrists.org/en/professional-standards/clinical_management_guidelines/. 2014. Accessed September 4, 2014.

49. National Health and Medical Research Council (NHMRC). Guidelines for the screening, prognosis, diagnosis, management and prevention of glaucoma 2010. Vol. CP113. Canberra: Commonwealth of Australia, 2010.

50. Downie LE, Keller PR, Vingrys AJ. An evidence-based analysis of Australian optometrists' dry eye practices. Optom Vis Sci 2013;90:1385-95.

51. Khan S, Clarke J, Kotecha A. Comparison of optometrist glaucoma referrals against published guidelines. Ophthalmic Physiol Opt 2012;32:472-7.

Figure Captions

Figure 1: Optometrists' attitudes to EBP. Scores of the modified Evidence Based Practice Attitude Scale (EBPAS)-50 for optometry are shown in each of the 12 domains, for the 18 workshop participants who completed this questionnaire prior to the workshop. The boxplot shows median scores (horizontal black lines) and the range of scores for each domain. Open circles and asterisk show outliers, which occurred only in the domains of Fit and Limitations. Patterned bars indicate those domains where a positive EBP attitude attracts a low score.

Figure 2: The relationship between optometrists' attitudes to EBP measured by the Evidence-Based Practice Attitude Scale (EBPAS)-50 score and age (A) and time (years) since graduation (B). Attitude to EBP worsened with increasing age (rho=-0.57, p=0.01) and as time since graduation increased (rho=-0.57, p=0.01).

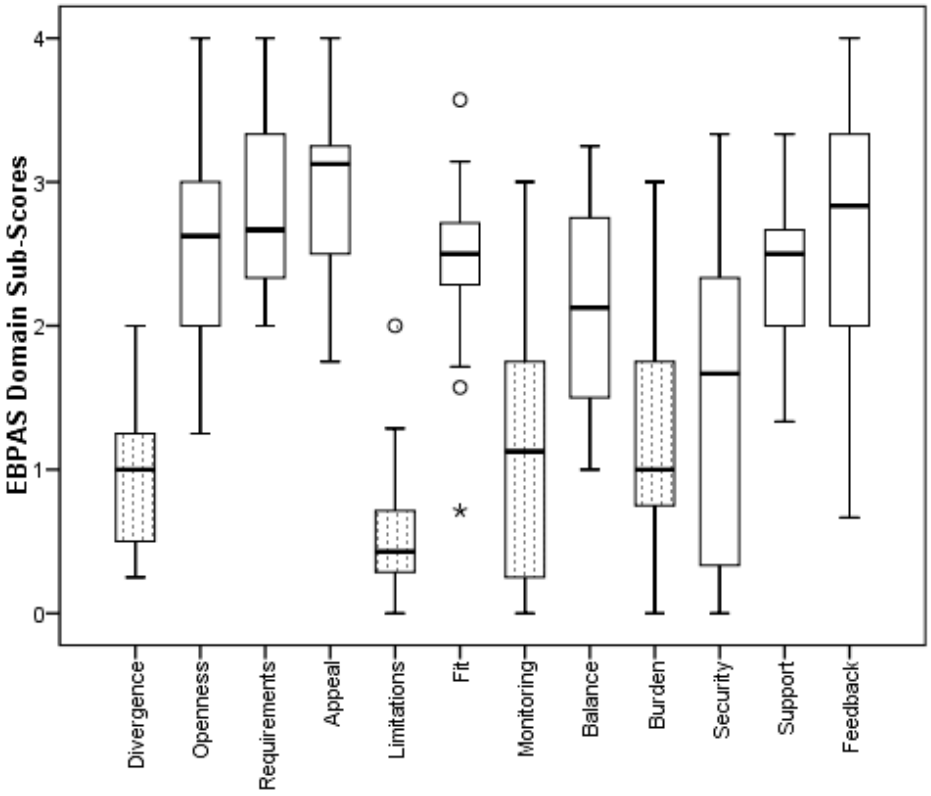
~~Figure 3: Optometric educators' answers to the question (A) *What does evidence-based practice mean to you, and what is its significance to optometry?* And (B) *What strategies do you use to teach optometry students to be evidence-based practitioners?*~~

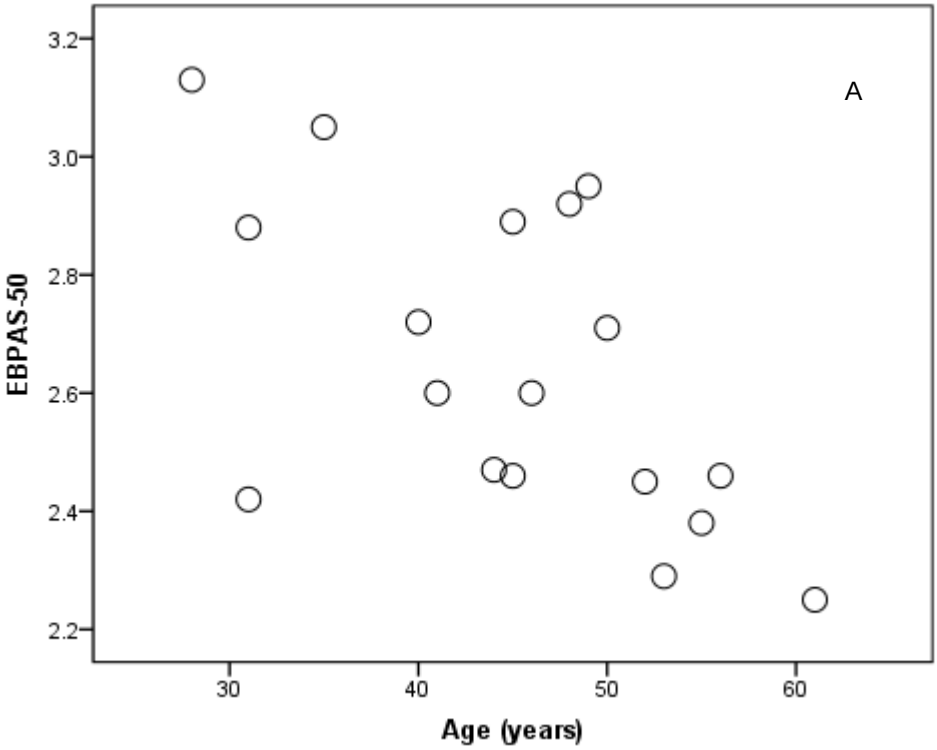
Figure 3: Barriers to EBP. The most frequency cited (primary y-axis) and highest scoring (secondary y-axis) top five barriers to EBP in optometry. The y-axis on the left is associated with the bars and represents the number of participants that identified these barriers in their top five and the y-axis on the right is associated with the line and represents the top five total score given by workshop participants, based on how important participants felt these were (high score = high importance).

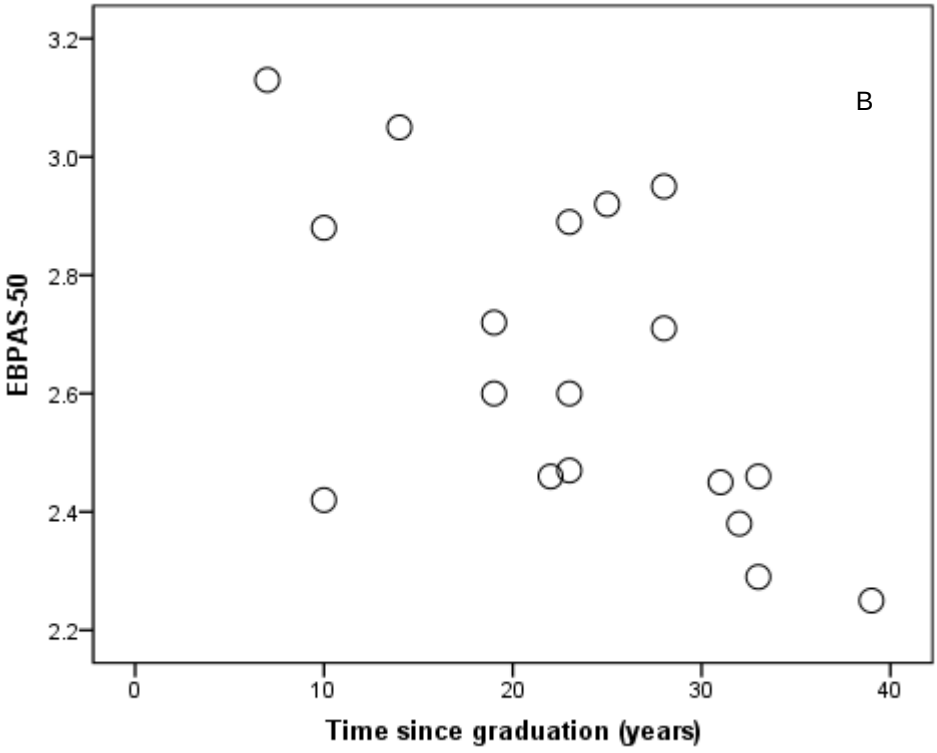
Supplemental Digital Content Legends

Supplemental Digital Content 1.pdf: The Evidence-Based Practice Attitude Scale (EBPAS) for optometry. The question used and the corresponding domain are shown for each of the 50 items contained in the EBPAS. Respondents were instructed as follows "*The following questions ask about using new types of therapy, interventions or treatments. Indicate the extent to which you agree with each item. Select the most appropriate answer. Choose only answer per question.*" Response options were rated using a categorical scale (see explanatory note*). Domains are described in the bottom section of the Table.

Supplemental Digital Content 2.pdf: Barriers to EBP in optometry were solicited using a group consensus process. Thematic analysis revealed four themes (time, knowledge / curriculum, attitude, and access). Barriers in grey italics applied to EBP teaching only whereas other barriers applied to EBP practice and EBP teaching. Participants selected and ranked (score of 5 = most important to 1 = least important) their top five barriers. The numbers of votes, the total and average score for each barrier are shown.


EBPAS Domain Sub-Scores
4
3
2
1
0
Divergence
Openness
Requirements
Appeal
Limitations
Fit
Monitoring
Balance
Burden
Security
Support
Feedback


A
EBPAS-50
3.2
3.0
2.8
2.6
2.4
2.2
30
40
50
60
Age (years)


B
EBPAS-50
3.2
3.0
2.8
2.6
2.4
2.2
0
10
20
30
40
Time since graduation (years)

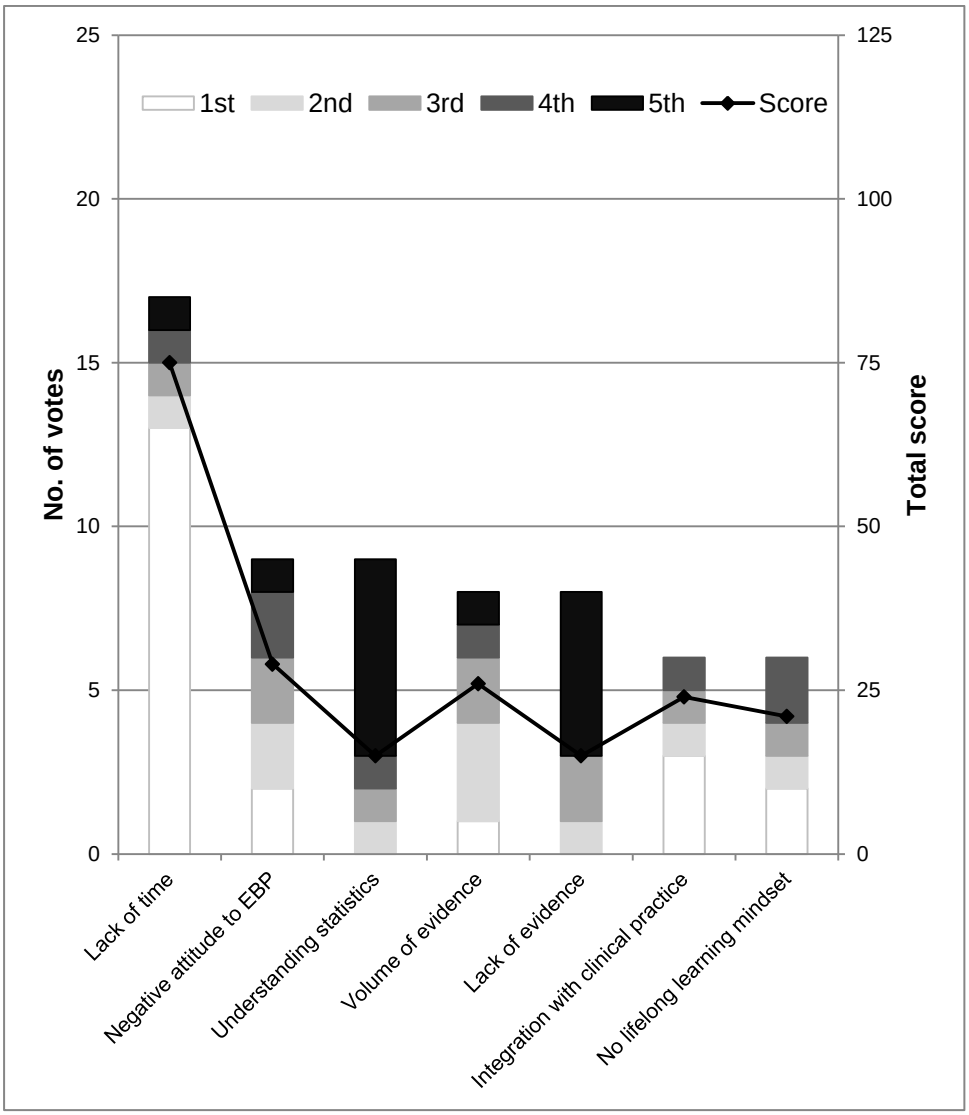

25
20
15
10
5
0
125
100
75
50
25
0
1st
2nd
3rd
4th
5th
Score
No. of votes
Total score
Lack of time
Negative attitude to EBP
Understanding statistics
Volume of evidence
Lack of evidence
Integration with clinical practice
No lifelong learning mindset

Table 1: Format (teaching method or activity) of individual workshop sessions and the rationale for the chosen format.

Session	Topic	Activity description and characteristics	Rationale
1	What is EBP? – participants' viewpoints	Discussions on the meaning of EBP and its significance to optometry. *Small group* *Interactive*	Active learning on the concept and significance of EBP; discussion based on participants' perspectives rather than didactic transfer of knowledge.
2	What is EBP? – definitions and understanding (Sicily statements)	Lecture introducing the meaning of EBP, the concept and the 5-step process. *Didactic*	To tell participants what EBP is general thought to be, so that participant's understanding is not solely based on the discussions.
3	EBM – practice and teaching	Lecture on EBM and approaches to EBM teaching. *Didactic*	To allow insight into the Medicine view of EBP and some of the methods used to teach it in this field.
4	EBP in optometry – practice and teaching	Lecture on the significance of EBP in eye care and on approaches to teaching it. *Didactic*	To show the significance of EBP in eye care, and to present some of the methods used to teach it in the eye care field.
5	Teaching EBP in optometry – participants' viewpoints	Discussion on strategies used by the group to teach EBP in optometry. *Small group* *Interactive*	Participants gain insight from hearing about others' teaching strategies and experiences.
6	Barriers to EBP in optometry – participants' viewpoints	Nominal group technique, with barriers to practicing and teaching EBP identified and ranked by participants. *Interactive*	For participants to identify any barriers to the practice and/or teaching of EBP, and to consider which of these are most problematic.
7	Overcoming barriers to EBP in optometry	Panel discussion of four facilitators from medicine, speech pathology and optometry, with discussion based on questions from participants. *Interactive*	To allow facilitators with experience in EBP and its teaching to discuss ways to overcome barriers and participants to gain from the facilitators' insight.
8	Introduction to the evidence-based optometry web site	Participants independently exploring a new web-based resource for EBP in optometry (www.eboptometry.com). *Self-directed with tutor interaction*	To familiarize participants with the new resource and to gather participants' suggestions for its improvement.
9	Where to from here?	Large group summary discussion on any further workshops or other provision would support participants in their EBP teaching.	To seek suggestions from participants on their training needs as EB practitioners and EBP

		Evaluation questionnaire	teachers. To obtain feedback on potential modifications to future iterations of the workshop.

Table 2: Demographic characteristics of workshop participants.

	EBPAS questionnaire n (%)	**Barriers to EBP session** n (%)
Number of participants	18	25
Age*	45 ± 9 range 28 to 61	46 ± 9 range 28 to 62
Sex		
Male	4 (22)	5 (20)
Female	14 (78)	20 (80)
Time since graduation as an optometrist *	23 ± 9 range 7 to 39	24 ± 8 range 7 to 40
Education		
Undergraduate	4 (22)	4 (16)
Postgraduate coursework	9 (50)	10 (40)
Postgraduate research	5 (28)	11 (44)
"With regards to EBP, you consider yourself?"		
Novice	10 (56)	12 (48)
Intermediate	7 (39)	8 (32)
Expert	1 (5)	5 (20)
"Which option BEST describes you?"		
Academic	6 (33)	13 (52)
Clinical Supervisor	9 (50)	9 (36)
Practitioner	3 (17)	3 (12)
Business / Administrator	0 (0)	0 (0)
Registration		
Optometrist not accredited for therapeutic practice	14 (78)	16 (64)
Optometrist accredited for therapeutic practice	4 (22)	7 (28)
Allied health or medical practitioner	0 (0)	2 (8)

* values are mean ± standard deviation

Table 3: Optometric educators' answers to the question (A) *What does evidence-based practice mean to you, and what is its significance to optometry?* and (B) *What strategies do you use to teach optometry students to be evidence-based practitioners?*.

(A) EBP Meaning and Significance in Optometry
• Application of the best available research to clinical decision-making • Patient-informed/patient-centred clinical decision-making • Consistency of approach across the profession • Legal defense for the practitioner • Justification for clinical decision-making • Credibility for the profession • Use of guidelines • Lifelong learning • Better patient care • Clinical experience combined with research evidence • Combats commercial pressures • Treatment may be delayed while awaiting evidence • EBP may stifle creativity
(B) EBP Optometry Teaching Strategies
• Self-directed learning with guidance • Case-based learning • Research methods including ethics and peer review, statistical concepts and methods • Point out knowledge gaps • References provided in lecture notes • Librarian teaching literature search integrated with 5 steps of EBP • Critical reading skills required for assessment tasks • Informally point out levels of evidence: cite specific examples during lecture • Online discussions including critique of evidence • Grand rounds, student case presentations and discussions • Evidence cited during decision-making in clinic • Effective clinical mentoring – students are asked questions, not just given answers