NSW GOVERNMENT
HETI HEALTH EDUCATION & TRAINING

VOLUME 1
ISSUE 1
2018

HEALTH EDUCATION IN PRACTICE

JOURNAL OF RESEARCH FOR PROFESSIONAL LEARNING

HETI.NSW.GOV.AU/RESEARCH

CC BY NC SA

Health Education in Practice: Journal of Research for Professional Learning
Volume 1 | Issue 1 | May 2018

Journal Editor-in-Chief
Dr Suzana Sukovic, *Health Education and Training Institute (HETI)*

Editorial Team
Dr Peter Stubbs, Journal Manager
Ms Jamaica Eisner, Editorial Assistant

Editorial Board
Dr Claire Blizard, *Health Education and Training Institute*
Ms Robyn Burley, *The Royal Australasian College of Physicians*
Ms Maggie Crowley, *Health Education and Training Institute*
Prof Peter Goodyear, *The University of Sydney*
Dr Antonio Penna, *NSW Ministry of Health*
Dr Ann Reich, *The University of Technology, Sydney*
Prof Tim Shaw, *The University of Sydney*
Dr Suzana Sukovic, *Health Education and Training Institute*
Adjunct Assoc Prof Kaye Spence, *Sydney Children's Hospital Network*
Prof Val Wilson, *The University of Wollongong*

Publisher
Health Education and Training Institute (HETI), NSW Health
Locked Bag 5022
Gladesville NSW 1675 Australia

Open Access Policy
Health Education in Practice: Journal of Research for Professional Learning is an open access publication, hosted by Sydney University Press and published by HETI, NSW Health.

Copyright
Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

The journal is available online,visit https://openjournals.library.sydney.edu.au/index.php/HEP/index

CONTENTS

EDITORIAL

RESEARCH & EVALUATION

EDUCATION-IN-PRACTICE

From the Chief Executive

Adjunct Professor Annette Solman
Health Education & Training Institute (HETI)

It is with pleasure that the Health Education and Training Institute (HETI) launches this inaugural issue of *Health Education in Practice: Journal of Research for Professional Learning*.

My vision, when I commenced in the role of Chief Executive, was the creation of a journal that will enhance the profile of the education and training that occurs within NSW Health. A journal that will also draw attention to the need for scholarly evidence-based practice to underpin the different educational approaches used within education program design and delivery.

The journal seeks contributors from within NSW Health and other educational institutions to further the empirical evidence base regarding best practice. I encourage all staff to subscribe to this free journal and those working in education and training to contribute to its future issues.

From the Editor

Dr Suzana Sukovic[1]
Editor-in-Chief

The first issue of *Health Education in Practice: Journal of Research for Professional Learning* is in front of us, bringing together different communities of practice with a variety of insights into education of the health workforce. This journal is the first of its kind for NSW Health and for the Health Education and Training Institute (HETI) as the journal publisher. Initiated and published by NSW Health, the journal has the ambition to create a rare meeting ground for different types of research-based knowledge about education of the health workforce. Professionals and researchers from different industries and disciplines, nationally and internationally, are invited to contribute.

For the Editorial Team and Board, this first issue is a sign that our ideas about creating an interdisciplinary meeting space are taking shape. We aim to nurture and develop conversations between professionals at the coalface of educational practice and academics from different disciplines to enrich our collective understanding of education of the health workforce. Our goal is, ultimately, to improve patient health outcomes while contributing to the shared pool of knowledge. Admittedly, progress towards these goals is notoriously difficult to document. As one of our authors, Professor Peter Goodyear, writes in this issue, 'learning is often diverse and messy' (p.7). However, collaboration and the sharing of insights, across industry and disciplinary boundaries, are the best ways to document progress and to learn from the researched practice.

In light of our ambition to contribute to sharing of ideas, this is a free-to-publish, open-access journal, hosted by Sydney University Press. This model ensures free sharing of content, and continuity

in archiving, which is vital in the volatile information environment of knowledge production. The journal has two publication streams: *Research & Evaluation* for double-blind peer-reviewed articles, and *Education-in-practice* for shorter pieces about news and insights from practice.

Although journal issues will be published biannually, articles will be published online on a rolling basis. In this way, authors and readers searching for the most recent content will have access to articles as they become ready for publication. Electronically bound issues will be available for readers who prefer journal browsing.

In this first issue, we present four scholarly articles in the *Research & Evaluation* stream. Professor Peter Goodyear reflects on the current state of educational research and difficulties in capturing the best evidence to inform design for learning. He argues for design based on understanding of the mechanism, of 'the how' and 'why' of learning. A challenge, in his view, is to become more sophisticated about different types of actionable knowledge in our practice of educational design. Professor Goodyear suggests that a journal such as this has a place in stimulating innovation in educational practice.

Professor Tim Shaw and co-authors contribute to innovation by sharing their CASE methodology as a systematic way of developing evidence-based scenarios for online learning. As the authors state, this framework ensures a **C**ollaborative approach to developing **A**uthentic and **S**uccinct case scenarios that are founded on **E**mbedding the best available evidence. This methodology is based on the authors' extensive experience and literature review. It is likely that this approach will provide an effective way to embed case scenarios in learning.

The integration of evidence-based practice (EBP) in daily work is a necessary and challenging process. In a study of undergraduate students' confidence in and attitudes to EBP, Dr Kylie Ann Murphy and co-authors found significant advantages in teaching EBP as part of workplace learning. Students who learnt these skills in workplace contexts felt more confident about them than those students who learnt about EBP within research subjects. Also, students perceived EBP as a more prominent part of their professional identity when they were exposed to relevant practices in the workplace setting.

Dr Audrey Wang, Ms Georgia Fisher and Ms Jillian Hall considered the impact of a one-day workshop on a biopsychosocial approach to pain management in geriatric patients. The authors found that clinicians changed their attitudes and beliefs after the workshop without changing their practice. The authors propose that a more complex approach is required to change clinicians' practice.

In the *Education-in-practice* stream, we present an interview with Professor Paul Bannon, Deputy Director of the Hybrid Theatre at Sydney Imaging, part of the Core Research facilities at the University of Sydney. The Hybrid Theatre is one of only four in the world, and the first to be dedicated solely to research and training. In an interview with Ms Jamaica Eisner, a member of our Editorial Team, Professor Bannon shared news about the Theatre.

It has the potential to play a role in advancing research and preparing the health workforce to work with current and emerging technologies.

I wish to thank all the contributors for sharing their work with us. With these contributions, the journal starts from a strong position. I look forward to the next round of thought-provoking manuscripts.

[1] **For correspondence:** Dr Suzana Sukovic, Executive Director Educational Research and Evidence-based Practice, Health Education & Training Institute (HETI), Locked Bag 5022, Gladesville NSW 1675, Australia.

Email: suzana.sukovic@health.nsw.gov.au

Health Education in Practice: Journal of Research for Professional Learning

Vol. 1 | No. 1 | 2018

Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

Citation: Goodyear P (2018) Design research. *Health Education in Practice: Journal for Professional Learning* 1(1): 7–17

Research & Evaluation article (double blind peer-review)

Design research

Peter Goodyear[1]

Abstract

This paper advances an argument for 'design research' as a core approach to developing useful knowledge for health education and training. Design research is research that is intended to produce actionable design knowledge: in our case, knowledge that can be used by people who are involved in designing for other people's work-related learning. Design research includes understanding how design is actually accomplished (its working practices, tools, methods, capabilities of the people involved, etc.) and understanding how local learning systems function. A richer and more realistic sense of how design is done is of great practical use. It can guide other aspects of the production of knowledge that will be useful to designers. Educational and training interventions tend to be complex and learning is often diverse and messy. Understanding the internal dynamics of local learning systems is useful to those whose job it is to improve their functioning. Analysis of this kind can also stimulate reflection on the why and how of design: design teams learn a great deal about the systems in which they are meshed. The paper ends with some thoughts about how organisations and journals can help to capture and share these lessons learned.

Keywords: design research, design knowledge, epistemic fluency

---

[1] The University of Sydney

Corresponding author: Prof. Peter Goodyear, Education Building (A35), The University of Sydney, NSW 2006, Australia: peter.goodyear@sydney.edu.au

In this article, I argue for a shift in how we frame research that is intended to inform and improve education and training in the health sector.

Over the last 20 years or so, I have been pursuing three connected lines of investigation. The first is concerned with professional knowledge and especially with the relationships between knowledge and action in the workplace (see e.g., Goodyear 1995; Markauskaite & Goodyear 2017). The second has been developing ways of analysing complex learning situations, to understand the 'architecture' of successful learning environments (e.g., Goodyear 2000; Carvalho & Goodyear 2014). The third focuses on design for learning: how people who are professionally involved in designing for other people's learning do what they do; what knowledge, tools and methods they use, and how their efforts might be strengthened (e.g., Goodyear 1997; Goodyear & Dimitriadis 2013; Goodyear 2015).

The shared insights from this program of work have led me to believe that it is time to push for some different ways of conceiving of the creation of useful knowledge in educational research and practice. *Design for learning* takes a central place in this conception. The real-world practices of design for learning provide a focus and timeframe for knowledge creation: actionable knowledge that flows into design practices can thereby have a significant effect on educational outcomes. This is not a radically new line of argument. It echoes what some people have been advocating for a while in areas such as formative evaluation and action research (Pawson & Tilley 1997; Penuel 2014; McConnell 2002; Laurillard 2008). But it goes further, by arguing that the complexity of many contemporary learning situations and workplaces needs us to take *design* much more seriously: to understand it better and to organise design work so that it can more easily draw upon an appropriate array of knowledge sources.

The argument starts with a caricature: a deliberate over-simplification intended to highlight a problem. There is an endemic educational pathology which is quite easy to recognise but rather harder to pin down. It presents as a fad, spreads by contagion and dies out when starved of resources by a new fashion or the lassitude of its victims. The flipped classroom is a recent example. Earlier instances include blended learning, e-portfolios, reflective practice and PBL.

There is nothing intrinsically wrong with any of these educational approaches. The problem lies in how they are understood, motivated, sustained and let go. Evidence of educational effectiveness rarely plays a central role in any of these issues of take-up, implementation and abandonment. Admittedly, most such approaches are accompanied by research – scholars have published thousands of papers on blended learning and PBL in the last decade alone. But it is very rare to find major educational innovations spreading on the basis of robust evidence (Bassir et al. 2014; Ahmadi et al. 2015; Betihavas et al. 2016; Wosinski et al. 2018).

For one thing, remarkably few empirical studies of innovative practices succeed in measuring specific learning gains (or even set out to do so). Measuring student satisfaction is much more common than measuring learning gain; but this only tells us that students are not unhappy about the innovation foisted upon them. It says little or

nothing about whether they have learned what they were intended to learn. Students are sometimes asked to report on the effectiveness of their own learning, though the literature tells us that they are often poor judges of how successful their learning has been (Kirschner & van Merriënboer 2013). Even where careful measurements have been made – before and after an educational intervention – of what students know or can do, it is rarely the case that the intervention is described in sufficient detail that it can be replicated elsewhere. In short, it is a wonder that we manage to educate anybody, whether in the health workforce or more broadly.

Rather than give in to despair – which would be the wrong stance to take in the first issue of a new journal – I want to argue for a fresh start. The fact that (most) people do manage to learn (most of) the things they need to learn in order to practice safely and effectively is a phenomenon to be researched and more widely understood. There are no grounds for complacency, but we need to acknowledge that health education and training keep on keeping on, with few crises, and research into professional education and training struggles to keep up with practice. In particular, there is a daunting gap between the best of what is written about professional learning and capability, on the one hand, and actionable knowledge for educational and training design, on the other. Some of the best recent work on theorising how effective professionals do what they do is yet to feed forward into design for learning. But also, some of the best educational design work goes under the radar: it is undocumented, hard to share, hard to build upon and does not feature in academic descriptions of how design work is, or should be, done. Educational design teams learn a lot during every major project, but this learning and its outcomes rarely get the attention they deserve.

This has long been a weakness in design practice more generally – in areas such as architecture and product design. In a recent review, Clive Dilnot quotes the celebrated American designer Jay Doblin:

> **'Although I designed hundreds of successful products for major corporations, it suddenly occurred to me that I didn't understand what I had been doing.'**

According to Dilnot,

> **'Design was done, but it was not *thought*. Design was without reflection. Indeed, it was all but ordered that it should be so.' (Dilnot 2018, p. 142, emphasis added.)**

Dilnot goes on to explain how research into design was actively resisted, in both design firms and design schools. A version of this also manifests itself in educational research: there is more interest in the 'what' than in the 'how' and 'why' of design.

So part of the challenge facing us is to turn new research on professional capability and learning into actionable knowledge for design. Another part is to describe design practices and outcomes in ways that render them shareable within a broader community of designers. These two parts of the intellectual enterprise can be brought together to form a core for what the design theorist Ezio Manzini calls '*design research*: an activity capable of producing knowledge useful to those who design. That is, *design* knowledge.' (Manzini 2015, p. 38, emphases in the original.)

SCOPING DESIGN RESEARCH

Design research in the field of health education and training needs to encompass the production of design knowledge that is useful to those who design for other people's (professional) learning. Design research cannot be undertaken rationally without a good understanding of how designers take knowledgeable action. In other words, how designers actually design is a valuable *object* of research. As a significant educational sub-community, we need to know more about real-world design practices in our area and how various forms of tacit and explicit knowledge actually feature in designers' work (Kali, Goodyear & Markauskaite 2011; Tracey & Baaki 2014; Svihla & Reeve 2016; Bennett, Agostinho & Lockyer 2017). Formalised design methods, such as ADDIE, and design tools, such as templates or patterns, need to be understood as resources that are bound up in actual design practices, rather than as descriptions or indicators of how design work is really done. That is, we need to know more about how the 'approved' ways of doing design actually figure in the reality of design work. Another way of putting this is to say that we need a better understanding of the actual needs and capabilities of real 'end users' of design research: people who design.

For example, Rebecca Udemans and colleagues have recently published a summary of the approaches taken by the Royal Australasian College of Physicians in renewing its speciality training programs (Udemans et al. 2018). They describe co-design and the management of multiple interacting elements of a complex intervention as two important aspects of the work. Co-design involved close interactions with a range of knowledgeable stakeholders: physician leadership of a process in which (re-)design work was accomplished through a combination of educational expertise and timely contributions from trainees, supervisors and others. This implies a particular model for design work, design processes and flows of design knowledge. Design researchers who want to contribute useful knowledge can benefit from having a better understanding of when and how different kinds of knowledge can make a real difference to the design work.

> **'Emerging evidence from the literature, piloting and feedback, contextual factors and organizational shifts can identify a need or opportunities to adjust and realign the design and development of an educational innovation *at any stage* prior to implementation. It may be necessary to adjust strategies to optimize the intended outcomes.' (Udemans et al. 2018, p. 6, emphasis added.)**

This is a much more responsive – and potentially expensive – model for carrying out design and implementation than one finds in the classic literature on how instructional design should be done. Crucially, it places additional demands on the *timely* production of design knowledge.

Design research also needs to help analyse current educational and training activities and systems. We need clearer, more robust and more grounded ways of understanding how specific learning events actually unfold. The useful question is not 'what works?' but 'what works, for whom, in what circumstances?' In other words, we need to understand the how and why – the actual mechanisms – of successful and unsuccessful learning events (Wong et al. 2010, 2012; Ericson et al. 2017). Recent research in the cognitive and learning sciences makes it clear that such mechanisms are not purely mental – they involve subtle combinations of brain, mind, body and world – and that any usable explanation of a real-world learning event is likely to involve references to the physical (material, digital) and social resources that come to hand during learning activities (diSessa, Levin & Brown 2016; Goodyear & Dimitriadis 2013; Markauskaite & Goodyear 2017). Studying learning in and for professional practice then involves careful tracing of the roles and movements of people, ideas and material and digital objects – as they embody and extend what participants can be said to know (Fenwick & Nerland 2014; Jensen, Lahn & Nerland 2012).

This is a very different way of understanding the relationships between technologies and learning than we find in the loose correlational studies of mainstream educational research and summative evaluation. While correlations can sometimes be useful in discovering interesting associations between inputs and outputs, they tell us little or nothing about the important mediating mechanisms – what is actually happening within the 'black box' of current learning activities. This is also a different way of conceiving of relations between design and research than one finds in the burgeoning educational literature on Design-Based Research (DBR). For one thing, DBR rarely has much to say about the processes of design itself: DBR implicitly assumes that it will be possible to convert evaluation outcomes into actionable knowledge for redesign on every iteration in an intervention's lifecycle (Zheng 2015; O'Neill 2016).

Design research needs to be informed by, and tell us more about, how design is done. It needs to help us analyse and explain how current learning systems actually function. It can also help us see what should and can be changed in order to improve valued outcomes. This proposition has some significant corollaries.

First, we need to distinguish carefully between what can be designed ahead of time and what must emerge 'at learntime'. What learners do, during a training event, is not designable. However, design can play a key role in shaping the circumstances in which learning activity unfolds. Learning cannot be designed, but it can be *designed for* (Wenger 1998). Second, the art of distinguishing between what can easily be changed and what can't acquires an important place in the repertoire of design know-how. If we are serious about design, then we need to acknowledge the power of design thinking to *reframe* a problem – helping reveal the causes behind symptoms and the structural forces that constrain and enable certain kinds of action. To restrict design to tinkering within taken-for-granted limits is to waste some of its power. Conversely, designers need to develop a 'feel' for the edges of the spaces within which they can act: not accepting *diktats* from above, but not wasting scarce time and resources trying to shift immoveable objects. Third, designers need to be comfortable working on definitions of value – collaborating with other experts in formulating robust descriptions of valued working practices and capabilities and the links between them. This does not exhaust the matter, but these questions of what is designable, what is changeable and what is valuable capture the main considerations.

SHARING DESIGN KNOWLEDGE

The second major issue in thinking about actionable knowledge for design is concerned with communication and action. Are some methods and formats better than others for encoding, sharing and interpreting design experience and the outputs of design research? For example, *design principles* are relatively easy to formulate but notoriously difficult to apply (to specific cases). *Design patterns* have the potential to combine specific guidance with a rationale for their application, but their take-up in educational design is very patchy (Goodyear & Retalis 2010). Attempts to invent and impose formal systems for design practice have not enjoyed much success, unless mandated by very powerful customers.

One possible way forward is to acknowledge the different kinds of actors involved in co-configuring any real-world learning situation and to map the knowledge flows in which they can usefully be involved. This helps to crystallise an otherwise very complex, fluid and uncertain situation. For example, to the extent that learners pro-actively (re)configure the learning tasks set for them, or the learning environments in which they work, we can ask whether it is possible to enhance what they do, through prior education or just-in-time guidance. We can see educational designs as part-finished artefacts which need to be understood, customised and handed on by their various users, over their whole lifecycle (Krippendorff 2006).

This does not require a serious rethinking of what design for learning encompasses, or of how it should be done. Rather, it implies taking a more *expansive* view of what a design consists of – how explaining more of the rationale for a design may be useful to both learners and other designers.

This touches on a key point about the relationship between research on learning and design for learning. Many people find themselves taking on a professional responsibility for other people's learning without having any proper training for this part of their role. They may be in an academic or workforce management position – as a dean or unit leader – or they may be moving sideways into educational technology, training or educational design. It is understandable when people in such positions complain about the poor state of educational research and the lack of consistent findings about how people learn (Albert et al. 2007; Dolmans & Tigelaar 2012). It would be lovely if every educational design decision we have to make could be informed by an evidence-based, theoretically coherent, conceptually clear principle, whose scope exactly matches the problem on which we are working. But this desire is rooted in delusion. Learning is messy. There are very few principles that have wide application. One of the best-developed areas is cognitive load theory, which stresses the limited capacities of working memory (Sweller 2004). Everyone has a limited working memory – human beings can pay attention to only a small number of things at one time; those things that are escaping attention are not going to find a place in long-term memory; they will not be learned. So educational design ought to avoid creating excessive cognitive load on learners. Sadly, there are very few other areas of research on learning that have this potential for breadth of applicability. Moreover, the meaning of 'things' in the phrase above – 'only a small number of things at one time' – varies from person to person, because it depends on the familiarity of the 'things'. To cut a long story short, familiarity allows us to mentally 'chunk' collections of associated 'things' into more complex 'things' and each of these compound things takes up only one slot in working memory. So, at a minimum, design principles need to take into account both the limited capacity of every working memory *and* variations in the familiarity of the material being taught. The limited working memory principle has a very broad application – it applies to all human beings – but the need to design in ways that take account of variations in familiarity with the material takes us into more complex territory. We have to find principles that apply to the current context.

This example is important because it helps to make a crucial point about actionable knowledge for design. Only a tiny fraction of the knowledge that we can use in design takes the form of universally applicable principles. Much of the knowledge that can be drawn upon in design is heavily contextualized: 'x is likely to be true if a, b and c are true here'. Understanding the relations between each piece of knowledge and the circumstances in which it is dependable is – or should be – a vital part of each designer's professional knowledge base. It is an important aspect of *epistemic fluency* – the ability to recognise and work with a variety of kinds of knowledge and ways of knowing (Markauskaite & Goodyear 2017). With experience, designers develop a *feel* for the landscape of knowledge that can guide their work. They know when a broad-ranging principle may be useful. They also know when decisions will have to be made on the basis of very specific, locally-true circumstances. Christian Voigt talks about this in his exploration of the strengths of design patterns and pattern languages: their nested, conditional forms map nicely onto heavily context-dependent design ideas (Voigt 2010).

CONCLUDING COMMENTS: NEXT STEPS

Sharing educational design knowledge is a chicken-and-egg problem. As a practice, it is still too rare for us to be able to infer useful formats for encoding and sharing design knowledge. Yet the absence of tools and other artefacts embodying design knowledge impedes the growth of sharing practices. In my view, this is an area in which ambitious journals can play a useful role: stimulating innovation in methods and practices for sharing knowledge that is useful for educational designers (Laurillard 2012) and providing incentives for what should be an important aspect of professional work among education and training practitioners.

At a less formal level, there are also some encouraging signs in the take-up of novel collaborative design practices. For example, Young and Perović (2016) and Carvalho and Yeoman (2017) describe simple card-based methods for collaborative educational design work which turn out to be very good at promoting animated discussion of design ideas and assumptions: useful instances of collaborative reflective practice. Authentic, situated design discussions of this kind have considerable potential as sites for surfacing and sharing experiential design knowledge within education and training organisations (Simonsen et al. 2014).

Organisations that are serious about strengthening their design capabilities can make a big difference to our whole field, providing opportunities for those who are involved in educational work to reflect on how they apply what they know, what they learn while tackling new projects, and how this learning can be crystallised and shared. For example, a great deal of serious learning goes on within any major design project. New understandings are developed of specific connections between patient outcomes, working practices, practitioner capabilities, training events, educational resources, design ideas and design methods. Design teams learn a lot about the real nature of these connections in specific circumstances. Unfortunately, much of that learning remains implicit and little of it is shared with the wider world. It tends to be treated as anecdotal, partial, and not as reliable as the knowledge that is acquired through large-scale systematic inquiry. One of the challenges for the health education and training field is to become more sophisticated about diverse forms, kinds and sources of actionable knowledge: to foster, within our design practices and workforce, a greater epistemic fluency.

Acknowledgements

I am grateful for feedback from reviewers, which has been very helpful in revising this paper.

Conflict of interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article

Funding

The author acknowledges financial support from the Australian Research Council through grants FL100100203 and DP150104163.

References

Ahmadi S-F, Baradaran HR & Ahmadi E (2015) Effectiveness of teaching evidence-based medicine to undergraduate medical students: A BEME systematic review. *Medical Teacher* 37: 21–30. doi:10.3109/0142159X.2014.971724

Albert M, Hodges B & Regehr G (2007) Research in medical education: balancing service and science. *Advances in Health Sciences Education* 12: 103–115. doi:10.1007/s10459-006-9026-2

Bassir SH, Sadr-Eshkevari P, Amirikhorheh S & Karimbux NY (2014) Problem-based learning in dental education: a systematic review of the literature. *Journal of Dental Education* 78: 98–109.

Bennett S, Agostinho S & Lockyer L (2017) The process of designing for learning: understanding university teachers' design work. *Educational Technology Research and Development* 65: 125–145. doi:10.1007/s11423-016-9469-y

Betihavas V, Bridgman H, Kornhaber R & Cross M (2016) The evidence for 'flipping out': A systematic review of the flipped classroom in nursing education. *Nurse Education Today* 38: 15–21. doi:10.1016/j.nedt.2015.12.010

Carvalho L & Goodyear P (eds) (2014) *The architecture of productive learning networks.* New York: Routledge.

Carvalho L & Yeoman P (2017) A toolkit for action: translating theory into practice Paper presented at the *25th International Conference on Computers in Education (ICCE 2017)*, Christchurch, New Zealand.

Dilnot C (2018) Thinking design: A personal perspective on the development of the Design Research Society. *Design Studies* 54: 142–145.

diSessa A, Levin M & Brown N. (2016) Knowledge and interaction: a synthethic agenda for the learning sciences. New York: Routledge.

Dolmans DHJM & Tigelaar D (2012) Building bridges between theory and practice in medical education using a design-based research approach: AMEE Guide No. 60. *Medical Teacher* 34: 1–10. doi:10.3109/0142159X.2011.595437

Ericson A, Löfgren S, Bolinder G, Reeves S, Kitto S & Masiello I (2017) Interprofessional education in a student-led emergency department: A realist evaluation. *Journal of Interprofessional Care* 31: 199–206. doi:10.1080/13561820.2016.1250726

Fenwick T & Nerland M (eds) (2014) Reconceptualising professional learning: sociomateral knowledges, practices and responsibilities. London: Routledge.

Goodyear P (1995) Situated action and distributed knowledge. *Educational and Training Technology International* 32: 45–55.

Goodyear P (1997) Instructional design environments: methods and tools for the design of complex instructional systems. In: Dijkstra S, Seel N, Schott F & Tennyson R (eds) *Instructional design: international perspectives.* Mahwah, New Jersey: Lawrence Erlbaum Associates, pp. 83–111.

Goodyear P (2000) Environments for lifelong learning: ergonomics, architecture and educational design. In: Spector JM & Anderson TM (eds) *Integrated and holistic perspectives on learning, instruction & technology: understanding complexity.* Dordrecht: Kluwer Academic Publishers, pp. 1–18

Goodyear P (2015) Teaching as design. *HERDSA Review of Higher Education* 2: 27–50. http://www.herdsa.org.au/system/files/HERDSARHE2015v02p27.pdf

Goodyear P & Dimitriadis Y (2013) In medias res: reframing design for learning. *Research in Learning Technology* 21. doi:http://dx.doi.org/10.3402/rlt.v21i0.19909

Goodyear P & Retalis S (eds) (2010) Technology-enhanced learning: design patterns and pattern languages. Rotterdam: Sense Publishers.

Jensen K, Lahn LC & Nerland M (eds) (2012) *Professional learning in the knowledge society.* Rotterdam: Sense Publishers.

Kali Y, Goodyear P & Markauskaite L (2011) Researching design practices and design cognition: contexts, concretisation and pedagogical knowledge-in-pieces. *Learning, Media & Technology* 36: 129–149.

Kirschner PA & van Merriënboer JJ (2013) Do learners really know best? Urban legends in education. *Educational Psychologist* 48: 169–183.

Krippendorff K (2006) *The semantic turn: a new foundation for design.* Boca Raton FL: CRC Press.

Laurillard D (2008) The teacher as action researcher: using technology to capture pedagogic form. *Studies in Higher Education* 33: 139–154.

Laurillard D (2012) Teaching as a design science: building pedagogical patterns for learning and technology. Abingdon: Routledge.

Manzini E (2015) Design, when everybody designs: an introduction to design for social innovation. Cambridge MA: MIT Press.

Markauskaite L & Goodyear P (2017) Epistemic fluency and professional education: innovation, knowledgeable action and actionable knowledge. Dordrecht: Springer.

McConnell D (2002) Action research and distributed problem-based learning in continuing professional education. *Distance Education* 23: 59–83.

O'Neill DK (2016) Understanding design research–practice partnerships in context and time: why learning sciences scholars should learn from cultural-historical activity theory approaches to design-based research. *Journal of the Learning Sciences* 25: 497–502. doi:10.1080/10508406.2016.1226835

Pawson R & Tilley N (1997) *Realistic evaluation.* London: Sage.

Penuel WR (2014) Emerging forms of formative intervention research in education. *Mind, Culture, and Activity* 21: 97–117. doi:10.1080/10749039.2014.884137

Simonsen J, Svabo C, Strandvad S, Samson K, Hertzum M & Hansen O (2014) *Situated design methods.* Cambridge MA: MIT Press.

Svihla V & Reeve R (eds) (2016) Design as scholarship: case studies from the learning sciences. New York: Routledge.

Sweller J (2004) Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture. *Instructional Science* 32: 9–31.

Tracey M & Baaki J (2014) Design, designers, and reflection-in-action. In: Hokanson B & Gibbons A (eds) *Design in educational technology: design thinking, design process, and the design studio.* Dordrecht: Springer International Publishing, pp. 1–13.

Udemans R, Stokes M-L, Rigby L, Khanna P & Christiansen J (2018) Educational renewal of physician training in Australia and New Zealand: Multiple educational innovations in a complex environment. *Medical Teacher* 21: 1–6. doi:10.1080/0142159X.2018.1444270

Voigt C (2010) A pattern in the making: the contextual analysis of electronic case-based learning. In: Goodyear P & Retalis S (eds) *Technology-enhanced learning: design patterns and pattern languages.* Rotterdam: Sense Publishers, pp. 107–122.

Wenger E (1998) Communities of practice: learning, meaning and identity. Cambridge: Cambridge University Press.

Wong G, Greenhalgh T & Pawson R (2010) Internet-based medical education: a realist review of what works, for whom and in what circumstances. *BMC Medical Education* 10: 12.

Wong G, Greenhalgh T, Westhorp G & Pawson R (2012) Realist methods in medical education research: what are they and what can they contribute? *Medical Education* 46: 89–96.

Wosinski J, Belcher AE, Dürrenberger Y, Allin A-C, Stormacq C & Gerson L (2018) Facilitating problem-based learning among undergraduate nursing students: A qualitative systematic review. *Nurse Education Today* 60: 67–74. doi:10.1016/j.nedt.2017.08.015

Young C & Perović N (2016) Rapid and creative course design: as easy as ABC? *Procedia – Social and Behavioral Sciences* 228: 390–395. doi:https://doi.org/10.1016/j.sbspro.2016.07.058

Zheng L (2015) A systematic literature review of design-based research from 2004 to 2013. *Journal of Computers in Education* 2: 399–420.

Health Education in Practice: Journal of Research for Professional Learning

Vol. 1 | No. 1 | 2018

Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

Citation: Shaw T, Janssen A, Barnet S, Nicholson J, Avery J, Henenka N and Phillips J (2018) The CASE methodology: A guide to developing clinically authentic case-based scenarios for online learning programs targeting evidence-based practice. *Health Education in Practice: Journal for Professional Learning* 1(1): 18–31

Research & Evaluation article (double blind peer-review)

The CASE methodology: A guide to developing clinically authentic case-based scenarios for online learning programs targeting evidence-based practice

Tim Shaw[1], Anna Janssen[1], Stewart Barnet[1], James Nicholson[2], Jennifer Avery[1], Nicole Henenka[3] and Jane Phillips[3]

Abstract

Introduction: Online learning has become an increasingly common means of delivering healthcare professional education. Case-based scenarios are the foundation of many continuing professional development (CPD) activities. No framework currently exists to ensure the development of quality, evidence-based cases, despite the weighted importance case-based scenarios have on improving participant learning. The aim of this project was to develop a systematic framework for generating evidence-based case-based scenarios for learning. ***Methodology****: A literature review was conducted to determine whether case development frameworks or resources currently existed: few were found. The authors then engaged in a framework development process, integrating their own previous experiences and lessons learnt in developing case-based scenarios, together with adult learning theory and evidence from the literature.* ***Results****: A framework that entailed a systematic approach to developing evidence-based case scenarios was developed, called the CASE methodology. This framework ensures a* ***C****ollaborative approach to developing* ***A****uthentic and* ***S****uccinct case scenarios that are founded on the* ***E****mbedding best available evidence.* ***Conclusion****: The CASE framework is a concise approach to developing quality case studies that are grounded on evidence. The CASE methodology could easily be applied to CPD development in many contexts to improve the overall consistency and quality of case scenarios for learning.*

Keywords: educational design, online learning, health education.

1 RISe, The University of Sydney

2 Learning and Teaching Centre, Australian Catholic University

3 Faculty of Health, University of Technology, Sydney (UTS)

Corresponding author: Ms Anna Janssen, Level 2, Charles Perkins Centre D17. The University of Sydney NSW 2006. anna.janssen@sydney.edu.au

INTRODUCTION

The need to improve the uptake of evidence into routine practice is well recognized. Despite regular development and updating of numerous clinical guidelines over the last 15 years, translating the best available evidence into practice remains challenging (Nutley et al. 2003). A wide variety of approaches have been taken to address this challenge, including interventions that target policy issues, organizational factors and healthcare professionals themselves (Browman et al. 2003; Grol & Grimshaw 2003; Sandars & Heller 2006).

Online learning is increasingly being used to deliver educational programs to healthcare professionals to improve quality of care. However, to date, there is little evidence regarding how to structure online learning to have the most impact on clinician behaviour. There is even less evidence demonstrating which methodologies have the highest impact on patient outcomes (Curran & Fleet 2005). Furthermore, there is sparse literature on how to incorporate cognitive learning theory that may be synergistic with health education into online learning for the health sector. Incorporating cognitive learning theory around processes such as chunking, which describes the way learners take fragments of information and combine them to create a valuable and cohesive whole (Gobet et al. 2001), and short- to long-term memory transfer, may have value when designing online health education.

In spite of the lack of literature on methodologically sound approaches to designing online health education, there is evidence that the use of case-based scenarios in continuing professional development (CPD) can effectively promote authentic learning experiences relevant to clinical practice (Ryan et al. 2007; Shaw et al. 2011; Janssen et al. 2016). Case-based scenarios – questions framed around scenarios that occur in clinical practice – are widely used in both formative and summative assessments, and a number of high-impact online learning programs rely solely on the use of targeted case scenarios to deliver educational content (Kerfoot & Brotschi 2009). However, to be effective, the development of these online scenarios must be purposeful, and sets of cases need to be structured in a way that ensures adequate coverage of a topic area and alignment with evidence-based practice (Shaw et al. 2015). Despite the central role of case-based scenarios in online learning, the literature reveals that there are few methodologies or resources available to support the systematic development of quality, effective case-based scenarios for online health education (Manns & Darrah 2012).

The aim of this paper is to describe the CASE methodology for developing online case-based scenarios that are concise, clinically authentic, reflect best evidence-based clinical practice and have the capacity to target key clinical decision-making or practice points. The CASE methodology has been used across a wide spectrum of health education and professional development.

METHODOLOGY

REAL-WORLD EDUCATIONAL DESIGN EXPERIENCE

The CASE methodology draws on over two decades of experience by the authors in developing cases for online education programs targeted at a wide variety of health professionals, including physicians (Jiwa et al. 2014), oncologists (Robinson et al. 2017) and nurses (Phillips et al. 2014), The CASE methodology is applicable to the development of case-based learning scenarios that are designed to capture the attention of busy practicing clinicians. The aims of the methodology are to directly impact clinical practice and to concurrently improve patient outcomes whilst aligning with evidence-based care. In particular, the authors have used the methodology in the development of case scenarios using the Qstream learning tool.

Qstream is an online learning platform developed at Harvard in the mid 2000s. The Qstream platform has been demonstrated to improve learner knowledge in a range of contexts (Kerfoot & Brotschi 2009; Shaw et al. 2012). Furthermore, the platform has been demonstrated to change clinician behaviours and to maintain those changes over time (Bruckel et al. 2016; Robinson et al. 2017). The Qstream platform is a system for delivering short case-based questions to learners online. The platform emails participants a small bundle of questions at spaced intervals, and repeats the delivery of the questions until participants have answered each question correctly a set number of times. The platform is informed by two core psychological principles: the testing effect and the spacing effect. The testing effect refers to the finding that testing has the capacity both to assess learners and also to improve retention of the knowledge being tested (Agarwal et al. 2008). The spacing effect refers to a learning principal that exposure to educational content that is repeated over time has the capacity to facilitate long-term knowledge retention (Vlach & Sandhofer 2012).

CONCEPTUAL FRAMEWORK

The use of case scenarios in online CPD activities conforms to adult learning principles. Key principles of adult learning include ensuring that the content in training material aligns with the real-world experiences of learners, and that learning experiences are situated and authentic (Reeves et al. 2002; Cercone 2008). Authentic learning experiences should have real-world relevance and provide opportunities for collaboration and reflection (Reeves et al. 2002). Furthermore, the use of case scenarios aligns with contemporary instructional design theory, which suggests that educational design should be authentic, creative and innovative (Hokanson & Miller 2009).

Instructional design theory has demonstrated that the medium in which a course is delivered needs to be chosen to suit the learner (Wong et al. 2010). In the case of online learning, it is important to balance the technical attributes of the medium with the needs of the learners, to enable meaningful interactions (Wong et al. 2010). The scenarios developed for case-based online learning must be clearly structured, with concise tasks that allow learners to promptly see the relevance of the online learning (Cercone 2008).

This aligns with adult learning theory, which suggests that offering such structure and support fosters self-reliance and self-directed learning (Cercone 2008).

A distinct learning process arises when online case-based learning integrates group discussion and interaction, which promotes sociality, thought sharing and, at times, discourse (Heckman & Annabi 2005). One framework describes learning as incorporating social processes, response processes, and reasoning processes (Aviv et al. 2003). In the social process, participant comments may have social value and be unrelated to the formal content, or, contrarily, may have no social value and be strictly focused on the formal content. In the response process, participants may have no response at all, may respond to other learners, or may respond to the instructor. In the reasoning process, participants undergo many sub-levels of learning, including making inferences, deductions, judgments, and seeking clarification. All of these processes instil varying degrees of learning that utilize self-reflection and sharing of individual experiences, thus aligning with adult learning principles.

Regardless of whether group discussion is integrated into online case-based CPD, the overarching concepts of adult learning theory imply that learners need authentic learning experiences, self-involvement, and reflection. Implementation of this conceptual framework promotes the ability of learners to apply their learning in practice (Shaw et al. 2015).

THE CASE METHODOLOGY

The CASE methodology is based on four key principles:

- Collaborative approaches to development
- Authentic clinical scenarios
- Succinct clinical scenarios, and
- Embedding the best available evidence.

These principles can be considered as a matrix, within which a series of key actions should be considered. (See Table 1.)

Table 1: key actions to be considered when designing to incorporate principles of the CASE Methodology

Principle:	Collaborative	Authentic	Succinct	Evidence-based
Description	Use a multidisciplinary approach that includes multiple professions, experts, end users and health consumers	Develop cases that are authentic to the end user to engage interest and enhance learning	Develop cases that cover key points as concisely as possible	Ground case development in best available evidence
Actions	Form a multidisciplinary development team and use a structured and consensus-based approach to case development	Use real cases where possible and include end users in case development	Use a rigorous development and editorial process	Review available guidelines and other sources of evidence prior to commencing case development

The CASE methodology has been developed over a number of years during which time it has been applied to the development of clinically focused cases on a variety of online learning platforms. The authors have used the methodology effectively across a broad range of online training initiatives to guide the development of concise and focused educational content. Through multiple applications of the CASE methodology, it has been demonstrated that the process streamlines the development of content for the platform and results in the creation of clear and contextually relevant case scenarios that are well received by participating clinicians (Phillips et al. 2014; Janssen et al. 2016).

The CASE methodology is not meant to be prescriptive, but rather provides a structured approach that can easily be adapted to meet the individual needs of each program's development.

APPLYING THE CASE METHODOLOGY

The methodology includes the following suggested sequence of steps to be used in approaching case development. See Table 2 for an overview.

Table 2: Steps in the CASE methodology

1. Assemble the team

Identify core team members, including an editor and project officer, to manage the process and conduct reviews.

Form a multidisciplinary development team that includes:

- representatives from multiple disciplines (ideally drawing from an actual clinical care team)
- content matter experts (if not covered above)
- health consumer(s)
- clinicians in the target group.

2. Establish the evidence base

Conduct a literature review and gap analysis.

3. Run a structured development process

(a) Develop an information pack that includes evidence summary, gap analysis, case examples and templates.

(b) Conduct a 3–4 hour orientation and priority setting workshop, at the conclusion of which you will have:

- discussed literature and gap analysis to determine key behaviours most likely to impact on outcomes
- identified 10–15 key take-home messages
- canvassed likely case scenarios that will allow exploration of key take-home messages
- familiarized the development team with the format to be used for the case scenarios
- assigned case writing tasks to team members based on area of expertise and enthusiasm.

(c) Case writers prepare cases and share with the editor, subsequently the draft set of cases is shared with the overall group via email for comment.

(d) Pilot the cases with a cohort of participants.

(e) Final meeting or teleconference confirms selected case scenarios and implements any necessary changes post pilot phase.

4. Evaluate the end product

Evaluate case study effectiveness and review learner feedback.

STEP 1: ASSEMBLE THE TEAM

The effort required to develop quality case scenarios for CPD programs is often underestimated.

To ensure that a systematic and robust approach to case development is taken, it is necessary to undertake an adequate review of the literature and evidence-base prior to case development. To oversee this process, the authors suggest that, at a minimum, a project officer is assigned to manage the overall development process for the cases, perform a literature review and conduct data analysis. The authors have frequently appointed an individual who is close to the

target audience to this role, such as a medical student who has had previous clinical experience in nursing or other health disciplines. Ideally, the project officer will work on multiple programs and will assist in the development and editing of cases by content experts. The second key appointment is an overall editor who has substantial content-matter expertise. The editor will appoint the multidisciplinary team, liaise with content-matter experts, oversee the development and review processes, and ultimately approve cases for use.

Several elements of the CASE methodology make it a unique tool for developing case-based educational resources. One of the central aspects of this methodology is the focus on a collaborative and multidisciplinary approach throughout the content-development process. It has been established in the literature that a multidisciplinary approach is beneficial in a range of situations, due to the ability to draw on a wide variety of views and experiences (Fraser and Matthews 2007). The use of multiple authors and disciplines facilitates discussion around complex clinical issues to ensure the development of clinically relevant cases. When forming the multidisciplinary team, it is important to include members not in the target audience (e.g., include nurses in programs being developed for doctors and vice versa). It is also important to include participants that are close in terms of years of practice to the target audience (e.g., using advanced trainees when developing programs for new graduate doctors). This helps to ensure that case scenarios are authentic to the end user and that any associated formative assessment is set at the appropriate depth. Where possible, healthcare consumers should also be involved in the development process to provide patient and carer viewpoints. Depending on the context of the course, it is important to consider including non-clinical team members drawn from the organization, such as risk managers if developing cases in safety and quality for example.

In the process of developing authentic case scenarios, an unanticipated but well-received consequence of engaging a multidisciplinary team in case development has been the creation of a safe and constructive space for the multiple healthcare professionals and consumers to discuss the clinical scenario under consideration. As an example, during the development of a program on reducing pain in palliative care and oncology, the multidisciplinary development team of nurses and doctors from a single clinical unit spent a number of weeks longer than anticipated developing the program. It was clear during the discussion that the case-development process was one of the few opportunities these professionals had had to discuss key challenges that they experience in their team-based care delivery.

STEP 2: ESTABLISH THE EVIDENCE BASE

It is surprising how many case scenarios used in CPD programs are not developed against an evidence base. An evidence base helps to ensure that any set of scenarios that are developed covers the content area and reflects best available practice. Having this evidence available to the development team is especially important during the initiation workshop and to guide initial case selection.

The evidence base to cover varies, but could include practice guidelines, patterns of care studies, and available local data. Ideally, an evidence base will also include consideration of where there are gaps in knowledge and practice to inform the targeted development of cases. The degree of effort expended in reviewing evidence will depend on the area under consideration and available budget and resources. If resources are limited, even a simple review of key guidelines and evidence can have a significant impact on the cases developed.

In instances where there is a lack of evidence, it can be useful to spend time canvassing the potential end users of a program for key issues they would like addressed. For example, in a program developed to address key issues in safety and quality for interns at Massachusetts General Hospital and Brigham and Women's Hospital, interviews were held with interns from the previous year regarding which safety and quality issues had had the most impact on their practice (Shaw et al. 2012). This step revealed a significant number of on-the-ground scenarios that were used to develop an authentic set of case scenarios set at the right level for the participants. It was of note that the leadership team had not previously identified a number of these issues and tended to focus on higher level issues that were not encountered regularly by the participants (Shaw et al. 2012).

STEP 3: RUN A STRUCTURED DEVELOPMENT PROCESS

Once a multidisciplinary team has been established, it is important to run a structured development process.

(A) COMPILE INFORMATION

To facilitate the development of scenarios, it is important to compile an information pack for the multidisciplinary team prior to their first meeting. This should include the following:

- contact details for the team members
- a summary of the evidence base, key publications and guidelines, as appropriate
- exemplar cases
- an example of how cases will be used in the educational program
- ideally, links to an example live online site.

(B) THE INITIATION WORKSHOP(S)

It is recommended that a 3–4 hour initiation meeting is held with the multidisciplinary team. The authors' experience suggests that this is best done face to face, but teleconferencing or video conferencing can also be used. Being able to see the other members of the development team at an initial meeting can help to ensure that all members share a common understanding of the process of program development and are included in the team as it moves forward. In the authors' experience, not holding this initial meeting delays the development of the program development and reduces its quality significantly.

During the meeting, the team will be led by the editor to achieve the following key objectives:

- discuss the evidence base and gap analysis to determine key behaviours that are most likely to have an impact on improving outcomes
- identify 10–15 key take-home messages
- discuss the structure of feedback to be included with the case scenarios
- canvas likely case scenarios that will allow exploration of key take-home messages
- familiarize the development team with the format to be used for the case scenarios
- assign case writing tasks to team members, based on area of expertise and enthusiasm for the topic area.

Discussing the evidence base and identifying the specific problem the course will address may be a lengthy or a short process, depending on the program area. In the development of a nursing program designed to improve pain management in the palliative care setting (as mentioned earlier), discussion of the evidence base and potential gaps in knowledge occurred over a series of meetings attended by the development team, including palliative care nurses and medical staff. In this instance, the issue at hand was improving patient self-reported pain scores, and it was not immediately clear what key behaviour or systems change was required. Following a very productive discussion, it was agreed that effective pain assessment was the key issue and a program of ten cases focused on this aspect of care was developed. The cases developed in this program were subsequently used in a program demonstrated to improve clinician knowledge and to reduce self-reported pain scores (Phillips et al. 2014).

This example contrasts with a program developed for primary-care clinicians on the diagnosis and referral of lung cancer patients, where the evidence base was covered in a 30-minute conversation with the multidisciplinary team, as a succinct resource had been recently developed by Cancer Australia covering the evidence and practice gaps surrounding this issue.

In almost all the programs developed by the authors, this step has proved productive and has produced unexpected results, in even the most evidence-based areas of clinical practice, in terms of where the gaps are in clinical behaviours and how these relate to patient outcomes.

In addition to the use of collaboration, the CASE methodology emphasizes the importance of the take-home message (THM) in developing online CPD programs. We have found this to be a particularly useful concept in CPD, where the time for course delivery is often limited and it is vital that a program is focused around the key learning objectives. The use of key THMs also generates a concisely defined focus on the key behaviour or patient outcomes that the program should target. THMs capture the core message from each scenario that learners should take away from the program. Collectively,

the THMs encase the core learning objectives of the program. It has been the experience of the authors that an average CPD activity of 4–6 hours should not exceed 10–15 THMs. It has also been the experience of the authors that each case should only deal with one or two key THMs to keep the program learning manageable from the participant's point of view. The authors have found that content experts invariably struggle with refining their content down to a manageable volume for inclusion in a course. If a reductive process is not applied then it is easy to end up with overly complex cases and text-heavy content.

Defining the THMs first, before case development, has been found to be a good way of informing a tighter and more focused case writing process. If one starts with case development *without* focusing first on THMs, one can quickly lose sight of the overall program objectives.

Almost all case scenarios used in online learning will be associated with a learning object, such as a multiple-choice question or free-text question, that provides an opportunity for providing feedback to participants once they have interacted with the case. The authors have found in their work that the impact of the learning experience is related to the structure and quality of the feedback. Through review of the literature and trial and error, we have found that the following points are important to consider when developing feedback.

In general, we have found it most important to keep feedback to no more than a small number of paragraphs, each of which is only a handful of sentences long. We generally break the feedback into four sections:

- *Take home message.* To reinforce the THM we commence feedback with a simple two or three-line paragraph that reiterates this take-home message.
- *What actually happened.* Where it is possible to use real-life case scenarios, it is very powerful to follow the THM with a section that describes the ultimate outcome for the clinician and/or patient in the case. For example, in the case mentioned earlier around developing case scenarios for medical interns in the USA, highlighting in the feedback the consequences for the interns and their patients who had been involved in the original scenario was found to enhance learning retention (Shaw et al. 2012). Where it is not practical to use real-life scenarios, then one can instead provide feedback on what the likely consequence of the scenario would have been on the patient and the clinician.
- *How are we performing?* The authors often include links to relevant organizational or national performance data relevant to the case. In safety and quality programs this may, for instance, include rates of falls in the hospital or adverse drug interactions. Once again, this directs the attention of the participant by contextually relating the case to their immediate practice. The authors are currently researching the impact of including audit and feedback data in scenario feedback, given the effectiveness of audit and feedback in other clinical contexts.
- *Links and resources.* Feedback on a case will usually conclude with a links to a small number of references, and ideally to local policies and procedures.

(C) COMMENCING DEVELOPMENT OF CASE SCENARIOS

During the initial meeting, it has been our experience that most participants will join more actively in the discussion around certain THMs than others. It is useful for the editor to note this participation, and then to allocate case development along these lines of interest. Ideally, to avoid too much variation in style, no more than two or three authors will develop a case in a set of 10–15.

In providing advice to authors on how to build cases, we provide exemplars and, ideally, access to case scenarios in-situ in other similar learning programs. During the meeting we emphasize the following points in case development:

- Where possible, draw on real scenarios that will be relevant and in the appropriate scope for the target audience.
- Keep cases short (no more than six or seven lines).
- Focus cases to address no more than one or two points.
- Use a writing style and language that participants will relate to – for example avoid overly formal language.
- Ideally, use a strong image alongside the case.
- Give the patient and any clinicians involved in the case credible pseudonyms.
- If developing multiple questions with the case, focus around one or two areas to explore and avoid the use of too many answer options in a multiple true/false question type (ideally no more than four options in any given question).

(D) CASE DEVELOPMENT AND REVIEW

We recommend that authors prepare draft cases that they first share with the content-matter expert. The content matter expert can then provide advice on consistency and content coverage. Ideally, authors will be given no more than two weeks to complete this step.

Once the editor has a complete, or near complete, set of cases, then these can be shared with the entire group to review overall coverage of the content area. It has been the authors' experience that this can be done effectively via email exchange rather than teleconference.

(E) PILOT TEST CASES

It is vital that the cases are pilot tested with a cohort of participants representative of the target audience, as this always results in significant modification of the cases regardless of the authorship team. Ideally, cases will be pilot tested using the same delivery platform that will ultimately be used.

(F) FINAL TELECONFERENCE

The authors have found it useful to arrange a final teleconference once all cases have been reviewed. This allows for sign-off from the group, which can be important in some courses, as well as time for the resolution of any final issues that may have arisen.

STEP 4: EVALUATE THE END PRODUCT

If possible, any new program is best released on a smaller cohort of participants, as there will inevitably be issues even following the pilot testing phase. As with any program roll-out, an evaluation plan should be developed to ensure adequate qualitative and quantitative feedback is gathered on the effectiveness of the case scenarios. Any feedback that is received should be extensively reviewed and used to modify and improve cases.

CONCLUSION

Continuing professional development in healthcare is being transformed with an ever-increasing reliance on online learning to deliver education. It is of concern that, in healthcare, increasing use is being made of click-through slide-set based online learning with an exit, fact-based knowledge quiz, to deliver mandated education.

The use of case scenarios to deliver contextually relevant online learning is an approach that aligns well with adult learning principles (Reeves et al. 2002; Cercone 2008). That being said, it has been the experience of the authors that case-based scenario development in many online learning programs does not follow a structured process and often little attempt is made to align case scenarios with key THMs and learning objectives. The CASE methodology provides a framework to support a structured, multidisciplinary, evidence-based and patient-centered approach to case development for use in online learning programs. Use of the CASE methodology has also resulted in unexpected benefits, such as providing an opportunity for multidisciplinary care teams to discuss key aspects of their practice in the 'safe' context of educational development.

The CASE methodology has been used successfully by the authors to develop a number of online learning programs that have had an effective impact on participant knowledge and behaviour (Shaw et al. 2012; Phillips et al. 2014; Robinson et al. 2017). The authors are currently researching aspects of extending the CASE methodology, such as how best to deliver audit and feedback data as part of online learning and how to link program evaluation with improvement in patient care and outcomes. From its use to date, the CASE methodology has successfully provided a concise, thorough and structured approach to designing what is an integral part of many online CPD programs. The CASE methodology should be considered for future use in case development as it ensures a well-constructed, thorough and structured approach to what is a commonly used educational strategy for health professionals.

Conflicts of interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

Agarwal PK, Karpicke JD, Kang SH, Roediger HL & McDermott KB (2008) Examining the testing effect with open-and closed-book tests. *Applied Cognitive Psychology* 22: 861–876.

Aviv R, Erlich Z, Ravid G & Geva A (2003) Network analysis of knowledge construction in asynchronous learning networks. *Journal of Asynchronous Learning Networks* 7: 1–23.

Browman GP, Snider A & Ellis P (2003) Negotiating for change. The healthcare manager as catalyst for evidence-based practice: changing the healthcare environment and sharing experience. *HealthcarePapers* 3: 10–22.

Bruckel J, Carballo V, Kalibatas O, Soule M, Wynne KE, Ryan MP & Shaw T (2016) Use of spaced education to deliver a curriculum in quality, safety and value for postgraduate medical trainees: trainee satisfaction and knowledge. *Postgraduate Medical Journal* 92:137–144.

Cercone K (2008) Characteristics of adult learners with implications for online learning design. *AACE Journal* 16: 137–159.

Curran VR & Fleet L (2005) A review of evaluation outcomes of web-based continuing medical education. *Medical Education* 39: 561–567.

Fraser S & Matthews S (2007) The Critical Practitioner in Social Work and Health Care. London: Sage.

Gobet F, Lane PC, Croker S, Cheng PC, Jones G, Oliver I & Pine JM (2001) Chunking mechanisms in human learning. *Trends in Cognitive Sciences* 5: 236–243.

Grol R & Grimshaw J (2003) From best evidence to best practice: effective implementation of change in patients' care. *The Lancet* 362: 1225–1230.

Heckman R & Annabi H (2005) A content analytic comparison of learning processes in online and face-to-face case study discussions. *Journal of Computer-Mediated Communication* 10. DOI: https://doi.org/10.1111/j.1083-6101.2005.tb00244.x

Hokanson B & Miller C (2009) Role-based design: A contemporary framework for innovation and creativity in instructional design. *Educational Technology* 49: 21–28.

Janssen A, Shaw T, Bradbury L, Moujaber T, Nørrelykke AM, Zerillo JA, Lacasce A, Robinson T, Starr A & Harnett P (2016) A mixed methods approach to developing and evaluating oncology trainee education around minimization of adverse events and improved patient quality and safety. *BMC Medical Education* 16: 91.

Jiwa M, Halkett G, Meng X, Pillai V, Berg M & Shaw T (2014) Supporting patients treated for prostate cancer: a video vignette study with an email-based educational program in general practice. *Journal of Medical Internet Research* 16.

Kerfoot BP & Brotschi E (2009) Online spaced education to teach urology to medical students: a multi-institutional randomized trial. *The American Journal of Surgery* 197: 89–95.

Manns PJ & Darrah J (2012) A structured process to develop scenarios for use in evaluation of an evidence-based approach in clinical decision making. *Advances in Medical Education and Practice* 3: 113.

Nutley S, Walter I & Davies HT (2003) From knowing to doing: a framework for understanding the evidence-into-practice agenda. *Evaluation* 9: 125–148.

Phillips JL, Heneka N, Hickman L, Lam L & Shaw T (2014) Impact of a novel online learning module on specialist palliative care nurses' pain assessment competencies and patients' reports of pain: results from a quasi-experimental pilot study. *Palliative Medicine* 28: 521–529.

Reeves TC, Herrington J & Oliver R (2002) Authentic activities and online learning. *In: HERDSA 2002 Quality Conversations*, Perth, Western Australia, 7–10 July 2002, pp. 562–567.

Robinson T, Janssen A, Kirk J, Defazio A, Goodwin A, Tucker K & Shaw T (2017) New approaches to continuing medical education: a QStream (spaced education) program for research translation in ovarian cancer. *Journal of Cancer Education* 32: 476–482.

Ryan G, Lyon P, Kumar K, Bell J, Barnet S & Shaw T (2007) Online CME: an effective alternative to face-to-face delivery. *Medical Teacher* 29: e251–e257.

Sandars J & Heller R (2006) Improving the implementation of evidence-based practice: a knowledge management perspective. *Journal of Evaluation in Clinical Practice* 12: 341–346.

Shaw T, Barnet S, Mcgregor D & Avery J (2015) Using the Knowledge, Process, Practice (KPP) model for driving the design and development of online postgraduate medical education. *Medical Teacher* 37: 53–58.

Shaw T, Long A, Chopra S & Kerfoot BP (2011) Impact on clinical behavior of face-to-face continuing medical education blended with online spaced education: A randomized controlled trial. *Journal of Continuing Education in the Health Professions* 31: 103–108.

Shaw TJ, Pernar LI, Peyre SE, Helfrick JF, Vogelgesang KR, Graydon-Baker E, Chretien Y, Brown EJ, Nicholson JC & Heit JJ (2012) Impact of online education on intern behaviour around joint commission national patient safety goals: a randomised trial. *BMJ Quality & Safety* 21: 819–825.

Vlach HA & Sandhofer CM (2012) Distributing learning over time: The spacing effect in children's acquisition and generalization of science concepts. *Child Development* 83: 1137–1144.

Wong G, Greenhalgh T & Pawson R (2010) Internet-based medical education: a realist review of what works, for whom and in what circumstances. *BMC Medical Education* 10: 12.

Health Education in Practice: Journal of Research for Professional Learning

Vol. 1 | No. 1 | 2018

Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

Citation: Murphy KA, Guisard Y, Curtin M, Thomas CJ, Crawford RE and Biles J (2018) Impact of the learning context on undergraduate healthcare students' evidence-based practice confidence and attitudes. *Health Education in Practice: Journal of Research for Professional Learning* 1(1): 32-50

Research & Evaluation article (double blind peer-review)

Impact of the learning context on undergraduate healthcare students' evidence-based practice confidence and attitudes

Kylie Ann Murphy[1], Yann Guisard[2], Michael Curtin[1], Catherine Jane Thomas[2], Ruth Elizabeth Crawford[3] and Jessica Biles[4]

Abstract

Evidence-based practice (EBP) is a complex process of enquiry and reasoning undertaken by practitioners to ensure defensible healthcare decisions are made. This study investigated the impact of different learning contexts on undergraduate healthcare students' EBP confidence and attitudes. Within a broader project, 231 third- and fourth-year students in 20 undergraduate healthcare degrees in one Australian university completed an online survey. Students were asked to indicate: the context(s) in which they could remember learning EBP skills (in a research-focused subject, in a non-research-focused subject, and/or during workplace learning); their frequency of exposure to research articles in different learning contexts in the past year; and their levels of EBP confidence and other attitudinal target variables. There was no association between learning EBP skills in a research subject and any target variable. Learning EBP skills in a non-research (e.g., clinically focused) subject or during workplace learning was associated with higher levels of EBP confidence ($p < 0.05$) and pro-EBP attitudes. In addition, there was a positive relationship between exposure to research articles and EBP confidence, found to be strongest when exposure to the research occurred in the context of practice-based learning ($\rho = 0.42$, $p < 0.001$). The findings show that the curricular context in which EBP skills are taught impacts on students' EBP confidence and attitudes. Teaching EBP skills in research-focused subjects may be necessary, but it is insufficient for maximising confidence and attitudes conducive to EBP. These findings are relevant to curriculum designers and educators seeking to enhance the effectiveness of undergraduate EBP education.

Keywords: Evidence-based practice, undergraduate education, allied health, nursing, social work, curriculum design

[1] School of Community Health, Charles Sturt University
[2] Faculty of Science, Charles Sturt University
[3] School of Exercise Science, Sport and Health, Charles Sturt University
[4] School of Nursing Midwifery and Indigenous Health, Charles Sturt University

Corresponding author: Dr Kylie Ann Murphy, School of Community Health, Charles Sturt University, PO Box 789, Albury NSW 2640; kmurphy@csu.edu.au

Universities providing undergraduate training for healthcare practitioners invest significantly in delivering curricula intended to teach students how to find, evaluate, and appropriately apply research evidence for professional practice. This is important in degrees preparing students for healthcare professions where there are mandated standards relating to evidence-based practice (EBP). Arguably, efforts to build students' knowledge and skills for EBP are wasted if students do not feel a resultant sense of confidence and commitment to engage in EBP in their professional practice. For the substantial resources invested in training undergraduate students in the skills of EBP, universities should produce EBP-confident graduates.

Various definitions of EBP have been published (e.g., Dawes et al. 2005; Hoffmann, Bennett & Del Mar 2017; Melnyk et al. 2010), but common to most is the notion that EBP is a question-in-context driven, client-centred process in which healthcare practitioners in situations of uncertainty seek out and judiciously incorporate relevant research evidence in their professional decision-making. It involves engaging in professional reasoning that takes into account the best available research evidence, their own and other clinicians' experience-based wisdom, their clients' individual situations and preferences, and the characteristics of the practice context (Hoffmann, Bennett & Del Mar 2017).

Operationally, EBP involves five steps, each of which requires training and practice (Dawes et al. 2005; Hitch & Nicola-Richmond 2017; Hoffmann, Bennett & Del Mar 2017; Khan & Coomarasamy 2006; Malik, McKenna & Griffiths 2017; Melnyk et al. 2010; Villanueva et al. 2001). EBP requires practitioners to: (1) Ask – Recognise situations of uncertainty and translate that uncertainty into answerable questions; (2) Acquire – Find the best research evidence available, if there is any, on those questions; (3) Appraise – Judge that evidence for its applicability to their situation and its validity/trustworthiness; (4) Apply – Act on the evidence if appropriate, following a process of reasoning that incorporates their own and other clinicians' learned wisdoms, client factors, and the practice context; and (5) Assess – Evaluate their reasoning processes and the outcomes of their decisions, to build experience-based evidence for their future practice.

However, significant barriers to implementing EBP have been documented (Curtin & Jaramazovic 2001; Harding et al. 2014; Harvey & Kitson 2015; Verloo, Desmedt & Morin 2017; Zwolsman et al. 2013): a lack of access to, or skills to access, research evidence; perceived inaccessibility in the way research is reported; perceived lack of available research evidence that is relevant and applicable; a lack of confidence to engage in EBP; and a lack of time to engage in EBP. Some of these obstacles are issues for researchers, research funders, publishers, and service managers to address (O'Halloran, Porter & Blackwood 2010; Rousseau & Gunia 2016). However, a range of EBP

obstacles might be overcome by better pre-service healthcare-professional training. Indeed, the perceived lack of time commonly cited as a barrier to EBP may in part be a proxy for barriers related to inadequate training. For example, a lack of skill in identifying types of practice decisions that can be informed by research, a lack of skills to appropriately formulate questions and efficiently search for relevant research, and/or a lack of the skills and confidence required to quickly dismiss irrelevant or poor quality research would make EBP impracticably time consuming in any practice context.

Indeed, many healthcare practitioners report a lack of confidence in their skills to engage in EBP (Curtin & Jaramazovic 2001; Graue et al. 2010; Saunders & Vehviläinen-Julkunen 2016; Zwolsman et al. 2013). Failure to produce EBP-confident graduates is problematic, as integration of research into professional reasoning means opportunities to optimise health outcomes may be missed. EBP is also important for avoiding inefficient, ineffective, and dangerous practices (Dawes et al. 2005; Grimshaw, Eccles & Tetroe 2004). Moreover, funds invested into research go to waste when research is not duly considered in healthcare decision-making. Improved pre-service EBP education might assist in overcoming obstacles linked to poor EBP skills and confidence.

It is well accepted that the development of EBP skills requires training. However, others have shown that it is difficult to teach EBP in a way that assists students to translate EBP knowledge into practice (Kahn & Coomarasamy 2006; Del Mar, Glasziou & Mayer 2004; Thomas, Saroyan & Dauphinee 2011). It remains unclear which specific kinds of learning experience are most effective for enhancing students' EBP competence and confidence (Dizon, Grimmer-Somers & Kumar 2012; Hecht, Buhse & Meyer 2016). Few studies have been conducted in universities with pre-service healthcare practitioners. Among the rare examples are studies by Bennett, Hoffmann and Arkins (2011) and Ruzafa-Martínez and colleagues (2016). These studies evaluated the immediate impact of specific, stand-alone EBP subjects/courses on student knowledge, skills and attitudes, employing a quasi-experimental design.

To date, there is no published research investigating what learning students take from their overall undergraduate training in relation to research evidence and EBP. Taking a realist perspective (Wong et al. 2012), it is reasonable to expect that the entirety of a student's learning experiences throughout their undergraduate training might have a more powerful influence on their EBP confidence and attitudes than any single EBP-focused subject they complete does. The present study investigated associations between the broad curricular contexts in which EBP skills are addressed, as possible influencing variables, and students' EBP confidence and attitudes, as the target variables.

METHODS

DESIGN

This study focused on the relationship between students' past curricular experiences and their current EBP confidence and attitudes, in students undertaking the third or fourth year of their undergraduate training. This study formed part of a broader project in which students in all year levels of Charles Sturt University's (CSU's) undergraduate healthcare degrees were invited to contribute to an anonymous online survey. Prior to data collection, Charles Sturt University Human Research Ethics Committee approved this research (Protocol Number H17113).

PARTICIPANTS

In the broader project, across all year levels, a total of 584 students from 20 health and social care degree courses responded to the survey; however, only students in the third or fourth year of their degree were the focus in the current study. Across all 20 courses, 185 third-year students responded to the survey. Across the eight courses with a duration longer than three years, a total of 46 fourth-year students participated. Therefore, for the purposes of the current study, data from a total of 231 students was analysed. The composition of the sample is shown in Table 1. Most respondents were studying Nursing, Clinical Practice (Paramedic), Social Work, Physiotherapy, and Medical Radiation Science. The response variation across courses generally reflected cohort size variations.

DATA COLLECTION PROCEDURE

The survey was emailed to all CSU's healthcare students at the beginning of Session 2 (midway through the academic year). The students were initially contacted via a generic course-level email. The email included a link to the participant information sheet and survey. The email message conveyed our interest in 'negative, neutral and positive views students have' and encouraged responses from students regardless of whether they knew 'very little or a lot' about research and EBP. Voluntary informed consent was deemed to have occurred if a student chose to proceed. In addition, all academics teaching subjects in the included courses were asked to assist in promoting the survey to their students, by including the link in their subject site announcements and/or verbally encouraging students to complete the survey outside of their class time.

SURVEY DESIGN

The survey was designed to gather anonymous demographic information about each student, their course experience so far, and their confidence and attitudes regarding EBP.

Table 1. Sample composition and course information (*n* = 231)

Bachelor course	Length of course	Percentage of total sample (%)	Percentage of total sample by year level (%)		Timing of first formal WPL experience[a]
			Year 3 students	Year 4 students	
B Clinical Practice (Paramedic)	3 years	11.8	11.4	N/A	Year 2
B Clinical Science	3 years	0.9	0.9	N/A	No WPL
B Dental Science	5 years	3.1	1.3	1.8	Year 2
B Exercise and Sport Science	3 years	1.3	1.3	N/A	Year 2
B Health and Rehabilitation Science	3 years	1.8	1.8	N/A	Year 1
B Health Science (Complementary Med)	3 years	4.8	4.8	N/A	No WPL
B Health Science (Food and Nutrition)	3 years	3.1	3.1	N/A	No WPL
B Health Science (Mental Health)	3 years	1.8	1.8	N/A	Year 1
B Medical Radiation Science	4 years	7.5	5.7	1.8	Year 1
B Medical Science	3 years	6.1	6.1	N/A	Year 2
B Nursing	3 years	20.2	20.2	N/A	Year 1
B Occupational Therapy	4 years	1.8	0.0	1.8	Year 1
B Pharmacy	4 years	1.3	0.9	0.4	Year 1
B Physiotherapy	4 years	9.7	6.1	3.5	Year 1
B Podiatric Medicine	4 years	0.9	0.0	0.9	Year 1
B Social Science (Psychology)	3 years	0.9	0.9	N/A	No WPL
B Social Work	4 years	10.5	6.1	4.4	Year 3 Session 1
B Social Welfare	3 years	6.6	6.6	N/A	No WPL
B Speech and Language Pathology	4 years	3.5	3.1	0.4	Year 1
B Vet Biology / Vet Science	6 years	2.6	1.3	1.3	Year 1
Total		100.0	80.3	19.7	

[a]WPL = Workplace learning

DEMOGRAPHIC VARIABLES

In the interests of transparency and replicability, demographic and course-enrolment information was collected for reporting purposes. Demographic information was collected regarding each student's age-group, gender, cultural and ethnic group (using Australian Bureau of Statistics categories, http://www.abs.gov.au/ausstats/abs@.nsf/mf/1249.0), and prior qualification level (using the Australian Qualifications Framework levels, https://www.aqf.edu.au/aqf-levels).

COURSE VARIABLES

The survey collected the student's course name, whether or not the course was an integrated honours degree, the student's enrolment mode (full-time or part-time; on campus, online, or blended mode), and their current year level ('What year level do you currently most identify with?' 'What year level are all or most of your current subjects?').

CURRICULAR CONTEXT VARIABLES

CONTEXT OF LEARNING EBP SKILLS

Respondents were asked, 'Ever since you started your course at CSU has your course covered anything about "research"?' This question was asked in relation to four different skill sets: how to do research of my own; how to find research reports; how to read and understand research reports; and how to evaluate or judge the worth of research reports. For each, students could select one or more responses:

- I have no experience of this in my course yet.
- This has been covered in a research methods subject.
- This has been covered in a subject not specifically about research.
- I learned about this while on placement/workplace learning.

RECENT RESEARCH EXPOSURE

Respondents were asked, 'How often have you looked at research in the past year?' Respondents were given the following definition of research: 'A research report/article explains how information was collected and analysed by the researchers to answer their research question(s). Methods are described under a heading such as "Methods" or "Methodology" and results are shown under a heading such as "Results" or "Findings".' The aforementioned question was asked in relation to three different purposes/contexts:

- to complete an assignment;
- to prepare for a test or exam; and
- during practice-based learning (workplace or simulated).

The answer options for respondents were:

1. I have not looked at any research report.
2. I have looked at only one research report.
3. I have looked at two research reports.
4. I have looked at 3 to 5 research reports.
5. I have looked at more than 5 research reports.

This variable was treated as a categorical variable and a scale variable in different analyses.

TARGET VARIABLES

EBP CONFIDENCE

Respondents were asked, 'How confident do you feel in each of the following skills?' Each skill (or skill set) could be rated on a five-point scale where 1 meant 'I feel not at all capable' and 5 meant 'I feel very capable'. Feeling 'very capable' was deemed to indicate the highest level of confidence. The skills mirrored the five steps of EBP, with Step 3 being divided into two skills. Thus, six skills were listed:

- recognising the types of question research reports can answer;
- finding research reports relevant to my questions;
- judging the validity of research evidence;
- judging the relevance/usefulness of research evidence;
- applying research evidence to practice; and
- evaluating the impact of applying research evidence.

Overall EBP confidence scores were derived by calculating a mean confidence score for each respondent across all six skills. This variable was treated as a categorical variable and a scale variable.

EBP PROFESSIONAL IDENTITY

Respondents were asked, 'How much is evidence-based practice part of your professional identity?' Respondents answered on a five-point scale where 1 meant not at all and 5 meant to a very large extent. This variable was treated as a scale variable.

PERCEIVED PROFESSION IMPACT

Respondents were asked, 'How would you rate the impact of research evidence in the profession you are training to enter?' Respondents selected from five options:

1. I don't know how impactful research evidence is in my profession.

2. Research seems to rarely impact on practice in my profession.

3. Research seems to sometimes impact on practice in my profession.

4. Research seems to often impact on practice in my profession.

5. Research seems to guide almost all practice in my profession.

This variable was treated as a scale variable.

PERCEIVED PERSONAL IMPACT

Respondents were asked, 'How much has research you have read impacted on you as an emerging health professional?' Respondents selected from five options:

1. I have never read any research report.

2. The research I have read did not affect me at all.

3. The research I have read affected me a little.

4. The research I have read affected me moderately.

5. The research I have read affected me substantially.

This variable was treated as a scale variable.

DATA ANALYSES

Descriptive statistics were calculated for all key variables. Relationships between categorical variables and continuous, normally distributed dependent variables were tested with the Independent Groups t-test, where two groups were compared. Where the dependent variable was not normally distributed, the Wilcoxon signed-rank test was used. Pearson's r or Spearman's ρ (rho) correlations were computed, depending on whether parametric assumptions were met (r) or not (ρ). Cohen's (1988) guidelines were followed when interpreting the strength of correlation coefficients: small = 0.10, medium = 0.30, large = 0.50. Microsoft Excel and IBM SPSS Statistics 24 software packages were used.

RESULTS

DEMOGRAPHIC VARIABLES

The largest group of respondents (41.8%) were aged 21–25 years. Almost a third of respondents (32.7%) were aged 26–35 years. One quarter (25.5%) were aged 36–45 years. Female students comprised 77.8% of the sample. Most (81.3%) of the respondents were non-Indigenous Australian; 4% were Aboriginal or Australian South Sea Islander people. A significant minority (14.5%) started their current degree with no previous qualification, 11.8% with a senior secondary certificate, and 10.5% following a previous bachelor degree. The remaining 63.2% of students had started their degree with a TAFE certificate, diploma or associate degree.

COURSE VARIABLES

The respondents' bachelor courses are listed in Table 1. Only 2.6% of respondents were enrolled in a bachelor honours stream of their degree. Most (63.5%) of the sample was studying full-time. Similar proportions were studying fully on campus (43%) versus online (46%), and 11% were studying in a blended mode.

CURRICULAR CONTEXT VARIABLES

Figure 1 shows the contexts in which respondents recalled learning EBP skills in their course so far. Between approximately one-third and 55% of the students recalled learning EBP skills in a non-research focused (e.g., clinically focused) subject. Less than 10% of the students recalled learning these skills during workplace learning (WPL) experiences.

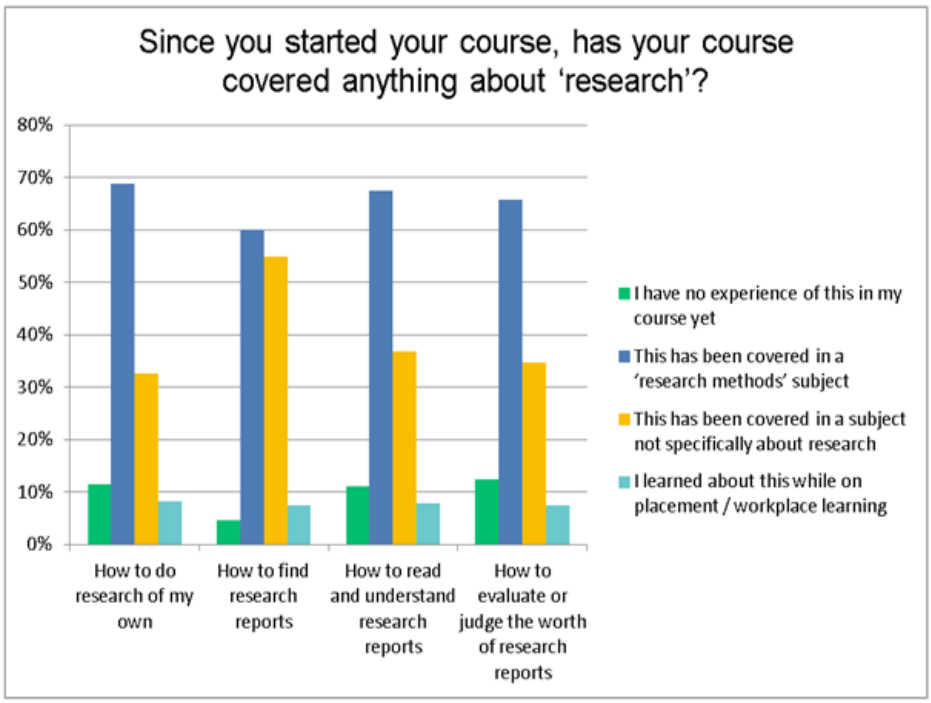


Figure 1: The curricular context of exposure to evidence-based practice (EBP) skills in Year 3 and 4 students from 20 CSU healthcare degree courses (*n* = 231)

Table 2 shows how often the respondents 'looked at' research in the past 12 months in different learning contexts. Of the contexts in which recent research exposure might have occurred, exposure to research during practice-based learning was less frequent (*m* = 3.61) than exposure to research to complete an assignment (*m* = 4.75), but more frequent compared with to prepare for a test or exam (*m* = 3.16).

TARGET VARIABLES

Table 3 shows the respondents' EBP confidence levels across the six EBP skills. The overall EBP confidence score was *m* = 3.49 (SD = 0.84). The mean EBP professional identity score was *m* = 4.05 (SD = 0.92). The mean perceived profession impact score was *m* = 4.21 (SD = 0.77). The mean perceived personal impact score was *m* = 3.96 (SD = 0.75).

Table 2. Self-reported frequency of exposure to research reports of Year 3 and 4 students from 20 CSU healthcare degree courses (*n* = 231) in the 12 months preceding the survey

Purpose/context	Recent research exposure categories				Average (*m*)
	No research report (%)	1 or 2 research reports (%)[a]	3 to 5 research reports (%)	More than 5 reports (%)	
To complete an assignment	1	4.5	12.0	82.5	4.75
To prepare for a test or exam	27.6	29.2	14.1	29.1	3.16
During practice-based learning (workplace or simulated)	16.7	22.9	26.0	34.4	3.61

[a]Two categories are collapsed in this column

Table 3. Percentages of respondents selecting each confidence level for Evidence-Based Practice (EBP) skills for Year 3 and 4 students from 20 CSU healthcare degree courses (*n* = 231)

	Respondents selecting each level of confidence (%) 5 = 'I feel very capable'					Average (*m*)
	1	2	3	4	5	
Recognising the types of question research reports can answer	4.8	11.5	39.2	29.7	14.8	3.38
Finding research reports relevant to my questions	2.9	7.2	20.6	41.2	28.2	3.85
Judging the validity of research evidence	5.3	15.8	35.4	31.6	12.0	3.29
Judging the relevance/usefulness of research evidence	2.9	8.1	30.1	39.2	19.6	3.65
Applying research evidence to practice	2.9	12.0	37.5	29.8	17.8	3.48
Evaluating the impact of applying research evidence	6.2	13.4	40.2	28.7	11.5	3.26

For the EBP skills shown in Figure 1, whether or not a student believed the skill had been covered in a 'research methods' subject (measured categorically) had no association with any target variable ($p > 0.05$). However, significant associations with target variables were observed when students' learning within non-research (e.g., clinically) focused subjects was examined. Students who believed that 'how to find research reports' had been covered in a non-research subject felt more strongly that they had been personally impacted by research in their professional development ($m = 4.07$) compared with students who could not recall this being covered in a non-research subject ($m = 3.83$, $p < 0.05$). Students who believed that 'how to read and understand research' had been covered in a non-research subject also endorsed higher levels of perceived personal impact ($m = 4.14$ versus $m = 3.86$, $p < 0.01$) and had greater overall EBP confidence ($m = 3.63$ versus $m = 3.41$, $p < 0.05$). Finally, students who believed that 'how to

judge the worth of research' had been covered in a non-research subject endorsed higher levels of EBP confidence (m = 3.65 versus m = 3.40, $p < 0.05$).

Significant associations with target variables were also observed when students' learning during workplace learning (WPL) was examined. Students who recalled learning about 'how to read and understand research' during WPL endorsed higher levels of perceived personal impact (m = 4.41 versus m = 3.91, $p < 0.01$), perceived profession impact (m = 4.59 versus m = 4.18, $p < 0.05$), and EBP confidence (m = 3.83 versus m = 3.46, $p < 0.05$). These effects are larger than the corresponding effects of learning 'how to read and understand research' in a non-research subject, displayed above.

Also, exposure to research in the past year was positively associated with EBP confidence, with a moderately strong effect size (ρ = 0.43, $p < 0.001$). Exposure to research during practice-based learning had the strongest correlation with EBP confidence (ρ = 0.42). The next strongest correlation was found for exposure to research to complete an assignment (ρ = 0.37). The weakest correlation was found for exposure to research to prepare for a test or exam (ρ = 0.27).

Finally, EBP confidence was positively correlated with perceived personal impact of research (r = 0.36, $p < 0.001$) and EBP professional identity (r = 0.25, $p < 0.001$). Stronger EBP professional identity was also associated with greater perceived profession impact (r = 0.38, $p < 0.001$). All other associations between the curricular context variables and target variables were either not statistically significant ($p > 0.05$) or weak (ρ or $r < 0.2$).

DISCUSSION

This study explored relationships between the context in which undergraduate healthcare students have read research articles and learnt about EBP, on the one hand, and their EBP confidence and attitudes, on the other. Third- and fourth-year students in 20 CSU healthcare degree courses contributed to this study via an online survey midway through the academic year. Overall, the respondents expressed positive attitudes regarding the role of research in their own professional development and the role of research in the profession they were training to enter. They also tended to feel that EBP was an important part of their professional identity. Confidence in the various EBP skills varied between skills and between students but, overall, EBP confidence levels were moderate.

Our study found that teaching EBP skills in non-research focused (e.g., clinically focused) subjects and during workplace learning (WPL) contributed to students' EBP confidence and positive attitudes, beyond any contribution made by research-focused subjects. Students who learnt EBP skills outside of a research-methods subject tended to feel more confident about their EBP skills. These same students, compared with students who had only learnt EBP skills in a research-focused subject, also tended to feel more strongly that research evidence impacted on the profession they were training to enter and that research evidence impacted on their own professional

development. It was concerning, therefore, that only one-third to one half of the third- and fourth-year students surveyed in this study reported learning EBP skills in any subject other than a research-focused subject. Few students recalled learning EBP skills during a WPL experience, even though students in most courses had experienced at least one formal WPL placement prior to completing the survey. Another key finding was that students' exposure to research articles was significantly correlated with EBP confidence. Research exposure during practice-based learning (workplace or simulated) was more strongly linked to their EBP confidence compared with exposure to research for the purpose of completing tests or assignments.

Together, these findings are important for the design of students' EBP learning experiences. It makes sense that looking at research with a real EBP purpose – driven by questions concerning clients in real-world contexts – would have a larger positive impact on EBP confidence than looking at research for an assignment. University assignments often require students to access and appraise research (Malik, McKenna & Griffiths 2017), giving students practice at Steps 2 and 3 of EBP but not necessarily Steps 1, 4 or 5. To become fully EBP-proficient, students need practice at 'joining up' the steps of EBP in a client-centred contextualised way, starting with Step 1. Real or simulated practice settings provide an ideal context in which to facilitate such practice. However, 17% of the respondents in this study reported that they had not looked at any research for practice-based learning purposes in the past year, and a further 23% of the respondents reported looking at only one or two research reports in a practice-based context.

Given that incomplete and over-simplistic notions of EBP are in circulation that limit the potential of EBP to enhance healthcare (Patterson-Silver Wolf, Dulmis & Maguin 2012; Swinkels et al. 2002), it is important to teach future graduates that EBP is different from simply adopting empirically supported treatments. A university task that requires a student to first read some research, and then propose how that research should impact on practice, runs the risk that students learn what we propose should be termed 'research-reactive practice', rather than EBP. EBP, in contrast, starts with a situation of uncertainty about how to best assess, diagnose, treat, advise or care for clients in a particular practice context (Hoffmann, Bennett & Del Mar 2017). Some research deserves attention in the absence of recognised uncertainty and warrants widespread changes in practice. However, simply adopting new practices in response to research is not EBP, and research findings should never dominate over client preferences or judicious practitioner reasoning.

To counteract naive notions that students might otherwise develop when studying research articles in the absence of authentic practice contexts, practice-based learning provides opportunities to teach EBP as a process of client-centred and contextualised professional inquiry and reasoning.

The relationship observed in this study between research exposure and EBP confidence is probably causal, but not necessarily directly or uni-directionally causal. For example, it is possible that exposure to research articles during practice-based learning may lead to increased EBP confidence. However, it is equally feasible that higher levels of EBP confidence may lead a student to seek out research more often in their practice-based learning. In other words, there may be a positive feedback loop in operation; a bi-directional causal relationship between EBP confidence and research exposure. Regardless of the nature of the relationship, the fact that research exposure and EBP confidence are positively linked suggests that educational designers, academics and clinical educators should work to maximise students' confidence in the skills of EBP and their authentically purposeful exposure to research. At least one of these variables is likely to impact on the other; probably both.

The findings of this study prompt questions about the worth of delivering EBP skills training in research-focused subjects at all. However, they do not suggest that research-focused subjects have no role to play in preparing students for EBP. The knowledge and skills learnt in research-focused subjects can provide important foundations on which students' practice-focused subjects can build. We suggest that research-focused subjects are best viewed as 'necessary but insufficient' for preparing students for EBP. Teaching students how to understand and evaluate research articles in both research and non-research focused subjects appears necessary to maximise students' preparedness for EBP careers.

Attention has previously been drawn to the importance of WPL experiences in students' development of EBP skills and confidence (Towns & Ashby 2014; Hitch & Nicola-Richmond 2017; Westwater-Wood, Hendrick & Diver 2014; Zhang et al. 2012). Practitioners require a number of attributes to be effective WPL educators, including: being a competent practitioner and capable teacher (Higgs & Mcallister 2007); being able to balance client and student needs and priorities (Rodger et al. 2011); and being able to clearly articulate to students the reasoning and decision-making processes involved in the therapy process (Ajjawi & Higgs 2008). However, research shows that not all experienced practitioners engage in EBP (Harding et al. 2014; Jette et al. 2003; Thomas & Law 2013; Verloo, Desmedt & Morin 2017), and it is possible that WPL supervisors may not be an exception. WPL supervisors may not necessarily have the capacity to confidently model, facilitate and assess students' EBP, potentially impacting on students' EBP learning (Brooke, Hvalič-Touzery & Skela-Savič 2015; Fiset, Graham & Davies 2017; Zhang et al. 2012). Further research in this area is important to understand how best to support WPL supervisors to facilitate and assess their students' EBP skills.

When healthcare degrees claim to prepare graduates for EBP, it is important that university assessments, including WPL supervisor reports, include an explicit focus on the attributes and skills required for EBP, beginning with a spirit of enquiry; that is, responding questioningly in situations of professional uncertainty (Melnyk et al. 2010).

The apparent lack of focus on EBP skills in practice-focused learning contexts uncovered in this study may or may not be redressed by the end of students' courses. Further investigation is warranted on this question.

LIMITATIONS

It is important to note that the respondents in this study were only halfway through their third or fourth year of study. Some students may have been yet to undertake practice-based learning experiences, during which they might look at research and practice the skills involved in EBP. Only 43 fourth-year students responded to the survey. Without surveying a large proportion of students at the end of their degree, it is not possible to determine the full extent to which they focus on EBP skills before they graduate. Nonetheless, the correlations between variables observed in this study were moderate-to-strong and statistically significant, indicating the importance of students learning EBP skills in practice-based learning contexts. We found that such learning, when it did happen, was significantly positively correlated with students' EBP confidence and attitudes. While it is probably helpful for undergraduate students to begin to learn EBP skills in their research-focused subjects, these skills should be contextualised and consolidated in their other subjects, especially in practice-based learning contexts.

Another limitation is that it is possible that students who feel positively about research and/or EBP may be over-represented among the respondents in this study. The views and confidence levels felt by the respondents are not necessarily representative of all healthcare students at this university or elsewhere. However, we encouraged 'positive, negative and neutral' views when inviting students to participate in this study, which we hoped would minimise sampling bias. Regardless, any lack of representativeness of the recruited students does not detract from the significant associations between variables observed in this study.

Finally, it is important to note that only students' perceptions were collected. A student's memory of having learned something was treated as a proxy for their actual learning. Moreover, students' actual EBP skills were not assessed. It is wrong to assume that confidence is equivalent to competence (Barnsley et al. 2004) or that attitudes always predict behaviour (Glasman & Albarracín 2006). Nonetheless, achieving high levels of EBP confidence and attitudinal commitment to EBP in healthcare graduates are important educational goals. If a student's EBP confidence is low, it is likely that their skills to engage in EBP are limited.

However, even if a student's EBP skills are strong when they graduate, without confidence and positive attitudes in relation to EBP, they are unlikely to take an EBP approach in their practice.

CONCLUSIONS

This study found that third- and fourth-year students who recalled being taught EBP skills in non-research focused (e.g., clinically focused) subjects, compared with students who could not, felt that the research they had been exposed to had more substantially impacted their development as a healthcare professional, and they felt higher levels of EBP confidence. In addition, students who recalled learning EBP skills during WPL had higher EBP confidence, and felt that research evidence had a greater impact on their professional development and on their profession *per se*, compared with students who did not recall such learning during WPL. Recalling learning EBP skills in a research-focused subject did not differentiate students on any target variable. This study also found that students who reported being more frequently exposed to research reports, especially in practice-based learning contexts, tended to have greater confidence in their EBP skills.

In sum, we found that learning experiences interact with their curricular contexts in the development of students' EBP confidence and attitudes. Based on our findings, we recommend that universities facilitate student exposure to research articles for a range of purposes, including in practice-based learning contexts; not just for the purpose of appraising research in research-focused subjects.

These findings raise important questions for future research: What do non-research subject teachers and WPL supervisors understand to be their role in developing students' EBP skills and attitudes? How capable and supported do they feel to facilitate the development of future evidence-based practitioners? How is EBP currently being taught and assessed, particularly in practice-based learning contexts? Further research on these questions will be important in identifying strategies to better facilitate the development and assessment of students' EBP skills and to strengthen students' confidence and attitudinal commitment to EBP as a way of practicing. Further research in this area is important given that universities are increasingly required to provide evidence to government and professional bodies regarding claims made about their students' learning outcomes.

Conflict of interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article

Funding

A Charles Sturt University Faculty of of Science seed grant supported this study.

References

Ajjawi R & Higgs J (2008) Learning to reason: A journey of professional socialisation. *Advances in Health Sciences Education: Theory and Practice* 13: 133–150. doi: 10.1007/s10459-006-9032-4

Barnsley L, Lyon PM, Ralston SJ, Hibbert EJ, Cunningham I, Gordon FC & Field MJ (2004) Clinical skills in junior medical officers: A comparison of self-reported confidence and observed competence. *Medical Education* 38: 358–67. doi: 10.1046/j.1365-2923.2004.01773.x

Bennett S, Hoffmann T & Arkins M (2011) A multi-professional evidence-based practice course improved allied health students' confidence and knowledge. *Journal of Evaluation in Clinical Practice* 17: 635–9. doi: 10.1111/j.1365-2753.2010.01602.x

Brooke J, Hvalič-Touzery S & Skela-Savič B (2015) Student nurse perceptions on evidence-based practice and research: An exploratory research study involving students from the University of Greenwich, England and the Faculty of Health Care Jesenice, Slovenia. *Nurse Education Today* 35: 6 –11.

Cohen J (1988) *Statistical Power Analysis for the Behavioral Sciences.* 2nd Edition. Hillsdale, NJ, USA: Lawrence Erlbaum Associates.

Curtin M, & Jaramazovic E (2001) Occupational therapists' views and perceptions of evidence-based practice. *British Journal of Occupational Therapy* 64: 214–22. doi.org/10.1177/030802260106400502

Dawes M, Summerskill W, Glasziou P, Cartabellotta A, Martin J, Hopayian K, Porzsolt F, Burls A & Osborne J (2005) Sicily statement on evidence-based practice. *BMC Medical Education* 5: 1. doi: 10.1186/1472-6920-5-1

Del Mar C, Glasziou P & Mayer D (2004) Teaching evidence based medicine. *British Medical Journal* 329: 989. doi: 10.1136/bmj.329.7473.989

Dizon JMR, Grimmer-Somers KA & Kumar S (2012) Current evidence on evidence-based practice training in allied health: A systematic review of the literature. *International Journal of Evidence-Based Healthcare* 10: 347–60. doi: 10.1111/j.1744-1609.2012.00295.x

Fiset V, Graham I & Davies B (2017) Evidence-Based Practice in clinical nursing education: A scoping review. *Journal of Nursing Education* 56: 534–541.

Glasman LR & Albarracín D (2006) Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin* 132: 778–822. doi: 10.1037/0033-2909.132.5.778

Graue M, Bjarkøy R, Iversen MM, Haugstvedt A & Harris J (2010) Integrating evidence-based practice into the diabetes nurse curriculum in Bergen. *European Diabetes Nursing* 7: 10–5. doi: 10.1002/edn.148

Grimshaw J, Eccles M & Tetroe J (2004) Implementing clinical guidelines: Current evidence and future implications. *Journal of Continuing Education in the Health Professions* 24: S31–S7. doi: 10.1002/chp.1340240506

Harding EK, Porter FJ, Horne-Thompson FA, Donley FE & Taylor FN (2014) Not enough time or a low priority? Barriers to Evidence-Based Practice for allied health clinicians. *Journal of Continuing Education in the Health Professions* 34: 224 –31.

Harvey G & Kitson A (2015) Translating evidence into healthcare policy and practice: Single versus multi-faceted implementation strategies – is there a simple answer to a complex question?(Editorial) *International Journal of Health Policy and Management* 4: 123. doi: 10.15171/ijhpm.2015.54

Hecht L, Buhse S & Meyer G (2016) Effectiveness of training in evidence-based medicine skills for healthcare professionals: A systematic review. *BMC Medical Education* 16: 103–119. doi: 10.1186/s12909-016-0616-2

Higgs J & Mcallister L (2007) Being a clinical educator. *Advances in Health Sciences Education* 12: 187–200. doi: 10.1007/s10459-005-5491-2

Hitch D & Nicola-Richmond K (2017) Instructional practices for evidence-based practice with pre-registration allied health students: A review of recent research and developments. *Advances in Health Sciences Education* 22: 1031–45. doi: 10.1007/s10459-016-9702-9

Hoffmann T, Bennett S & Del Mar C (2017) *Evidence-Based Practice Across the Health Professions.* 3rd Edition. Adelaide, Australia: Elsevier.

Jette DU, Bacon K, Batty C, Carlson M, Ferland A, Hemingway RD, Hill JC, Ogilvie L & Volk D (2003) Evidence-based practice: beliefs, attitudes, knowledge, and behavior of physical therapists. *Physical Therapy* 83: 786–805.

Khan KS & Coomarasamy A (2006) A hierarchy of effective teaching and learning to acquire competence in evidenced-based medicine. *BMC Medical Education* 6: 59 –68. doi: 10.1186/1472-6920-6-59

Malik G, McKenna L & Griffiths D (2017) Using pedagogical approaches to influence evidence-based practice integration – processes and recommendations: Findings from a grounded theory study. *Journal of Advanced Nursing* 73: 883–93. doi: 10.1111/jan.13175

Melnyk BM, Fineout-Overholt E, Stillwell S & Williamson K (2010) Evidence-Based Practice: Step by Step: The Seven Steps of Evidence-Based Practice. *American Journal of Nursing* 110: 51 –53. doi: 10.1097/01.NAJ.0000366056.06605.d2

O'Halloran P, Porter SAM & Blackwood B (2010) Evidence based practice and its critics: What is a nurse manager to do? *Journal of Nursing Management* 18: 90–5. doi: 10.1111/j.1365-2834.2009.01068.x

Patterson-Silver Wolf DA, Dulmis CN & Maguin E (2012) Empirically Supported Treatment's impact on organizational culture and climate. *Research on Social Work Practice* 22: 665–71. doi: 10.1177/1049731512448934

Rodger S, Fitzgerald C, Davila W, Millar F & Allison H (2011) What makes a quality occupational therapy practice placement? Students' and practice educators' perspectives. *Australian Occupational Therapy Journal* 58: 195. doi: 10.1111/j.1440-1630.2010.00903.x

Rousseau DM & Gunia BC (2016) Evidence-Based Practice: The Psychology of EBP Implementation. *Annual Review of Psychology* 67: 667–92. doi: 10.1146/annurev-psych-122414-033336

Ruzafa-Martínez M, López-Iborra L, Barranco DA & Ramos-Morcillo AJ (2016) Effectiveness of an evidence-based practice (EBP) course on the EBP competence of undergraduate nursing students: A quasi-experimental study. *Nurse Education Today* 38: 82–7. doi: 10.1016/j.nedt.2015.12.012

Saunders H & Vehviläinen-Julkunen K (2016) The state of readiness for evidence-based practice among nurses: An integrative review. *International Journal of Nursing Studies* 56: 128 –40. doi: 10.1016/j.ijnurstu.2015.10.018

Swinkels A, Albarran JW, Means RI, Mitchell T & Stewart MC (2002) Evidence-based practice in health and social care: Where are we now? *Journal of Interprofessional Care* 16: 335–47. doi: 10.1080/1356182021000008265

Thomas A & Law M (2013) Research utilization and evidence-based practice in occupational therapy: A scoping study. *American Journal of Occupational Therapy* 67: 55–65.

Thomas A, Saroyan A & Dauphinee WD (2011) Evidence-Based Practice: A review of theoretical assumptions and effectiveness of teaching and assessment interventions in health professions. *Advances in Health Sciences Education* 16: 253–76. doi: 10.1007/s10459-010-9251-6

Towns E & Ashby S (2014) tThe influence of practice educators on occupational therapy students' understanding of the practical applications of theoretical knowledge: A phenomenological study into student experiences of practice education. *Australian Occupational Therapy Journal* 61: 344–52. doi: 10.1111/1440-1630.12134

Verloo H, Desmedt M & Morin D (2017) Beliefs and implementation of evidence-based practice among nurses and allied healthcare providers in the Valais hospital, Switzerland. *Journal of Evaluation in Clinical Practice.* 23: 139–48.

Villanueva EV, Burrows EA, Fennessy PA, Rajendran M & Anderson JN (2001) Improving question formulation for use in evidence appraisal in a tertiary care setting: A randomised controlled trial [ISRCTN66375463]. *BMC Medical Informatics and Decision Making* 1: 4–9. doi.org/10.1186/1472-6947-1-4

Westwater-Wood S, Hendrick P & Diver C (2014) Can 'Evidence Based Practice' be taught in a way that is meaningful to the student for practice? *Health and Social Care Education* 3: 44–5. doi: 10.11120/hsce.2013.00037

Wong G, Greenhalgh T, Westhorp G & Pawson R (2012) Realist methods in medical education research: What are they and what can they contribute? *Medical Education* 46: 89–96. doi: 10.1111/j.1365-2923.2011.04045.x

Zhang Q, Zeng T, Chen Y & Li X (2012) Assisting undergraduate nursing students to learn evidence-based practice through self-directed learning and workshop strategies during clinical practicum. *Nurse Education Today* 32: 570.

Zwolsman SE, van Dijk N, te Pas E & Wieringa-de Waard M (2013) Barriers to the use of evidence-based medicine: Knowledge and skills, attitude, and external factors. *Perspectives on Medical Education* 2: 4–13. doi: 10.1007/s40037-013-0039-2

Health Education in Practice: Journal of Research for Professional Learning

Vol. 1 | No. 1 | 2018

Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

Citation: Wang AP, Fisher G and Hall J (2018) Pain education for clinicians in geriatrics: a study into changes in clinician attitudes and beliefs. *Health Education in Practice: Journal of Research for Professional Learning* 1(1): 51–68

Research & Evaluation article (double blind peer-review)

Pain education for clinicians in geriatrics: a study into changes in clinician attitudes and beliefs

Audrey P Wang[1,2], Georgia Fisher[3] and Jillian Hall[1]

Abstract

A lack of recognition of chronic pain in older adults has fundamental healthcare implications. A practice gap exists that affects evidence-based practice for chronic pain assessment and management specific to older adults. Psychologically informed practice (PIP) has been proposed as a method of enabling health professionals to deliver biopsychosocial pain assessment and management in their practice. The aim of this study was to test the feasibility of a single one-day structured educational program to both introduce the concept of PIP and to shift the attitudes, beliefs and orientation towards patients of clinicians working in the geriatric rehabilitation setting. An observational pre-post study design used two previously validated questionnaires: Pain Attitudes and Beliefs Scale (PABS) and the Patient-Practitioner Orientation Scale (PPOS). Eighteen clinicians from a sub-acute geriatric rehabilitation hospital participated in a one-day pain education training workshop run by an expert psychologist who trains health professionals in pain management skills. Participants completed the questionnaires pre and immediately post workshop. A significant shift ($p < 0.001$) away from the biomedical model ($\bar{x}$ = -9.33, 95% CI: -12.41 to -6.26) was detected in the PABS post-workshop, indicating a change towards a more biopsychosocial attitude in assessing and treating chronic pain. Nil significant change ($\bar{x}$ = 0.61, 95% CI: -2.44 to 3.66) was detected in the PPOS. In conclusion, a one-day structured educational program was feasible in providing foundational steps in implementing the concept of PIP in geriatric rehabilitation settings. This was sufficient to shift key therapist attitudes and beliefs towards a more biopsychosocial model of pain management in older adults, and to reduce the strength of their biomedical attitudes. Surprisingly, this attitudinal shift was not accompanied by a shift in practitioner orientation towards their patients. Practitioner-patient orientation represents a potential translational target to improve the implementation of biopsychosocial principles in the care of the older adult.

Keywords: chronic pain, geriatric assessment, attitude of health personnel, behaviour, Education

[1] Physiotherapy Department, War Memorial Hospital, Waverley, NSW 2024.
[2] School of Physiotherapy, Australian Catholic University, North Sydney, NSW 2060.
[3] The University of Technology, Sydney, Australia

Corresponding author: Dr. Audrey P. Wang, School of Physiotherapy, Australian Catholic University, PO Box 968, North Sydney, NSW 2059. Email: audrey.wang@acu.edu.au

INTRODUCTION

There is a paucity of research into effecting evidence-based practice for chronic pain assessment and management specific to older adults. This is often compounded by the under reporting of chronic pain by older adults in the clinic, despite the evidence of increasing prevalence both in Australia (Blyth et al. 2001; Currow et al. 2010) and globally (Thomas et al. 2007; Tsang et al. 2008). Indeed, in Australia the prevalence of chronic pain is reported to peak in males in the 65–69 year age group (27.0%) and in females in the 80–84 year age group (31.0%) (Blyth et al. 2001). Both men and women above 80 years of age have the highest influence of pain-related interference on daily function (Blyth et al. 2007; Thomas et al. 2007). Older adult chronic pain is associated with several negative sequelae, including mood disruption (Rudy et al. 2007) and disruption in mental flexibility (Karp et al. 2006), but, perhaps most importantly, is strongly linked to falls (Leveille et al. 2009; Menant et al. 2013; Stubbs et al. 2014; Blyth et al. 2007). It is hence essential for health professionals to consider chronic pain in the management of older adult patients.

The current best-practice treatment for chronic pain is interdisciplinary biopsychosocial rehabilitation (Gatchel & Okifuji 2006; Kamper et al. 2014; Qaseem et al. 2017). The biopsychosocial model of care is care that regards biological, psychological, social, and environmental factors as equally important in their interaction with human function (Masters 2013). Multiple studies, including a large-scale review, have shown that treatment with the biopsychosocial model that focuses on restoring the function of a patient and involves a well-coordinated interdisciplinary team is effective in the management of chronic pain (Chou et al. 2009; Nicholas et al. 2012; Oslund et al. 2009; Townsend et al. 2008). The concept of 'psychologically informed practice' (PIP) has been introduced as a model of integrating biopsychosocial principles into the practice of a variety of clinicians to facilitate best-practice pain management where a multidisciplinary team is not available (Porter 2017; Main & George 2011). The education and training of clinicians is proposed as an essential preliminary step in the implementation of this model (Jeffrey & Foster 2012)).

However, little research exists that investigates biopsychosocial pain assessment and management in older adults outside the bounds of specialised multidisciplinary pain teams (Nicholas et al. 2017; Sharpe et al. 2017; Kaasalainen et al. 2017). In addition, there is a deficit in the implementation of PIP specific to the older adult (Kaasalainen et al. 2017). Rather than being unique to geriatric specialist settings, a lack of pain education is common to the current health workforce and is a symptom of shared previous clinical experience (Thompson et al. 2016). Health professionals have identified the major barriers to effective biopsychosocial pain management as being: a biomedically focused education, a lack of confidence (Synnott et al. 2015) and a lack of time (Gibbs 2011). The introduction of theoretical pain education into

undergraduate health professional training (Fishman et al. 2013; Jones & Hush 2011) is an improvement, but not sufficient to ensure a translation of concepts into clinical practice (Rochman et al. 2013; Ung et al. 2015).

The effect of this research and educational deficit is a lack of adequate chronic pain management and assessment in the area of geriatric specialism (Booker & Herr 2016; Hadjistavropoulos et al. 2007; Reid et al. 2015). Most pain education research has focused on a specific form of chronic pain (e.g., lower back) in general populations or related to specific professions, including general practitioners (Bowey-Morris et al. 2010) and physiotherapists (Monaghan et al. 2016; Overmeer et al. 2009). Facilitation of the necessary changes required through implementation is also lacking (Kaasalainen et al. 2017) despite the growing accessibility to resources (Ramaswamy et al. 2015; International Association for the Study of Pain, 2018).

Previous studies have frequently either used the Pain Attitudes and Beliefs Scale (PABS) or Patient-Practitioner Orientation Scale (PPOS) to evaluate the effectiveness of their pain education program (Bowey-Morris et al. 2010; Monaghan et al. 2016; Overmeer et al. 2009). The PABS has a Cronbach's alpha of 0.80 and 0.68 for each subscale it contains and correlates to similar measures (Bishop et al. 2007; Houben et al. 2005). It is a reliable and valid tool to assess clinician attitudes and beliefs towards back pain (Gardner et al. 2017). The PPOS assesses instead the extent to which practitioners believe that patients should share equal power and control with their practitioner, and has a Cronbach's alpha of 0.73 and 0.75 for each subscale (Shaw et al. 2012; Haidet et al. 2001). Combined, these two questionnaires provide insights into clinician attitudes and beliefs towards pain itself, but also towards patient autonomy in healthcare, an important distinction when examining pain through a biopsychosocial lens.

At the time of publication, no study has yet assessed this combination when considering pain management education. Hence, the aim for this study was to test the feasibility of a single one-day structured educational program to both introduce the concept of PIP and to shift the attitudes, beliefs and orientation of clinicians working in the geriatric rehabilitation setting using the above two scales as outcome measures. We hypothesised that therapist attitudes and beliefs would shift towards a more biopsychosocial model of pain management in older adults following the educational program.

METHODS

ETHICAL CONSIDERATIONS

Low negligible ethical approval was gained from the South Eastern Local Health District Human Research Ethics Council, reference number HREC 17/011. All survey data was de-identified for publication.

SETTING AND PARTICIPANTS

All clinical staff (*n* = 240) at a sub-acute geriatric hospital, War Memorial Hospital located in Sydney, Australia were invited to participate via a hospital-wide invitation email. The hospital is a third schedule care hospital specialising in adults over 65 years old only.

DATA COLLECTION

A web-link using an online survey containing two previously validated questionnaires – PABS (Bowey-Morris et al. 2010) and PPOS (Krupat et al. 2000) – was sent to participants via email two weeks prior to, and immediately post, workshop. Pre-reading information was provided in a similar manner a maximum of two days before the workshop, contingent on completion of the email questionnaires. Post-workshop slides were given upon completion of the post-workshop surveys and a paper-based participant satisfaction questionnaire was given at the workshop.

INTERVENTION

A one-day education workshop was delivered and facilitated by a reputable expert psychologist who trains health professionals in pain management skills at a post-qualification or post-graduate level. The workshop covered the biopsychosocial nature of pain and introduced psychological-informed assessment principles. The sessions highlighted the importance of the PIP approach to assessing chronic pain in older adults, case formulation, facilitation of self-management and coping skills strategies in older adults. Intervention options geared towards enhancing patient self-management skills were discussed in the context of a variety of case studies. Clinicians practiced these concepts via role-play and there were opportunities for feedback and further questions to enhance learning and understanding of the approach. For a review of the theoretical framework of psychological-informed practice, please see Main and George (2011), Main and colleagues (2012) and Nicholas and Blyth (2016).

OUTCOME MEASURES

The primary outcome measure was the change in score on the PABS and the secondary measure was the PPOS.

PABS is a validated shortened version adapted from the PABS-PT (Ostelo et. al. 2003) and consists of two subscales: biomedical and biopsychosocial. Twelve items in the PABS measure the strength of the biomedical attitudes and beliefs of participants. Five items measure the strength of the biopsychosocial attitudes and beliefs of participants. Each item is rated on a 6-point Likert scale. A higher score on each item reveals a stronger identification with the approach it assesses.

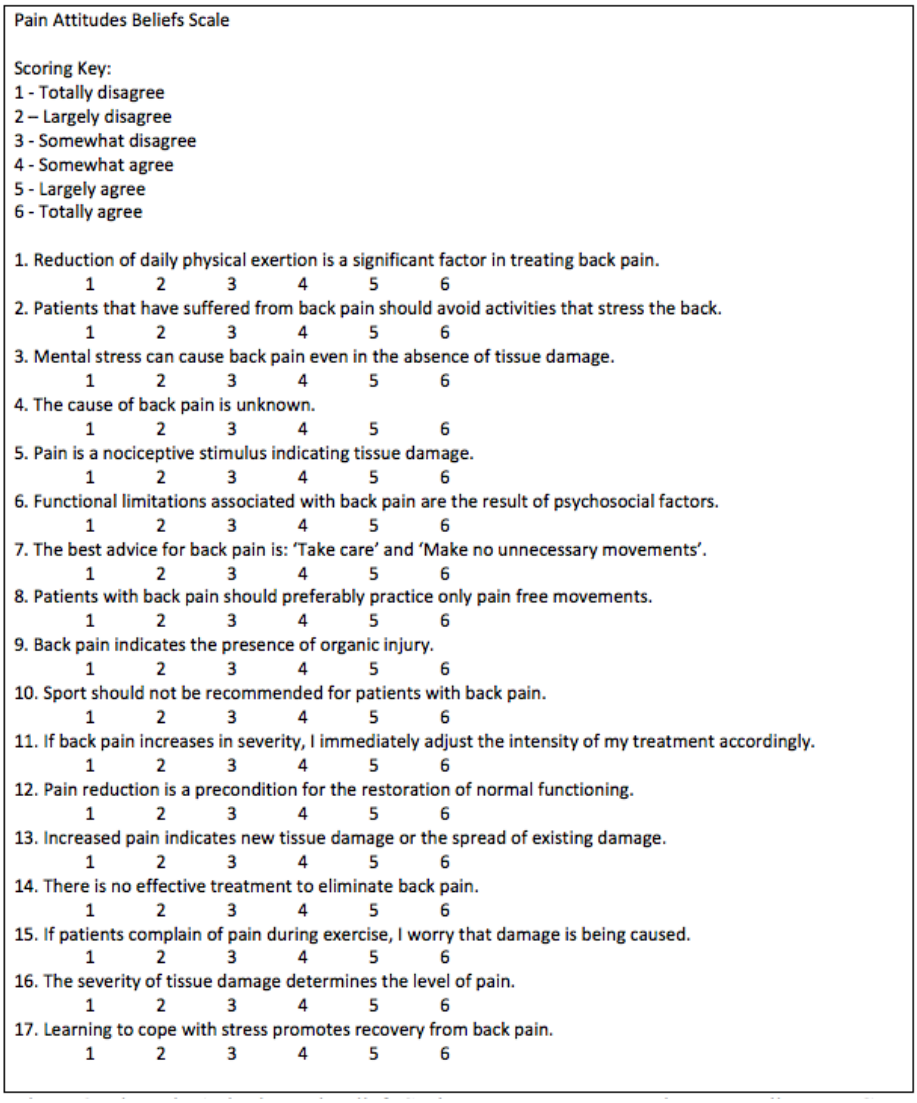
PPOS contains 18 items. The total score ranges from 'patient-centred' to 'clinician-' or 'disease-centred'. A higher score (maximum 108) on the total PPOS indicates a more patient-centred orientation, and a lower score (minimum 18) indicates a 'clinician-' or 'disease-centred' orientation. A score of greater than 90 is considered to indicate a strongly patient-centred orientation (Krupat et al. 2000). The

scale is divided into two subscales of 'Sharing' and 'Caring', with nine items per subscale. Each item is rated on a 6-point Likert scale. Sharing scores reflect the extent to which the respondent believes that: (a) practitioners and patients should share power and control on a relatively equal basis; and (b) practitioners should share as much information with their patients as possible. Caring refers to the extent that respondents believe that: (a) caring about emotions and good interpersonal relations is a key aspect of the medical encounter; and (b) practitioners should care about the patient as a whole person rather than as a medical condition. Figures 1 and 2 contain complete versions of both the PPOS and the PABS.

Data pertaining to participant age, gender, education level, years of experience in healthcare and NSW Health Award level were collected. A paper based participant satisfaction questionnaire was used by the facilitator to gauge whether learning objectives were completely met, partially met or unmet. Learning objectives included 'more familiar with pain and psychosocial contributors to the experience and impact of pain' and 'learnt some pain coping skills that I could teach my patients'. The change in scores for the PABS and PPOS from pre- to post-workshop were calculated by subtracting the pre-scores from the post-scores.

STATISTICAL ANALYSIS

Data was checked for the assumption of normality (Kim 2013). Related samples Wilcoxon signed-rank test and Spearman's correlations were used. Data are presented as means with 95% CI. All tests were carried out using SPSS (version 23: SPSS Inc., Chicago, IL, USA) with $\alpha = 0.01$, 2- tailed. In order to avoid a Type 1 error due to multiple comparisons, Bonferroni correction was used i.e. α (3 tests) = 0.05/3 = 0.017.



Pain Attitudes Beliefs Scale

Scoring Key:
1 - Totally disagree
2 – Largely disagree
3 - Somewhat disagree
4 - Somewhat agree
5 - Largely agree
6 - Totally agree

1. Reduction of daily physical exertion is a significant factor in treating back pain.
1 2 3 4 5 6
2. Patients that have suffered from back pain should avoid activities that stress the back.
1 2 3 4 5 6
3. Mental stress can cause back pain even in the absence of tissue damage.
1 2 3 4 5 6
4. The cause of back pain is unknown.
1 2 3 4 5 6
5. Pain is a nociceptive stimulus indicating tissue damage.
1 2 3 4 5 6
6. Functional limitations associated with back pain are the result of psychosocial factors.
1 2 3 4 5 6
7. The best advice for back pain is: 'Take care' and 'Make no unnecessary movements'.
1 2 3 4 5 6
8. Patients with back pain should preferably practice only pain free movements.
1 2 3 4 5 6
9. Back pain indicates the presence of organic injury.
1 2 3 4 5 6
10. Sport should not be recommended for patients with back pain.
1 2 3 4 5 6
11. If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly.
1 2 3 4 5 6
12. Pain reduction is a precondition for the restoration of normal functioning.
1 2 3 4 5 6
13. Increased pain indicates new tissue damage or the spread of existing damage.
1 2 3 4 5 6
14. There is no effective treatment to eliminate back pain.
1 2 3 4 5 6
15. If patients complain of pain during exercise, I worry that damage is being caused.
1 2 3 4 5 6
16. The severity of tissue damage determines the level of pain.
1 2 3 4 5 6
17. Learning to cope with stress promotes recovery from back pain.
1 2 3 4 5 6

Figure 1: The PPOS, source: Krupat and colleagues (2000).

Patient-Practitioner Orientation Scale (PPOS)
Scoring Key:
1 = Strongly Agree
2 = Moderately Agree
3 = Slightly Agree
4 = Slightly Disagree
5 = Moderately Disagree
6 = Strongly Disagree

1. The practitioner is the one who should decide what gets talked about during a visit.
1 2 3 4 5 6
2. Although health care is less personal these days, this is a small price to pay for medical advances.
1 2 3 4 5 6
3. The most important part of the standard medical visit is the physical exam.
1 2 3 4 5 6
4. It is often best for patients if they do not have a full explanation of their medical condition.
1 2 3 4 5 6
5. Patients should rely on their practitioner's knowledge and not try to find out about their conditions on their own.
1 2 3 4 5 6
6. When practitioners ask a lot of questions about a patient's background, they are prying too much into personal matters.
1 2 3 4 5 6
7. If practitioners are truly good at diagnosis and treatment, the way they relate to patients is not that important.
1 2 3 4 5 6
8. Many patients continue asking questions even though they are not learning anything new
1 2 3 4 5 6
9. Patients should be treated as if they were partners with the practitioner, equal in power and status.
1 2 3 4 5 6
10. Patients generally want reassurance rather than information about their health
1 2 3 4 5 6
11. If a therapist's primary tools are being open and warm, the practitioner will not have a lot of success.
1 2 3 4 5 6
12. When patients disagree with their practitioner, this is a sign that the practitioner does not have the patient's respect and trust.
1 2 3 4 5 6
13. A treatment plan cannot succeed if it is in conflict with a patient's lifestyle or values.
1 2 3 4 5 6
14. Most patients want to get in and out of the practitioner's office as quickly as possible.
1 2 3 4 5 6
15. The patient must always be aware that the practitioner is in charge.
1 2 3 4 5 6
16. It is not that important to know a patient's culture and background in order to treat the person's illness.
1 2 3 4 5 6
17. Humour is a major ingredient in the practitioner's treatment of the patient.
1 2 3 4 5 6
18. When patients look up medical information on their own, this usually confuses more than it helps.
1 2 3 4 5 6

Figure 2: The PABS, source: Bowey-Morris and colleagues (2010).

RESULTS

Twenty-one clinicians registered interest in the workshop and had no prior experience of a similar pain management workshop or any workshop by the expert. Therefore, these clinicians were naïve to this form of pain education. Two psychologists who attended the workshop had prior experience of applying psychological-informed assessment principles to other generic areas of geriatric health. Other clinicians may be conceptually familiar with the biopsychosocial model in health but this information was not collected.

Twenty clinicians who were naïve to the evaluation questionnaires completed the pre-survey, all within one week prior to the workshop. Nineteen attended the workshop, one of whom failed to complete the post-survey and was lost to follow up. Table 1 shows the demographic data from the 18 clinicians who completed the post-workshop survey.

Table 1: The demographic characteristics, education, work experience and NSW HEALTH Award Level* of participants of the education program.

Variable	*n*	Mean ± SD	Min, max
Gender			
Male	1	-	-
Female	17	-	-
Age (years)			
	18	47.1 ± 9.9	28, 59
Education			
Bachelor's Degree	9	-	-
Master's Degree	3	-	-
Tertiary Education Course	4	-	-
School Certificate	1	-	-
Doctorate	1	-	-
Experience (years)			
	18	22.3 ± 11.9	6, 39
NSW Health Award Level*			
Technical Assistant Grade 1	2	-	-
Clinical Psychologist Year 5+	2	-	-
Registered Nurse Year 8+	2	-	-
Health Professional Level 1	1	-	-
Health Professional Level 3	5	-	-
Health Professional Level 4	2	-	-
Health Professional Level 5	1	-	-

*3 participants did not provide their NSW Health Award Level

SURVEY RESULTS

All (n = 18) completed the questionnaires within two weeks post-workshop and were included in the final analyses of the PABS and PPOS questionnaires. Please see Figure 3. Fourteen clinicians completed the post-workshop satisfaction survey.

Compared with the baseline, the biomedical PABS score decreased significantly [mean 38.3 at baseline vs. 28.9 after the intervention, mean difference -9.33, 95% confidence interval (CI): 6.26 to 12.41, $p < 0.001$]. Significant increase in the biopsychosocial PABS was found post intervention [18.6 vs. 20.9, mean difference 2.33, 95% CI 3.77 to 0.90, $p = 0.006$]. These results indicate both a reduced biomedical focus and a greater biopsychosocial focus of attitudes and beliefs.

The PPOS score was not significantly different post intervention [83.7 vs. 84.4, mean difference 0.61, 95% CI -2.43 to 3.66, $p = 0.68$). The PPOS subscales also did not differ significantly post intervention [Sharing Subscale 41.33 at baseline vs. 40.50 after the intervention, 95% CI -2.98 to 1.31, $p = 0.42$; Caring Subscale 42.44 at baseline vs. 43.89 post, 95% CI -0.27 to 3.16, $p = 0.09$]

An initial disease-centred/clinician-centred score, which is indicated by a low score on the PPOS, was moderately associated with having a larger change towards a patient-oriented approach post workshop, r_S= -0.531,p = 0.023 . Therefore, the workshop might have had a larger impact on those with an initially disease-centred or clinician-centred orientation. Those who had a clinician-led orientation in the PPOS post workshop continued to be associated with strong biomedical attitudes and beliefs towards assessing pain after the workshop, r_S= -0.747, p < 0.001; observed through little change in their PABS scores.

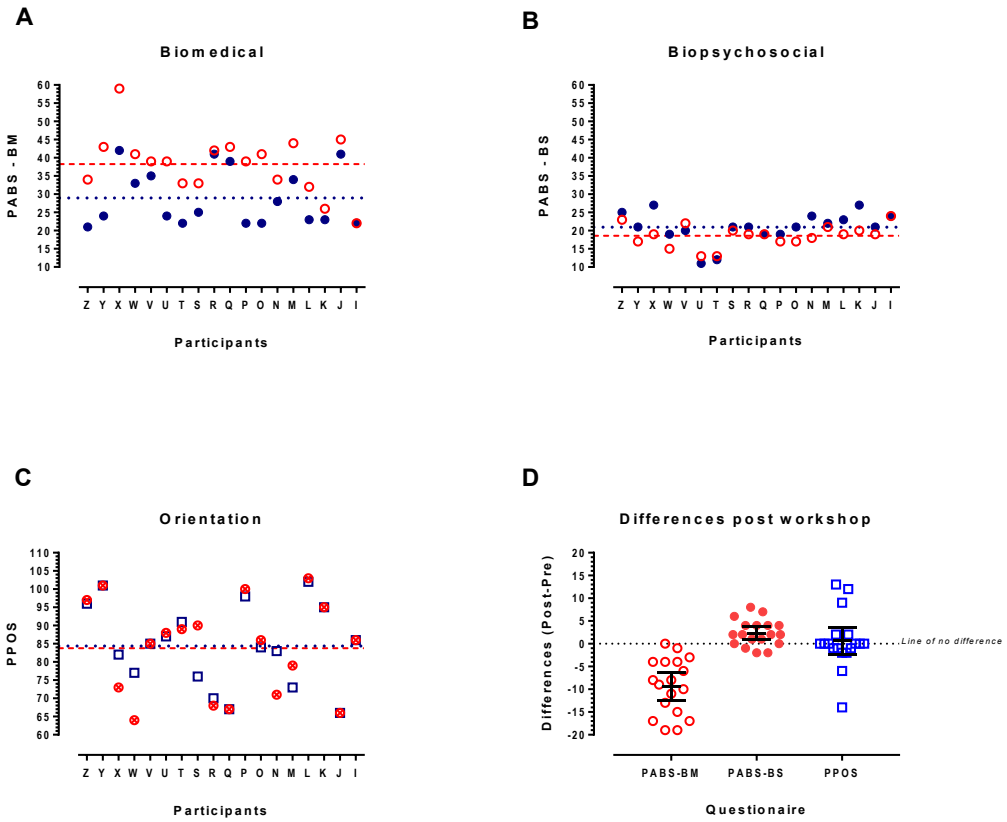


Figure 3: The analysis of individual data points for PABS and PPOS. In the top two graphs, scatter plots of individual pre (o) and post (•) data points for each PABS questionnaire sub-scale are indicated. Each red and dark blue broken line reports the pre-workshop and post-workshop means, respectively. A: The pre-workshop mean score of participants became less biomedical post workshop, from 38.3 to 28.9. B: The biopsychosocial score of participants increased post workshop, from 18.6 to 20.1. The bottom left-hand graph reports the PPOS and the bottom right-hand graph reports change data for each questionnaire. C: The PPOS pre workshop mean data of 83.7(---) shows no change post workshop at 84.4 (···), individual PPOS data points are ⊗ pre-workshop and □ post-workshop. D: There is a distinct difference post workshop for both PABS change scores with a decrease in biomedical beliefs (PABS-BM) and increase in biopsychosocial (PABS-BS) attitudes (PABS-BM: mean -9.33, 95% CI: -12.41, -6.26; PABS-BS: mean 2.33, 95 % CI: 0.90, 3.77; and no change in previous patient or practitioner orientation, PPOS: mean 0.61, 95% CI:-2.44, 3.66)

WORKSHOP METHOD EVALUATION

The clinicians (*n* = 14) described their overall satisfaction with the workshop as 'excellent' (at 69%) or 'good' (at 32%). There was a large overall increase in understanding and confidence in applying self-management and coping skills reported across all items in the workshop evaluation. They reported they were 'more familiar with pain and psychosocial contributors to the experience and impact of pain'; completely met (89%), partially met (11%). They also 'learnt some pain coping skills that I could teach my patients'; completely met (82%), partially met (18%).

DISCUSSION

The results of this study suggest a significant shift towards a biopsychosocial approach in assessing chronic pain in older adult patients in naïve hospital clinicians. The shift also occurred with a significant reduction in the strength of biomedical attitudes following participation in the PIP workshop. Overall, the PABS indicated that the content delivery was successful in changing clinicians' pain attitudes and beliefs. Yet, the PPOS revealed that this did not necessarily show an overall change in type of orientation in the clinicians, who remained only moderately patient-centred. Hence, the study results in combination suggest that separate elements might explain why pain education in isolation is not enough to facilitate change in clinical practice.

Our results from the PABS agree with the literature on pain education, that it is effective in changing the attitudes and beliefs of practitioners and patients alike (Abdel Shaheed et al. 2017; George et al. 2009). A recent systematic review by Gardner and colleagues (2017) showed that attitudes and beliefs, as assessed by the PABS, were correlated with therapist intervention, in that stronger biomedical beliefs were associated with biomedical treatment choices. Hence, it could be possible to assume, based on the results of the PABS alone, that the attitudinal change achieved in our clinicians would correlate with altered treatment behaviour.

Barriers to the pragmatic application of evidence-based treatment decision making by clinicians within their own scope of practice exist, despite their positive shift in attitudinal change. The same systematic review by Gardner and colleagues (2017) noted that the perceived likelihood of a patient effectively engaging in treatment directly affected the treatment selected by clinicians (Gardner et al. 2017). Other studies reported that physiotherapists who identified unhelpful attitudes and beliefs, or poor motivation, in their patients felt that they were working against those patients, and hence felt unable to continue with treatment (Jeffrey & Foster 2012). They were more likely to refer on to other health providers (Bond & Soundy 2012). The orientation of clinicians towards their patients is hence clearly an important factor in treatment decisions. This lack of change in our clinicians' orientation towards patients post workshop might indicate a persistent selection of biomedical treatment options for patients who are perceived as either reluctant to engage in self-management or unable to due to cognitive decline.

Translation of education into clinical practice may hence depend on other factors far removed from education (Teodorczuk et al. 2013; Teodorczuk et al. 2009).

Two such factors could be the influence of years of experience and workplace culture. The orientation of student clinicians shifts towards a patient-centred approach after short sessions of education (Ross & Haidet 2011). In addition, when presented with low back pain patient vignettes post pain education, student physiotherapists are more likely to make return to work and exercise recommendations in line with best-practice guidelines (Domenech et al. 2011; Colleary et al. 2017). However, once students enter the workforce, their patient orientation significantly declines (Grilo et al. 2014). Furthermore, education on evidence-based practice provided to already practicing occupational therapists changed knowledge but had no impact on clinical behaviour (McCluskey & Lovarini 2005). Student attitudes, beliefs, orientation and hence practice can clearly be influenced by education. However, facilitating practice change in clinicians with many years of practice in a potentially biomedical and hence clinician-centred system may require a multifactorial approach (Teodorczuk et al. 2013; Teodorczuk et al. 2009), not just the education of clinicians working within it (McCluskey & Lovarini 2005; Overmeer et al. 2011).

Indeed, the translation of education into clinical practice has long been identified as a challenge in healthcare. Barriers such as lack of support, time constraints and organisational hierarchy are well documented (McKenna et al. 2004; Melnyk et al. 2012). To address these barriers, a variety of models have been proposed with a common theme of integrating researchers and research users in the generation and implementation of healthcare evidence (Flum et al. 2014; Gagliardi & Dobrow 2016; Mays et al. 2013). However, robust research involving the investigation and implementation of these models specific to geriatric care is scarce (Lourida et al. 2017). Importantly, it is even less frequent in the translation of geriatric pain research (Hadjistavropoulos et al. 2007; Abdulla et al. 2013; Schofield 2018). Hence, facilitating pain assessment and management practice change in clinicians working in geriatric care is an exciting and promising area for future research.

Our results indicate that the delivery of the intervention by a reputable expert was likely key for credibility of the intervention, as confirmed in the participants' feedback. Further anecdotal evidence from the feedback included the participants reporting increased confidence in identifying opportunities to use the skills they had learnt in their daily practice to address the more complex needs of older adult patients. Overall, the results should be interpreted with caution, as this was a feasibility study and a small proportion of the possible hospital staff within this site self-selected to attend.

This one-day workshop educational program introduced evidence-based principles of teaching pain self-management and coping skills to a vulnerable older person population with multiple comorbidities to interested but previously naïve (to PIP) hospital staff. This workshop style of education delivery was effective in shifting clinician attitudes and beliefs towards a more biopsychosocial viewpoint of pain. Local implementation strategies that might be considered include mentoring staff with newly acquired skills in practice or during case conferences

on older adults with chronic pain. Implementation strategies that could be further considered include partnering with older adult consumers and carers to develop information leaflets that empower them to request the assessment and treatment options for pain management. Avenues where this could be disseminated range from regular small-scale health promotion seminars at the hospital study site to larger scale consumer state-wide level initiatives.

It remains uncertain whether longer length workshops are more effective for implementing change in clinical practice (Overmeer et al. 2009; Synnott et al. 2015). Future research could investigate which mode of delivery of content might be most effective at ensuring a permanent change in practice in time-poor clinicians (Gibbs 2011). This could include comparing face-to face modules to online modules (Madaus and Lim 2016) and multi-modal approaches to professional learning and assessment. The most effective mode would ultimately assist the focus of in-practice educational resources for this area.

CONCLUSION

A one-day structured educational program is feasible in providing foundational steps in implementing the concept of PIP in the geriatric rehabilitation setting. This program was sufficient to shift key therapist attitudes and beliefs towards a more biopsychosocial model of pain management in older adults, and to reduce the strength of their biomedical attitudes. It was not sufficient to significantly alter clinician orientation in the practitioner–patient relationship. Further support in the pragmatic application of knowledge acquired through educational workshops such as this one should be explored to evaluate the potential for effecting change in practitioner orientation in assessing chronic pain in the older adult.

Acknowledgements

We thank Professor Michael Nicholas for conducting the workshop, the Health Education and Training Institute 2016 Workplace Learning Grant Program and War Memorial Hospital staff for their support for this project.

Conflict of interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article

Funding

Health Education and Training Institute 2016 Workplace Learning Grant Program

References

Abdel Shaheed C, Graves J & Maher C (2017) The effects of a brief educational intervention on medical students' knowledge, attitudes and beliefs towards low back pain. *Scandinavian Journal of Pain* 16: 101–104.

Abdulla A, Adams N, Bone M, Elliott AM, Gaffin J, Jones D, Knaggs R, Martin D, Sampson L & Schofield P (2013) Guidance on the management of pain in older people. *Age Ageing* 42: Suppl 1: i1–57.

Bishop EA, Thomas EE & Foster EN (2007) Health care practitioners attitudes and beliefs about low back pain: A systematic search and critical review of available measurement tools. *Pain* 132: 91–101.

Blyth FM, Cumming R, Mitchell P & Wang JJ (2007) Pain and falls in older people. *European Journal of Pain* 11: 564–571.

Blyth FM, March LM, Brnabic AJM, Jorm LR, Williamson M & Cousins MJ (2001.) Chronic pain in Australia: a prevalence study. *Pain* 89: 127–134.

Bond SJ & Soundy A (2012) The influence of perceptions and beliefs of civilian physiotherapist working for the Ministry of Defence in their management of back pain: an exploratory study using mixed methods. *Journal of the Royal Army Medical Corps* 158: 14 J R Army Med Corps 21.

Booker SQ & Herr KA (2016) Assessment and Measurement of Pain in Adults in Later Life. *Clinics in Geriatric Medicine* 32: 677 J R Army Med Corps 692.

Bowey-Morris J, Purcell-Jones G & Watson PJ (2010) Test-retest reliability of the pain attitudes and beliefs scale and sensitivity to change in a general practitioner population. *The Clinical Journal of Pain* 26: 144–152.

Chou R, Loeser JD, Owens DK, Rosenquist RW, Atlas SJ, Baisden J, Carragee EJ, Grabois M, Murphy DR, Resnick DK, Stanos SP, Shaffer WO & Wall EM (2009) Interventional therapies, surgery, and interdisciplinary rehabilitation for low back pain: an evidence-based clinical practice guideline from the American Pain Society. *Spine* 34: 1066.

Colleary G, O'Sullivan K, Griffin D, Ryan CG & Martin DJ (2017) Effect of pain neurophysiology education on physiotherapy students' understanding of chronic pain, clinical recommendations and attitudes towards people with chronic pain: a randomised controlled trial. *Physiotherapy* 103: 423–429.

Currow DC, Agar M, Plummer JL, Blyth FM & Abernethy AP (2010) Chronic pain in South Australia – population levels that interfere extremely with activities of daily living. *Australian and New Zealand Journal of Public Health* 34: 232–239.

Domenech FJ, Sánchez-Zuriaga FD, Segura-Ortí, FE, Espejo-Tort FB & Lisón FJ (2011) Impact of biomedical and biopsychosocial training sessions on the attitudes, beliefs, and recommendations of health care providers about low back pain: A randomised clinical trial. *Pain* 152: 2557–2563.

Fishman, SM, Young HM, Lucas Arwood E, Chou R, Herr K, Murinson BB, Watt–Watson J, Carr DB, Gordon DB, Stevens BJ, Bakerjian D, Ballantyne JC, Courtenay M, Djukic M, Koebner IJ, Mongoven JM, Paice JA, Prasad R, Singh N, Sluka KA, St Marie B & Strassels SA (2013) Core Competencies for Pain Management: Results of an Interprofessional Consensus Summit. *Pain Medicine* 14: 971–981.

Flum DR, Alfonso-Cristancho R, Devine EB, Devlin A, Farrokhi E, Tarczy-Hornoch P, Kessler L, Lavallee D, Patrick DL, Gore JL & Sullivan SD (2014) Implementation of a "real-world" learning health care system: Washington State's Comparative Effectiveness Research Translation Network (CERTAIN). *Surgery* 155: 860–866.

Gagliardi AR & Dobrow MJ (2016) Identifying the conditions needed for integrated knowledge translation (IKT) in health care organizations: qualitative interviews with researchers and research users. *BMC Health Services Research* 16: 256.

Gardner T, Refshauge K, Smith L, McAuley, J Hübscher M & Goodall S (2017) Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: a systematic review of quantitative and qualitative studies. *Journal of Physiotherapy* 63: 132–143.

Gatchel RJ & Okifuji A (2006) Evidence-based scientific data documenting the treatment and cost-effectiveness of comprehensive pain programs for chronic nonmalignant pain. *The Journal of Pain* 7: 779–793.

George SZ, Teyhen DS, Wu SS, Wright AC, Dugan JL, Yang G, Robinson ME & Childs JD (2009) Psychosocial education improves low back pain beliefs: results from a cluster randomized clinical trial (NCT00373009) in a primary prevention setting. *European Spine Journal* 18: 1050–1058.

Gibbs V (2011) An investigation into the challenges facing the future provision of continuing professional development for allied health professionals in a changing healthcare environment. *Radiography* 17: 152–157.

Grilo AM, Santos MC, Rita JS & Gomes AI (2014) Assessment of nursing students and nurses' orientation towards patient-centeredness. *Nurse Education Today* 34: 35–39.

Hadjistavropoulos T, Herr K, Turk DC, Fine PG, Dworkin RH, Helme R, Jackson K, Parmelee PA, Rudy TE, Lynn Beattie B, Chibnall JT, Craig KD, Ferrell B, Ferrell B, Fillingim RB, Gagliese L, Gallagher R, Gibson SJ, Harrison EL, Katz B, Keefe FJ, Lieber SJ, Lussier D, Schmader KE, Tait RC, Weiner DK & Williams J (2007) An interdisciplinary expert consensus statement on assessment of pain in older persons. *The Clinical Journal of Pain* 23: S1–43.

Haidet P, Dains JE, Paterniti DA, Chang T, Tseng E & Rogers JC (2001) Medical students' attitudes toward patient-centered care and standardized patients' perceptions of humanism: a link between attitudes and outcomes. *Academic Medicine* 76: S42–44.

Houben RMA, Ostelo RWJG, Vlaeyen JWS, Wolters PMJC, Peters ML & Stomp-Van Den Berg SG (2005) Health care providers' orientations towards common low back pain predict perceived harmfulness of physical activities and recommendations regarding return to normal activity. *European Journal of Pain* 9: 173–183.

Jeffrey JE & Foster NE (2012) A qualitative investigation of physical therapists' experiences and feelings of managing patients with nonspecific low back pain. *Physical Therapy* 92: 266–278.

Jones LE & Hush JM (2011) Pain education for physiotherapists: is it time for curriculum reform? *Journal of Physiotherapy* 57: 20720–20728.

Kaasalainen S, Zacharias R, Hill C, Wickson-Griffiths A, Hadjistavropoulos T & Herr K (2017) Advancing the pain management in older adults agenda forward through the development of key research and education priorities: A Canadian perspective *Canadian Journal of Pain* 1: 171–182.

Kamper SJ, Apeldoorn AT, Chiarotto A, Smeets RJ, Ostelo RW, Guzman J & Van Tulder MW (2014) Multidisciplinary biopsychosocial rehabilitation for chronic low back pain *The Cochrane Database of Systematic Reviews* Cd000963.

Karp JF, Reynolds CF 3rd, Butters MA, Dew MA, Mazumdar S, Begley AE, Lenze E & Weiner DK (2006) The relationship between pain and mental flexibility in older adult pain clinic patients. *Pain Medicine* 7: 444–452.

Kim H-Y (2013) Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry & Endodontics* 38: 52–54.

Krupat E, Rosenkranz SL, Yeager CM, Barnard K, Putnam SM & Inui TS (2000) The practice orientations of physicians and patients: the effect of doctor–patient congruence on satisfaction. *Patient Education and Counseling* 39: 49–59.

Leveille SG, Jones RN, Kiely DK, Hausdorff JM, Shmerling RH, Guralnik JM, Kiel DP, Lipsitz LA & Bean JF (2009) Chronic musculoskeletal pain and the occurrence of falls in an older population. *JAMA* 302: 2214–2221.

Lourida I, Abbott RA, Rogers M, Lang IA, Stein K, Kent B & Thompson Coon J (2017) Dissemination and implementation research in dementia care: a systematic scoping review and evidence map. *BMC Geriatrics* 17: 147.

Madaus SM & Lim LS (2016) Teaching Pain Management in Interprofessional Medical Education: A Review of Three Portal of Geriatric Online Education Modules. *Journal of the American Geriatrics Society* 64: 2122–2125.

Main CJ & George SZ (2011) Psychologically informed practice for management of low back pain: Future directions in practice and research. *Physical Therapy* 91: 820–824.

Main CJ, Sowden G, Hill JC, Watson PJ & Hay EM (2012) Integrating physical and psychological approaches to treatment in low back pain: the development and content of the STarT Back trial's 'high-risk' intervention (StarT Back; ISRCTN 37113406) *Physiotherapy* 98: 110–116.

Masters KS (2013) Biopsychosocial Model In: Runehov ALC & Oviedo L (eds) *Encyclopedia of Sciences and Religions*. Dordrecht: Springer Netherlands.

Mays GP, Hogg RA, Castellanos-Cruz DM, Hoover AG & Fowler LC (2013) Public health research implementation and translation: Evidence from practice-based research networks. *American Journal of Preventive Medicine* 45: 752–762.

McCluskey A & Lovarini M (2005) Providing education on evidence-based practice improved knowledge but did not change behaviour: A before and after study. *BMC Medical Education* 5: 40.

McKenna H, Ashton S & Keeney S (2004) Barriers to evidence based practice in primary care: a review of the literature. *International Journal of Nursing Studies* 41: 369–378.

Melnyk BM, Fineout-Overholt E, Gallagher-Ford L & Kaplan L (2012) The state of evidence-based practice in US nurses: critical implications for nurse leaders and educators. *Journal of Nursing Administration* 42: 410–417.

Menant JC, Wong A, Sturnieks DL, Close JC, Delbaere K, Sachdev PS, Brodaty H & Lord SR (2013) Pain and anxiety mediate the relationship between dizziness and falls in older people. *Journal of the American Geriatrics Society* 61: 423–428.

Monaghan J, Fothergill M & Adams N (2016) A pain education programme for physiotherapists in clinical practice: a mixed methods feasibility study. *Physiotherapy* 102: e213–e214.

Nicholas MK, Asghari A, Blyth FM, Wood BM, Murray R, Mccabe R, Brnabic A, Beeston L, Corbett M, Sherrington C & Overton S (2017) Long-term outcomes from training in self-management of chronic pain in an elderly population: a randomized controlled trial. *Pain* 158: 86–95.

Nicholas MK, Asghari A, Corbett M, Smeets RJP, Wood BM, Overton S, Perry C, Tonkin LE & Beeston L (2012) Is adherence to pain self-management strategies associated with improved pain, depression and disability in those with disabling chronic pain? *European Journal of Pain* 16: 93–104.

Nicholas MK & Blyth FM (2016) Are self-management strategies effective in chronic pain treatment? *Pain Management* 6: 75–88.

Oslund S, Robinson RC, Clark TC, Garofalo JP, Behnk P, Walker B, Walker KE, Gatchel RJ, Mahaney M & Noe CE (2009) Long-term effectiveness of a comprehensive pain management program: strengthening the case for interdisciplinary care. *Proceedings* (Baylor University Medical Center) 22: 211–214.

Ostelo RW, Stomp-Van Den Berb SG, Vlaeyen JW, Wolters PM & De Vet HC (2003) Health care provider's attitudes and beliefs towards chronic low back pain: the development of a questionnaire. *Manual Therapy* 8: 214-222.

Overmeer T, Boersma K, Denison E & Linton SJ (2011) Does teaching physical therapists to deliver a biopsychosocial treatment program result in better patient outcomes? A randomized controlled trial. *Physical Therapy* 91: 804–819.

Overmeer T, Boersma K, Main CJ & Linton SJ (2009) Do physical therapists change their beliefs, attitudes, knowledge, skills and behaviour after a biopsychosocially orientated university course? Journal of Evaluation in Clinical Practice 15: 724–732.

International Association for the Study of Pain (2018) Pain in older persons. Accessed 28 February 2018. https://www.iasp-pain.org/GlobalYear/PaininOlderPersons.

Porter S (2017) Psychologically-informed physiotherapy : embedding psychosocial perspectives within psychologically-informed physiotherapy. Oxford, Edinburgh Elsevier.

Qaseem A, Wilt TJ, Mclean RM & Forciea MA (2017) Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain: A Clinical Practice Guideline From the American College of Physicians. *Annals of Internal Medicine* 166, 514–530.

Ramaswamy R, Leipzig RM, Howe CL, Sauvigne K, Usiak C & Soriano RP (2015) The Portal of Geriatrics Online Education: A 21st-Century Resource for Teaching. *Geriatrics Journal of the American Geriatrics Society* 63: 335–340.

Reid MC, Eccleston C & Pillemer K (2015) Management of chronic pain in older adults. *British Medical Journal*: 350.

Rochman DL, Sheehan MJ & Kulich RJ (2013) Evaluation of a pain curriculum for occupational therapists: experiences from a master's-level graduate program over six years. *Disability and Rehabilitation* 35: 1933–1940.

Ross EF & Haidet P (2011) Attitudes of physical therapy students toward patient-centered care, before and after a course in psychosocial aspects of care. *Patient Education and Counseling* 85: 529–532.

Rudy TE, Weiner DK, Lieber SJ, Slaboda J & Boston JR (2007) The impact of chronic low back pain on older adults: a comparative study of patients and controls. *Pain* 131: 293–301.

Schofield P (2018) The Assessment of Pain in Older People: UK National Guidelines. *Age and Ageing,* 47: i1–i22.

Sharpe L, Mcdonald S, Correia H, Raue PJ, Meade T, Nicholas M & Arean P (2017) Pain severity predicts depressive symptoms over and above individual illnesses and multimorbidity in older adults. *BMC Psychiatry* 17: 166.

Shaw WS, Woiszwillo MJ & Krupat E (2012) Further validation of the Patient-Practitioner Orientation Scale (PPOS) from recorded visits for back pain. *Patient Education and Counseling* 89: 288–291.

Stubbs B, Binnekade T, Eggermont L, Sepehry AA, Patchay S & Schofield P (2014) Pain and the risk for falls in community-dwelling older adults: systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation* 95: 175–187.e9.

Synnott A, O'Keeffe M, Bunzli S, Dankaerts W, O'sullivan P & O'Sullivan K (2015) Physiotherapists may stigmatise or feel unprepared to treat people with low back pain and psychosocial factors that influence recovery: a systematic review. *Journal of Physiotherapy* 61: 68–76.

Teodorczuk A, Mukaetova-Ladinska E, Corbett S & Welfare M (2013) Reconceptualizing models of delirium education: findings of a Grounded Theory study. *International Psychogeriatrics* 25: 645–655.

Teodorczuk A, Welfare M, Corbett S & Mukaetova-Ladinska E (2009) Education, hospital staff and the confused older patient. *Age and Ageing* 38: 252–253.

Thomas E, Mottram S, Peat G, Wilkie R & Croft P (2007) The effect of age on the onset of pain interference in a general population of older adults: prospective findings from the North Staffordshire Osteoarthritis Project (NorStOP). *Pain* 129: 21–27.

Thompson K, Milligan J, Johnson M & Briggs M (2016) Pain education in professional health courses – a scoping review of standards, protocols and frameworks. *Physiotherapy* 102: e37–e38.

Townsend OC, Kerkvliet LJ, Bruce KB, Rome DJ, Hooten WM, Luedtke AC & Hodgson EJ (2008) A longitudinal study of the efficacy of a comprehensive pain rehabilitation program with opioid withdrawal: Comparison of treatment outcomes based on opioid use status at admission. *Pain* 140: 177–189.

Tsang A, Von Korff M, Lee S, Alonso J, Karam E, Angermeyer MC, Borges GLG, Bromet EJ, De Girolamo G, De Graaf R, Gureje O, Lepine J-P, Haro JM, Levinson D, Oakley Browne MA, Posada-Villa J, Seedat S & Watanabe M (2008) Common Chronic Pain Conditions in Developed and Developing Countries: Gender and Age Differences and Comorbidity With Depression-Anxiety Disorders. *Journal of Pain* 9: 883–891.

Ung A, Salamonson Y, Hu W & Gallego G (2015) Assessing knowledge, perceptions and attitudes to pain management among medical and nursing students: a review of the literature. *British Journal of Pain* 10: 8–21.

Health Education in Practice: Journal of Research for Professional Learning

Vol. 1 | No. 1 | 2018

Copyright is held by the authors with the first publication rights granted to the journal. Conditions of sharing are defined by the Creative Commons License Attribution-ShareAlike-NonCommercial 4.0 International

Citation: Eisner J (2018) The Hybrid Theatre: An interview with Professor Paul Bannon. *Health Education in Practice: Journal for Professional Learning* 1(1): 69–72

Education-in-Practice article

The Hybrid Theatre: An interview with Professor Paul Bannon

Jamaica Eisner[1]

Abstract

The Hybrid Theatre at Sydney Imaging, the University of Sydney, is a state-of-the-art imaging facility that is the first of its kind to be dedicated solely to research and training. Professor Bannon, Deputy Director of the Hybrid Theatre, described this new facility. He emphasised the collaborative potential of the space for innovation in research and training to prepare the health workforce for both current and emerging technologies. The theatre uses the latest Siemens technology.

Keywords: future technologies, workforce education, interdisciplinary research, collaboration

[1] Health Education in Training Institute (HETI),

Corresponding author: Jamaica Eisner, Building 13, Gladesville Hospital, Gladesville NSW 2111, jamaica.eisner@health.nsw.gov.au

Sydney Imaging's flagship Hybrid Theatre at the University of Sydney has some of the most advanced imaging systems currently available, such as the Siemens ARTIS pheno system. I spoke to Professor Paul Bannon about his role in the theatre and the opportunities it affords for innovation in research and training. By combining the latest technologies with a mindset that prioritises research, the theatre has drawn collaboration from people in robotics to health. The theatre stands apart due to its potential to create developments in the future that we cannot yet envisage. The space also provides the opportunity for the health workforce to become familiar with the latest technologies, ensuring a full education in the capabilities of current and emerging technologies.

ET: What is your role in the theatre?

PB: I am Academic Director for the Hybrid Theatre, one of the three major components of Sydney Imaging at the University of Sydney. Sydney Imaging comes under the bigger structure of Core Research facilities.

ET: What is a hybrid theatre?

PB: The hybrid theatre that we have at Sydney is the theatre of the future, although that's not to say that we will all be doing everything in a hybrid theatre of this level. In this setting, we're able to train people not only in what they need to know now, but in what they will need to know in the future – and that's for surgery or any other interventional work.

In terms of the research aspects, it opens up an enormous field of being able to do things. The research aspect of the theatre is really wiping the slate clean and working out what's possible. I think that's the most exciting part, because it allows us to develop techniques to do things that have either never been done before, or to do things in different ways.

To give you an example of that, a really clear one, the imaging system integrates directly with the robotics. So we can go from an image taken, or a scan taken, on the table which can then inform the robotics system intuitively to take and perform a procedure you've directed it to do. You can then go further and start developing a robotics system to make its own decisions. Industrial robotics systems, or artificial intelligence systems, are not really making their own decisions, they're making decisions according to algorithms that we have created for them. Turning industrial robotics into medical robotics is very exciting and is only possible in a place like the Hybrid Theatre. To summarise, it allows us to advance what we do now and it allows us to find out what we can do better in different ways.

ET: What does a day at the theatre encompass?

PB: A day in the life of the Hybrid Theatre is broken up into two main areas of research and training. And they will be the two great uses for it. We are supporting internal researchers and external researchers, as well as industry, to use the technologies available and to develop training programs. If you are going to train people in what we're doing in hybrid situations now, you need a hybrid theatre to train in. And we are very keen to train people in the next generation of technologies. The surgeons and interventional physicians of the future need somewhere to train, not only in the current technology, but also in the newer technology – and that's what the facility provides. It can develop newer techniques that we're not doing currently.

Figure 1. Operating the ARTIS pheno C-Arm in Sydney Imaging's Hybrid Theatre

ET: You mentioned training programs earlier, could you elaborate on that?

PB: We're developing programs, starting with training people on the very basics of orientation around a high-end hybrid theatre. We're beginning to run courses on orienting people within the hybrid theatre of the future – training them on the use, the safety issues, on what the capacity of the system will be for research. Think about the medical students – they are coming down to the theatre to see what they will actually have to understand as the next generation of doctors. Our facility is very open to discussing tours, but also to organising instructional courses. We're just going through the process of putting those together as soon as possible.

We're very interested in the next stage in doing imaging of people where we can look at neuronal connectivity and how we learn. We're

looking at functional MRI (Magnetic Resonance Imaging) scans as well as the underlying defect or abnormalities with mental health studies such as depression, as well as what you expect us to look at after surgery and strokes, and how we can help to treat people. But we are very interested in all applications – it doesn't have to be medical.

As a teacher or a trainer, I've been heavily involved in the Royal Australasian College of Surgeons, as well as the Australian & New Zealand Society of Cardiac & Thoracic Surgeons. The training array for surgeons at the moment depends on what is done now, it has no capacity, really, to teach people what we expect to do in the next five or ten years. Or even to teach what they will be expected to do as young surgeons. If you have a site where you can introduce them to those concepts and techniques, and develop techniques in conjunction with the current training paradigm, then you'll have young surgeons who are better prepared for the job.

ET: Where do you see the theatre going in the future? What next?

PB: I was asked recently what I think this theatre can do, and the true answer is that nobody knows exactly. When we purchased this, Siemens recognised what we were doing, so they gave us high-end technology instead of the current technology. This was only the fourth system in the world. It's the only one solely for research and training. So we don't actually know what we can do. We do have the addition of a robotics system and the potential for getting those two to work together.

I've already been approached by nanoscience to look at nanorobotics systems. We're already talking about what we're developing and looking at scaling it down into another paradigm, if you like. Into developing things we can't even possibly imagine right now.

For more information about The Hybrid Theatre at The University of Sydney, visit their website,

https://sydney.edu.au/research/facilities/sydney-imaging/the-hybrid-theatre.html

---

Conflict of interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article

Acknowledgements

I would like to thank Dr Peter Stubbs for his assistance in the interview process.