Knowledge translation intervention to improve evidence-based practice behaviour of allied health professionals: A cluster randomised controlled trial and 2-year follow-up study

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Knowledge Translation Intervention to Improve Evidence-Based Practice Behaviour of Allied Health Professionals

A cluster randomised controlled trial and 2-year follow-up study

Lanie Campbell
Bachelor of Applied Science Speech Pathology (1991)

A thesis submitted for the degree of Doctor of Philosophy at

University of Notre Dame Australia
November 2013
**Declaration**

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text.

The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. No part of my thesis has been submitted to qualify for another award.

____________________  _______________
Signature                  Date
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Miles, Finn, Henry and Dudley – you have kept me grounded and helped me remember what is important. Thanks for your belief in me and for coming on this adventure with me.
Abstract

Background: It is difficult to foster the use of research findings among allied health professionals (AHPs). Tailored, multifaceted knowledge translation (KT) strategies are now recommended but are resource intensive to implement. Employers need effective KT solutions, but little is known about: (a) the impact and viability of multifaceted KT strategies using an online KT tool, (b) their immediate and longer-term effectiveness with AHPs, and (c) their effect on evidence-based practice (EBP) decision-making behaviour. The aim of this project was to measure the effectiveness of a multifaceted KT intervention including a customised KT tool, to change EBP behaviour, knowledge and attitudes of AHPs over an 8-week period and at 2-years.

Methods: The first study was an evaluator-blinded, cluster randomised controlled trial (RCT) conducted in a community-based cerebral palsy service. AHPs (135 physiotherapists, occupational therapists, speech pathologists, psychologists and social workers) from 4 regions were cluster randomized (n = 4), to either the KT intervention group (n = 73) or the control group (n = 62), using computer-generated random numbers, concealed in opaque envelopes, by an independent officer. The KT intervention included a 3-day skills training workshop and workplace support to redress barriers (paid EBP time, mentoring, system changes and access to an online research synthesis tool). Primary RCT outcome (self- and peer-rated EBP behaviour) was measured using the Goal Attainment Scale (individual level). Secondary RCT outcomes (knowledge and attitudes) were measured using exams and the Evidence Based Practice Attitude Scale.

The second study was a follow-up study 2-years after the completion of the RCT using an online survey. The survey included: (a) questions based on Goal Attainment Scale, and (b) questions relating to the utilisation and usefulness of an evidence alert system.
**Results**  RCT - the intervention group’s primary outcome scores improved relative to the control group, however when clustering was taken into account, the findings were non-significant: self-rated EBP behaviour [effect size 4.97; 95% confidence interval (CI)-10.47, 20.41; p = 0.52]; peer-rated EBP behaviour (effect size 5.86; 95% CI-17.77, 29.50; p = 0.62). Statistically significant improvements in EBP knowledge were detected (effect size 2.97; 95% CI 1.97, 3.97; p < 0.0001). Change in EBP attitudes was not statistically significant. Two-year follow-up study - AHPs’ KT strategy GAS T-scores improved (GAS T-score change from RCT to 2-years = 29.58; 95%CI 12.66, 46.52; p = 0.02).

**Conclusions** The two studies suggest meaningful gains in EBP behaviour, with consistent GAS peer-ratings and self-ratings in the RCT, along with an overall increase in GAS T-scores in the 2-year follow-up study. This cannot be stated with certainty however, due to methodological issues due to pragmatic constraints. The large variability in behaviour observed between clusters suggests barrier assessments and subsequent KT interventions may need to target subgroups within an organisation.
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<td>allied health professional</td>
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<td>CI</td>
<td>confidence interval</td>
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<td>EAS</td>
<td>evidence alert system</td>
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<td>EBM</td>
<td>evidence-based medicine</td>
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<td>EBP</td>
<td>evidence-based practice</td>
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<td>EBPAS</td>
<td>evidence-based practice attitude scale</td>
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<td>GAS</td>
<td>goal attainment scaling</td>
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<td>ICC</td>
<td>intra-cluster correlation co-efficient</td>
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<td>KT</td>
<td>knowledge translation</td>
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<td>KTA</td>
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<td>NEAF</td>
<td>national ethics application form</td>
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<td>OTseeker</td>
<td>occupational therapy systematic evaluation of evidence</td>
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<td>PEDro</td>
<td>physiotherapy evidence database</td>
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<tr>
<td>RCT</td>
<td>randomised controlled trial</td>
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<td>sd</td>
<td>standard deviation</td>
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<td>SpeechBITE</td>
<td>speech pathology database for best interventions and treatment efficacy</td>
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CHAPTER 1
INTRODUCTION

Overview

The focus of this doctoral research programme was to measure whether the evidence-based practice (EBP) behaviours of allied health professionals (AHPs) working with people who have cerebral palsy in a community-based organisation could be changed using knowledge translation (KT) techniques. This chapter introduces the topic by providing:

1) Background information about EBP and KT
2) Background information about cerebral palsy
3) Background information about AHPs’ role in cerebral palsy treatment
4) Statement of the problem and rationale for the studies
5) Research aims and questions
6) Overview of the thesis contents.

Background

Evidence-based practice involves using the best available research evidence to inform clinical decisions. Although there is strong support for EBP, there is a significant gap between what research evidence suggests and what health professionals do in most areas of healthcare.\(^1\) The reason this gap exists is complex as there are many factors that may hinder or facilitate evidence from becoming a part of everyday practice.\(^2\) There is a growing body of research that seeks to understand and measure the best strategies to change health professionals’ behaviour, and therefore narrow the research-practice gap known as knowledge translation.\(^3\) The ultimate purpose of KT is to increase the use of evidence-based interventions to optimise clinical outcomes. KT strategies include face-to-face workshops,\(^4\) mentoring,\(^5\) clinical guidelines or a combination of strategies known as multifaceted KT
strategies. Systematic review literature suggests that most KT strategies lead to small–moderate changes in EBP behaviour. A KT strategy that is based on a strong theoretical model and designed to overcome context specific barriers is most likely to induce behaviour change. There are unique challenges in the field of cerebral palsy that need careful consideration prior to designing a KT strategy.

AHPs play a key role in assessing and treating people with cerebral palsy. The AHPs discussed throughout this thesis are physiotherapists, occupational therapists, speech pathologists, psychologists and social workers. Although AHPs endorse EBP, lack of time, lack searching and research appraisal skills, and lack of access to databases are barriers to new knowledge being translated in a timely and efficient way.

**Statement of the problem**

Survey data suggest that the research–practice gap exists in the field of cerebral palsy despite quality research being available. In addition to the barriers mentioned above, AHPs working with people with cerebral palsy face specific EBP challenges including complex clinical decision-making due to the complicated nature of cerebral palsy, and the rapid expansion of the cerebral palsy evidence base in the last two decades, making it hard for clinicians to keep up to date. For example, a MEDLINE search for cerebral palsy studies during 2012 retrieved 887 articles, compared to 407 studies in 2002, and 218 studies in 1992.

The most common strategy chosen to influence AHPs EBP behaviour to date has been teaching searching and critical appraisal skills. This technique however, may not be feasible longer-term given the ever increasing volume of published literature. Additionally, research evaluating the effectiveness of teaching critical appraisal skills does not lead to an improvement in EBP behaviour. Leaders in the knowledge translation field therefore recommend that future KT strategies should pursue the development of
evidence-based information resources (such as research summaries) that are embedded into health professionals’ workflow. The idea here is that, evidence embedded in workflow will prompt adoption and thus is easier and less time-consuming to use than strategies that necessitate an interruption in workflow that involves skilled and time-consuming searching.

Despite this, no studies with AHPs have investigated the effectiveness of KT strategies that have revolved around the development of evidence-based information resources. More broadly, the KT evidence base in the allied health professions is scant. There have been no RCTs measuring the effectiveness of KT strategies that have: (1) included a wide range of AHPs, (2) been done in the field of cerebral palsy, or (3) measured a wide range of EBP behaviours.

**Research aims and methods**

The aim of this research was to measure the effectiveness of a KT strategy (that centred around an evidence-based information resource) to change AHPs’ EBP behaviour. The secondary aims were to measure the effect of the KT strategy on EBP knowledge and attitudes. We conducted a cluster randomised controlled trial (RCT) in 2009 with follow-up study 2-years later to test the effectiveness of the KT strategy. The KT strategy was based on a theoretical model called the Knowledge-to-Action (KTA) process and was developed after a comprehensive, informal barriers/facilitators assessment. Barriers identified were: lack of time, skill and knowledge, restricted access to databases, negative attitudes towards EBP and evidence not always being clinically relevant (see Table 4 for details). The KT strategy therefore included an online evidence-based information resource that summarised cerebral palsy research, called the Evidence Alert System (EAS); a 3-day workshop; paid protected EBP time; mentoring; and mandatory use of outcome measures, included in client documentation. The following research questions were formulated to address these aims.
Chapter 1 – Introduction

Research questions

Over an 8-week period does a multifaceted KT strategy

- improve AHPs EBP behaviour
- improve AHPs EBP attitudes
- improve AHPs EBP knowledge
- lead to increased use of the EAS?

And further, does a multifaceted KT strategy improve AHPs EBP behaviour over a 2-year period?

The RCT findings have been accepted for publication in the peer-reviewed journal, Implementation Science, which is the leading journal on KT. A copy of the article proofs can be found in Appendix 9.

Thesis outline

This doctoral thesis presents a cluster RCT and 2-year follow-up study seeking to answer the above 5 research questions. It is presented in the following order.

**Chapter 1 – Introduction**

Chapter 1 introduces the thesis topic by providing background information and the rationale for the studies. This is followed by research aims, an overview of the methods used, and an outline of the thesis.

**Chapter 2 – Literature Review**

Chapter 2 provides an overview of the theoretical and empirical background of EBP and KT. The key theories that the studies were based upon are highlighted along with an overview of KT strategies and KT research in the allied health professions. The chapter finishes with a detailed rationale for conducting the RCT and 2-year follow-up study.
Chapter 3 – Randomised Controlled Trial Methods
Chapter 3 describes the steps that were undertaken to address the hypotheses and aims. The reporting of the RCT methods comply with the CONSORT statement\(^\text{17}\) for cluster RCTs. The theoretical framework and development of the KT strategy are described in detail, applying the literature summarised in Chapter 2 to the specific context of the RCT.

Chapter 4 – Randomised Controlled Trial Results
Chapter 4 presents a statistical analysis of the data obtained from the RCT. Participant flow through the study and results for the primary and secondary outcomes are detailed.

Chapter 5 – 2-year Follow-up Study Methods
Chapter 5 begins by describing the relationship between the RCT and the follow-up study, and the flow of participants throughout the 2-year period. The survey methods and process undertaken to address the hypotheses and research questions are detailed.

Chapter 6 – 2-year Follow-up Study Results
Chapter 6 presents the survey results from the follow-up study according the study hypotheses. Interpretation of these results is provided in Chapter 7.

Chapter 7 – Discussion
Chapter 7 provides interpretation and implications of the RCT and follow-up study, and describes how these studies have contributed to the KT evidence base. Strengths and limitations of each study are detailed. The chapter finishes by providing recommendations for organisations wanting to implement KT strategies, and future research directions.
CHAPTER 2
LITERATURE REVIEW

Overview

This chapter reviews the published literature and has six components:

1) Definition of EBP and KT
2) Summary of the theories and models underpinning EBP behaviour change
3) Consideration of the barriers to EBP use
4) Summary of the effectiveness of KT strategies to change behaviour
5) Ways to measure EBP behaviour
6) Rationale for the research.

There were a number of systematic reviews available related to knowledge translation and as a result, this chapter provides a broad overview of the available literature, rather than being a systematic review itself.

Evidence-based practice

The term ‘evidence-based practice’ is more commonly used than ‘evidence-based medicine’ (EBM) in the allied health professions. EBP has its roots in EBM, and the terms are often used interchangeably.\textsuperscript{18,19} This section will therefore begin with a definition and history of EBM however, the term EBP will be used from the Section \textit{EBP in the allied health professions} onwards.

Definition of evidence-based medicine

Evidence-based medicine is the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual clients. The practice of EBM means integrating individual clinical expertise with the best available external clinical evidence from systematic research”.\textsuperscript{20}
Chapter 2 – Literature Review

Figure 1 illustrates the integration of clinical expertise, client values and the best evidence into the decision-making process for client care.

![The EBM Triad](image)

**Figure 1: The evidence-based medicine triad**
Source: Florida State University, College of Medicine.  

**History of evidence-based medicine**

The philosophy of EBM dates back to the 19th century; however, Gordon Guyatt first used the term ‘evidence-based medicine’ in 1992 for the JAMA user guides.\(^{10,21}\) These guides were designed to integrate research findings into bedside clinical decision-making. Inclusion of research papers in discussing client care was integrated into the ward round system at McMaster teaching hospitals in the early 1990s.\(^{10}\) By the late 1990s information technology had improved and Sackett and Straus\(^{22}\) described the usefulness of an “evidence cart” used on ward rounds at John Radcliffe Hospital in Oxford. It is now almost 20 years on and EBM has become accepted as best practice with few practitioners debating the need to base clinical decisions on the best available evidence.\(^{13,23-25}\) In some ways, the focus has changed from whether research should be included in clinical decision-making to the ways that this can best occur. At a fundamental level EBM has changed the way in which health professionals approach clinical questions and has changed the landscape of our health care system.
“Perhaps one of the most important contributions of EBM has been to drive us from ‘do this do that’ medicine to the justification of ‘why to do this or that’”.26

**Why use EBM?**

There is little doubt that EBM has become the new paradigm in health care, as Sackett et al.20 suggested it would. Although there is widespread support of EBM in the Australian health-care system, there are researchers and health professionals who maintain that our health-care system should not rely on the principles of EBM.27 The need to use EBM in our health-care setting is however driven by compelling medical ethics. First, there is an ethical obligation to do no harm by providing clients with treatment options that research suggests will be most likely to work.28 Second, with increasing demands on our health-care system, policy makers need to ensure that funding is allocated to effective treatments that have a strong evidence base, and that funds are not directed to those that have been proven to be ineffective.2,29-32 Physicians, nursing staff, AHPs, managers and policy makers ethically must therefore embrace EBM.33

**EBP in the allied health professions**

The term ‘evidence-based practice’ was coined to accommodate the wide range of services that AHPs provide (apart from medical interventions). Considering its origins in hospital-based medicine, there has been ongoing discussion in the literature about how the allied health professions can appropriately apply the principles of EBP to their professions.33-36 Some authors question whether the conceptual and philosophical framework is suitable for the allied health professions, however most AHPs are supportive of the underlying principles.34,37-39 The way in which each professional group interprets and applies EBP varies greatly.10,25 This is due in part to the fact that each profession has unique EBP implementation challenges. For example, Reilly40 noted that in speech pathology literature, there are few RCTs — the gold standard for measuring effectiveness. This is particularly
true in sub-specialties where the client groups are often heterogeneous and case series design is often a more realistic methodology even though it is considered a lower level of evidence.\textsuperscript{36,39} Reilly\textsuperscript{40} argued that rather than being a reason not to engage with EBP, it is simply a challenge to researchers (to produce the highest quality evidence possible), clinicians (to access the highest quality evidence and use valid outcome measures) and professional bodies (to educate and create clinical guidelines).

**The research–practice gap**

The implementation of research findings into practice are often haphazard and delayed.\textsuperscript{1,37,41,42} This problem is referred to as the research-to-practice gap\textsuperscript{43} or the gap between “what is known” and “what is currently done”.\textsuperscript{2} For example, two areas of medicine where the research–practice gap has been quantified are hypertension management and respiratory care. Each year, 68,000 deaths from hypertension in the USA have been deemed preventable.\textsuperscript{44} Furthermore, people with hypertension only received 64.7% of the optimal care recommended by national and hospital guidelines. Mularski et al.\textsuperscript{44} examined the medical records of 260 asthma clients and 169 clients with obstructive lung disease. Alarmingly, asthma clients received only 53.5% of recommended care, and clients with obstructive lung disease only 58% of recommended care when the quality of care provided was compared to national evidence-based guidelines.

The research–practice gap is worldwide. Widespread variation exists in the use of non-steroidal anti-inflammatory drugs in Europe, the United States and Canada,\textsuperscript{45} despite clear, consistent guidelines regarding their best use.\textsuperscript{46,47} The research–practice gap also exists in allied health such as speech pathology,\textsuperscript{15,40,48} physiotherapy\textsuperscript{9,42,49} and occupational therapy.\textsuperscript{50}

The need to redress the research–practice gap has given rise to a growing body of research focusing on the processes of how to move research findings
into clinical care as quickly, accurately and sustainably as possible. This new research field is most commonly known as knowledge translation.

**Knowledge translation**

As strategies to narrow the research–practice gap have evolved and changed, so too has the terminology used to describe this field. In Europe the terms implementation science and research utilisation have been used, whereas in the United States knowledge transfer, dissemination and uptake have been more commonly used. The term knowledge translation originated in Canada and is now more widely used. The Canadian Institutes of Health Research (the federal agency that funds health research) described KT as “a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve Canadians’ health, provide more effective health services and products, and strengthen the health care system”. KT ultimately aims to improve client outcomes via smoothing the transition of EBP into clinical practice. This process is achieved by strategies such as continuing medical education, organisational change and guideline implementation.

The term knowledge translation will be used from this point forward to describe a range of activities, including research utilisation, innovation diffusion, knowledge transfer, research implementation, research uptake and evidence-based decision-making. The term also suggests a dynamic, two-way process as opposed to a top-down, one-way process.

**Theories and models underpinning knowledge translation**

KT theories are grounded in theories of behaviour change. The theoretical underpinnings of KT are important as they can assist to test, modify and inform whether change is possible, and highlight the complexities of attempting to induce change. Literature suggests that theoretical
perspectives should be carefully considered prior to developing an educational intervention as different theoretical assumptions lead to different intervention strategies.\textsuperscript{53} Theoretical models and approaches are often selected from potentially biased beliefs about human behaviour and change.\textsuperscript{54} A systematic approach to considering underlying theoretical assumptions can reduce this bias and generate testable hypotheses.

However, authors rarely document the role of theory underpinning their KT strategies,\textsuperscript{55} making it difficult for others to replicate successful strategies and build evidence supporting or refuting the effectiveness of strategies aligned with a given theory. KT theories and models draw on theories in other areas such as public health,\textsuperscript{56} organisational change,\textsuperscript{57} business\textsuperscript{58} and mental health.\textsuperscript{59} The body of theoretical literature regarding KT is extensive and complex,\textsuperscript{60} however there are some helpful models that synthesise a range of theories and have been adapted for KT in health settings.

A theoretical-informed approach offers the advantage of a generalizable framework to: inform the development and delivery of interventions; guide evaluation; explore moderating factors and causal mechanisms; and facilitate a better understanding of the generalizability and replicability of implementation interventions.\textsuperscript{16}

**Conceptual KT models**

A number of KT models have been proposed, that incorporate key theories suited for various target settings and professional groups.\textsuperscript{51,52,61-63}

**Knowledge-to-Action process**

The Knowledge-to-Action (KTA) process model selected for the present study provides a guideline on how to implement change.\textsuperscript{64} The KTA model\textsuperscript{51} was developed to assist research implementation and is particularly well suited for community-based organisations such as the study site in the present study. It provides a comprehensive and cohesive basis to underpin the multifaceted KT strategy described in this thesis.
Chapter 2 – Literature Review

Graham et al.\textsuperscript{51} reviewed thirty-one planned-action theories resulting in the development of the KTA process. As outlined in Figure 2 the KTA process has two distinct but interacting components:

1) Knowledge creation is at the centre of the model and includes 3 phases, knowledge inquiry, knowledge synthesis and knowledge tools/products. It involves gathering and synthesising research information leading to tools that are to be used by health professionals. The inverted cone shape represents the distillation of knowledge tailored to the knowledge users. The circle of arrows represents the ongoing process of knowledge creation.

2) Action cycle, which has 7 steps and revolves around activities that may be needed for knowledge application. The phases are not linear but rather dynamic and interact with the knowledge-creation funnel at the centre of the model.

\textbf{Figure 2: Knowledge-to-Action (KTA) process}

Used with permission: Graham et al., 2006\textsuperscript{51}.
Chapter 2 – Literature Review

5S model for seeking evidence-based information

Central to the KTA process is knowledge creation, involving inquiry, synthesis and tools. This process involves tailoring knowledge (evidence-based information) for a group of users and is a cornerstone to any KT strategy.\[^{13,65}\] Evidence-based information may take the form of systematic reviews, research summaries, clinical guidelines or clinical decision-making tools.

Straus and Haynes\[^{13}\] described a hierarchy of evidence-based information resources in the 5S model (Figure 3). The model is depicted by a pyramid with 5 levels (studies, syntheses, synopses, summaries, systems) that aim to be increasingly readable, reliable and relevant as one moves up the pyramid. Straus and Haynes recommend a top-down approach for answering clinical questions. According to the top-down approach, when faced with a clinical question, an AHP would ideally be able to rely on clinical decision-making support systems linked to client data and the process of care (Level 5). In the absence of decision support systems, the next level of evidence-based information resource would be sought (customised summaries), and so on. Levels 4 and 5 could also be referred to as KT tools. Figure 3 provides examples of evidence-based information resources available to AHPs at each level of the pyramid.

The top-down approach to answering clinical questions is in stark contrast to the bottom-up approach commonly used in EBP education of AHPs.\[^{66}\] An example of the bottom-up approach is workshops that aim to teach AHPs the stepwise process of EBP involving: (1) developing an answerable clinical question, (2) searching for relevant information using databases and journals, (3) appraising articles, and (4) synthesising the information gathered in appraised articles. The reasons for EBP being taught the bottom-up approach may partly be due to (1) the lack of availability of information resources such as evidence summaries and clinical decision support systems, (2) the fact that AHPs report that they lack confidence and skill in searching and appraising...
research, so education has aimed to overcome this barrier, and (3) for historical reasons. This approach may have been more feasible in the past, when there were vastly smaller numbers of original studies to synthesise.

A description of each level of the 5S pyramid and its application to AHPs follows.

**Level 1 – Studies**
Level 1 encompasses all primary studies. Within primary studies, there is a hierarchy of the levels of evidence (refer to Appendix 1 – Oxford Levels of Evidence) relating to the evidence quality of published research. AHPs report that they lack confidence and skill in appraising primary studies.\(^7\,^9\)

**Level 2 – Syntheses**
Level 2 includes primary studies that are synthesised in the form of systematic reviews answering a specific clinical question. AHPs prefer systematic reviews over individual studies,\(^6\,^7\) however they still report that
systematic reviews do not always answer their clinical questions.\textsuperscript{13,68} Additionally, systematic review literature may not always be interpreted correctly.\textsuperscript{69} A study conducted by Lai and colleagues\textsuperscript{70} found that only 30\% of health professionals were able to correctly identify both the direction of effect and strength of recommendation from four systematic reviews.

**Level 3 – Synopses**

Synopses provide brief critical appraisal of studies or topic areas. In the allied health professions the available synopses are discipline-based. These include free sites such as PEDro (The Physiotherapy Evidence Database, http://www.pedro.org), OTseeker (Occupational Therapy Systematic Evaluation of Evidence, http://www.otseeker.com) and SpeechBITE (Speech Pathology Database for Best Interventions and Treatment Efficacy, http://www.speechbite.com). Each of these resources includes searchable databases (according to keyword or topic area) and contains the highest level of research evidence available. All RCTs on the sites are rated for evidence quality (e.g. PEDro resource uses the PEDro scale, SpeechBITE uses a modified version of PEDro called the PEDro-P). These are invaluable resources, however it is outside their scope to provide clinically useful summaries and recommendation for specific interventions within every diagnostic area. There are no known resources at this level (level 3, synopses) that pertain specifically to cerebral palsy.

**Level 4 – Summaries**

Summaries collate the information from the lower levels (studies, syntheses and synopses). This would normally be presented according to a clinical problem such as upper limb spasticity. There are no resources of summaries known in the allied health professions. Examples in medicine include Dynamed (www.ebscohost.com/dynamed) and ClinicalEvidence (http://clinicalevidence.bmj.com/ceweb/index.jsp). A key component of our study involved the development of a level 4 evidence-based information resource (the EAS).
**Level 5 – Systems**

At this level, electronic health information/clinical data would be linked to relevant evidence and incorporate a decision-making aid. These are rare (and none exist for AHPs or are related to cerebral palsy) so the top-down approach recommended normally begins at Level 4.13,65,71,72

**KT theories**

KT is primarily concerned with changing what health professionals do, with the ultimate aim of improving outcomes for clients and the wider community. The KTA process51 defines a number of stages in the KT process. Each phase in this process draws on different theoretical assumptions as the factors and outcomes for each stage are different.73 For this reason it is necessary to consider the many theories in more detail as each theory has relevance for different aspects of the stages of the KT strategy in the present study.53,73 The focus of the KT strategy may be directed towards any combination of the following: the individual health professional, the social context, the organisational context, or the political context.73 The theories below are summarised according to those domains and are all relevant to the KT strategies applied in this doctoral program of research. Table 4 describes the way in which each theory influenced the choice of KT strategies in the present study.

**Theories related to individual professionals**

**Educational theories**

Educational approaches include adult learning theories such as problem-based learning74 and learning styles. The underlying assumption of these theories is that change occurs as a result of an individual striving for competence. The emphasis is therefore less on cognitive or rational processes and more on the motivation to learn.54 These theories are relevant for consideration in the action cycle component of the KTA process. The resultant interventions and educational strategies include strategies such as small group interactive learning, problem-based learning and a bottom-up
approach. These strategies are often used in medical education\textsuperscript{74} such as workshops and seminars. There is low-level evidence for the effectiveness of strategies such as problem-based learning, self-directed learning and portfolio learning\textsuperscript{75} and the impact of educational theory remains largely untested.\textsuperscript{54,76} These theories suggest that a KT strategy needs to focus on: attitudes, the idea that motivation to change is crucial to success, and that people change as a result of real problems experienced.

**Cognitive theories**

Cognitive theories focus on human rational processes and the choices that result. These theories consider the provision of accurate, convincing information as a cornerstone to change.\textsuperscript{54,73} The other types of theories that are applied in epidemiological approaches include theories that describe how rational thinking may be prevented. The purpose of preventing rational thinking to elicit behaviour change rests on the belief that people make choices based on context and previous experience or to fit the individual’s beliefs, needs and behaviour.\textsuperscript{53} The theory of confirmation bias is an example, where the human tendency to look for evidence that supports the hypotheses we personally favour and to consciously, or unconsciously disregard the ones that we disagree with.\textsuperscript{77} Although there is limited evidence that this group of theories is effective in isolation, it is possible that they have contributed to the push towards high quality, accurate and rigorous research summaries. The strategies that have evolved from these theories include evidence-based guidelines, journals, and other research dissemination channels.

**Motivational theories**

Motivation theories have been primarily used in the field of health promotion and suggest that implementation of change needs to focus on health professionals’ attitudes, perceptions and intentions.\textsuperscript{78} According to these theories, EBP behaviour such as using outcome measures, are determined by the AHPs attitudes and perceived positive or negative
consequences from using outcome measures. Strategies resulting from motivation theory can be incorporated into different stages of the KT strategy. For example, convincing managers, AHPs and clinical seniors of the importance of using outcome measures and developing a positive culture may increase desired performance.

**Theories related to social context**

**Communication theories**
Communication theories regard effective communication as being important to change an individual’s attitudes, beliefs and behaviour. Both the credibility of the source of the message and the recipient are key factors in the extent to which an individual may change. Repetition of information, novelty, adaptability to an individual’s context, personal relevance and perceived validity are factors dictating the relative success of a communication interaction.\(^\text{79}\) Communication theories can be applied to many phases of a KT strategy. Ensuring that messages are clear, presented multiple times, are clinically relevant and from a credible source may maximise the success of a KT strategy.

**Social learning theory**
Bandura developed social cognitive theory as an extension to classic behavioural theories in the mid-1980s. Social learning theory suggests that there is a dynamic interplay between personal behaviour and context-related factors that reinforce and inhibit behaviour change in an ongoing way.\(^\text{80}\) Important context-related factors include modelling and reinforcement. For example, certain behaviour may be reinforced by material rewards, or non-material rewards such as positive feedback from a clinical senior. Encouraging senior staff to model EBP behaviour, such as checking levels of evidence for client treatment, or overtly using an outcome measure is an example of modelling.
Many of the strategies that have strong evidence to increase EBP use (even if to a small extent) are related to social learning theory. Examples include outreach visits, opinion leaders, and small group support — all of which draw on social networks within an organisation. Strong professional relationships are a key feature of these theories and often the strategies that result focus on creating and strengthening networks within an organisation or professional body.

**Social network theories**

Diffusion and innovation theory considered the networks between individuals, and how these effect dissemination of information and ideas. Network characteristics that influence knowledge dissemination include the strength of the networks between individuals, the proportion of the group who have already adopted an innovation and the differences between individuals within the network. Network theories recommend studying local team interaction and influencing identified opinion leaders (who may or may not be senior staff).

**Professional development theories**

Professional development theories are about development of specific disciplines and professionals, and how this influences behaviour. Health professionals have expertise in their fields, and their identities and loyalties are often tied to their professions as opposed to their workplaces. Professional bodies can influence behaviour by introducing clinical guidelines and standards, and by discipline specific training that they offer both at undergraduate and postgraduate levels. KT strategies that are consistent with a professional group are more likely to be successful. Tapping into professional pride and loyalty can be effective tools to inducing behaviour change.

**Leadership theories**

Effective leaders, either formal or informal can promote or block a new innovation. Leaders may be managers, however they can also be respected
for their professional expertise, or may be respected socially within a network. Different types of leaders are useful for bringing about different types of change. For KT strategies to be successful, education and ‘buy-in’ from formal and informal leaders can be key factors.

Theories related to organisational context

Organisational theories do not focus on the individual but rather on changing the environment to be conducive for change. Key theories relevant to the present study are summarised below.

**Marketing approaches**

Marketing approaches assume that different groups have different needs, goals and barriers to success. The focus is on producing an attractive product or message that will appeal to the target group and spread it through numerous channels (for example media, or networks). These approaches lead to KT strategies based on needs assessment and emphasise a number of channels for dissemination, using a stepwise approach. Elements of the marketing approach have been incorporated into a number of recent conceptual models of change such as the KTA process that assesses individual and group needs — continually reviewing, and adapting the intervention to produce a highly customised intervention.

**Total quality management theory**

Total quality management (TQM) theory emphasises the importance of continuous improvement in multidisciplinary processes to improve client care. Substandard client care is viewed as a failure of the systems and processes rather than the individual. Important aspects of this theory include identifying leaders, building strong teams and influencing workplace culture. TQM is a client centred, whole organisation model encouraging periods of implementing change followed by periods of relative stability. TQM encourages a long-term view of changing health professionals’ behaviours, and elements of this theory can be the backbone of a KT strategy.
Organisational learning theory
Organisational learning theory says that the interaction between the organisation and the individual is looked at as a symbiotic relationship, where the individual and organisation learn from one another. Ortenblad\textsuperscript{88} described the process as individuals learning as agents for an organisation and that knowledge then being stored as embedded routines in the organisation. Organisational change theory says that in order for an organisation to learn and change, the individuals within the context must be willing to change. The concept of a climate for optimal learning is therefore important in organisational theory\textsuperscript{54} and includes leadership theories.\textsuperscript{89}

Theories related to political context
Theories included in this category are reimbursement theories, contracting theories, and accreditation and licensing theories. Reimbursement theories focus on how health care is paid for at a political level. A number of reviews have looked at the effect of different payment methods for client care with mixed results.\textsuperscript{90} Although an organisation rarely has direct control over these aspects it can still be important to consider them in the whole system when developing an intervention for changing behaviour.

Summary of theories
Critical analyses and syntheses of KT theories\textsuperscript{43,53,91} reported that there is little evidence to suggest the superiority of one theory over another, it is in fact the choice of KT strategies tailored to overcome the local barriers that matter. Some types of theories lend themselves towards specific contexts and interventions. For example, cognitive theories are particularly useful to change simple, routine behaviour in highly structured environments (for example, hand washing).\textsuperscript{53} Organisational theories are often useful in chronic care, or community settings. To assist in planning effective KT strategies, there are a number of conceptual models combining elements of different theories. Table 1 summarises potential application of the different theories to
the present study context. The KTA process combines aspects of a number of the theories summarised above. When using the KTA process the combination of theories and extent to which one theory is utilised over another, depends on what the specific barriers to EBP are in the given setting. Using a theory informed approach, in response to context specific barriers results in a highly tailored, targeted intervention.

Table 1: Underpinning theories of KT

<table>
<thead>
<tr>
<th>Theory</th>
<th>Potential interventions for the present KT study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual professionals</strong></td>
<td></td>
</tr>
<tr>
<td>Educational</td>
<td>Involve AHPs in the problem-solving process during workshops, mentoring sessions; provide mentoring to set customised personal goals.</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Provide accurate, easily accessible research evidence on cerebral palsy assessment and treatment.</td>
</tr>
<tr>
<td>Motivational</td>
<td>Convince AHPs of the need for EBP in cerebral palsy treatment via workshop, mentoring and online KT tool.</td>
</tr>
<tr>
<td><strong>Social context</strong></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Credible staff to facilitate EBP workshops and provide mentoring; cohesive, convincing EBP message based on the online KT tool.</td>
</tr>
<tr>
<td>Social learning</td>
<td>Ensure that clinical seniors and managers are modelling target EBP behaviours (management training, strategic planning, system changes to support this).</td>
</tr>
<tr>
<td>Professional development</td>
<td>Use professional pride to motivate EBP use within specific disciplines via workshop, mentoring, clinical seniors and specific interventions targeting professional groups on online KT tool.</td>
</tr>
<tr>
<td>Leadership</td>
<td>Management ‘buy-in’ and endorsement from executive to support changes throughout the organisation.</td>
</tr>
<tr>
<td><strong>Organisational context</strong></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>Produce an appealing product and disseminate the information regarding the product in a variety of ways (intranet, workshop, supervision, written guidelines, memos and reminders).</td>
</tr>
<tr>
<td>Total quality management</td>
<td>Reorganise client documentation and work processes to support clinical decision-making; introduce a standard, organisation-wide process and monitor/adapt as necessary.</td>
</tr>
<tr>
<td>Organisational learning</td>
<td>Ensure that all staff members at every level of the organisation have access to current cerebral palsy evidence and ensure exchange of information via team meetings and mentoring sessions.</td>
</tr>
<tr>
<td><strong>Political and economic context</strong></td>
<td></td>
</tr>
<tr>
<td>Reimbursement</td>
<td>Provide paid, protected time for AHPs to engage in EBP activities.</td>
</tr>
<tr>
<td>Contracting</td>
<td>Modify job descriptions to reflect engagement in EBP activities.</td>
</tr>
</tbody>
</table>
Barriers to EBP implementation

Real and perceived barriers hinder evidence being embedded into clinical practice. A complex interplay exists between the numerous barriers and this will affect whether or not a health professional uses research evidence in their planning, decision-making and treatment. Literature suggests that clinicians have a high level of awareness of EBP value and believe that clinical decision-making should be evidence-based. The process of identifying and categorising barriers is considered to be an important phase in developing tailored, effective interventions.

Seven categories of barriers to KT have been proposed in systematic review literature.  

- Support/resource barriers
  - Time
  - Resource barriers
  - Support
  - Costs/funding issues
- Cognitive/behavioural barriers
  - Knowledge
  - Awareness
  - Skill/expertise
- Attitudinal/rational-emotive barriers
  - Efficacy/perceived competence
  - Accurate self-assessment
- Clinical Practice guidelines/evidence barriers
  - Clinical usefulness
  - Evidence/disagree content
  - Access
- Client barriers
  - Client characteristics/factors
  - Client adherences
- Health care professional/physician barriers
  - Characteristics
  - Professional boundaries
Gender

Inertia

- System/process barriers
  - Organisational
  - System
  - Workload
  - Referral process.

Literature about barriers to EBP use has research methodology limitations. The studies are mostly survey design, few are based on any existing framework or model, and they are mostly closed questions. Nevertheless, stronger methodology is emerging, reflecting the complexity of KT, and reported barriers in the existing literature can assist in developing effective interventions.

**Support/resource barriers**

Lack of time is the most commonly perceived barrier concerning the use of EBP for occupational therapists, speech pathologists, physiotherapists and physicians. Lack of time may have multiple dimensions, and can overlap with issues related to workplace support for paid EBP time and extra time being required due to low skill level. Some studies report that the issue is lack of paid, protected time for EBP — only 8% of participants in one study having paid time for EBP activities. Speech pathologists in one survey reported that they did not have enough time to read literature and implement research findings. Perceived lack of time can also be a proxy for other issues such as difficultly synthesising information or lack of clear, quality evidence summaries. A study by Young and Ward using a questionnaire along with in-depth interviews with GPs, found that the completed questionnaire indicated that lack of time was the major barrier to EBP use. However when the participants were interviewed, it became clear that lack of time was obscuring more complex barriers. The barriers that emerged were lack of skill to quickly understand and synthesise
research studies and a lack of time to carefully consider a client’s demands for non-evidence-based treatments. This finding may be specific to physicians and it is difficult to say whether this study can be generalised to other professional groups.

**Cognitive/behavioural barriers**

Most health professionals report inadequate skill levels to search, critically appraise, synthesise and implement research findings as a significant barrier to EBP implementation. This is not surprising as performing these tasks requires a complex skill set, even for academic researchers, and is borne out in research studies that have found educating health professionals to perform these skills increases knowledge but does not carry over to changing practice. The degree to which lack of knowledge and skill level are barriers may be related to professional discipline, and varies between studies.

**Attitudinal/rational-emotive barriers**

Attitudes to EBP are often considered to be a key barrier — a finding that is supported by systematic reviews in the literature. The most recent systematic review looking at individual determinants to research use in allied health found that overcoming negative attitudes toward EBP may be important in reducing the research–practice gap. Attitudes to EBP and feelings of confidence appear to vary according to profession and background. This may be important in a workplace whose staff have vastly different levels of background training and are a mix of professional groups. Different strategies for different professions and level of training may be necessary to induce change.

**Clinical practice guideline/evidence barriers**

Although Internet and library access have been major barriers to EBP use in the past, access to computers and Internet resources have increased significantly in recent years. Ten years ago, Internet access rates for doctors...
in developed countries were reported to be between 13–17% \textsuperscript{100,101} compared to 60–70% in 2008.\textsuperscript{110} There seems to be considerable differences in ease of access between rural and metropolitan areas\textsuperscript{111,112} and between different organisations and professional groups.\textsuperscript{113} Internet access available at key clinical decision-making points in time could be a factor in whether or not client care is evidence-based. Mixed results from studies may reflect the trend towards better access to the Internet in health care — some studies reported adequate access to research\textsuperscript{93,96} and other studies reported access as a barrier to EBP\textsuperscript{8}.

Internet access does not however imply full access to journals, systematic reviews, evidence-based guidelines or research summaries. Even when an AHP does have adequate access, the enormous quantity of research studies that are published\textsuperscript{114-116} means that searching and appraising research evidence can be time consuming. Additionally, AHPs believe that research does not always translate well into practice\textsuperscript{50,99} and that methodological inadequacies are a barrier.\textsuperscript{7,8,40} Despite recent efforts by professional organisations to customise research evidence with tools such as PEDro for physiotherapists,\textsuperscript{117} there is consensus that it is still difficult to access reliable, easy to read summaries.\textsuperscript{9,40,97,100,118}

**Client barriers**

Clients are now far more likely to research their own health-care needs using the Internet.\textsuperscript{119} This has changed the client-health professional relationship in terms of EBP since clients have access to a range of health information not all of which is reliable.\textsuperscript{120} This may result in increased use of research in practice, however it can potentially create an EBP barrier. Some studies have reported that client demands for treatments that may not be evidence-based are a barrier to EBP use.\textsuperscript{101} Family-centred practice is considered best practice in disability organisations, and the interplay between family-centred practice and EBP is complex.\textsuperscript{121} This complexity is also reflected in the EBP triad (see
Figure 1) with client preferences representing one of the three overlapping circles.

**Health care professional/physician barriers**

Qualification and years of experience are known barriers to EBP use.\(^9\) Seniority of qualification is positively correlated with self-reported uptake of research findings.\(^9,10\) In other words, health professionals with a university degree are more likely than colleagues without a degree to use research evidence in their clinical decision-making. Conversely, more years of clinical experience are negatively correlated with EBP use.\(^50,9\) Health professionals who have been practicing for more than 10 years report lower skill, confidence and implementation rates.\(^10\) McEvoy et al.\(^10\) reported that males had a higher level of confidence towards EBP than females, and females had more positive attitudes towards EBP than males. The other professional boundary reported in the literature is health professionals’ belief that searching and synthesising research findings should not be a part of their professional role.\(^9,10\) This view is supported by Vallino-Napoli\(^4\) who encouraged academics to publish systematic reviews on topics of high clinical relevance. The present study sought to address this barrier by creating customised topic summaries based on the best available research evidence, avoiding the need for AHPs to search for research evidence.

**System/process barriers**

Workplace factors such as systems and organisational culture can significantly facilitate or hinder EBP use,\(^23,12\) and are commonly reported barriers.\(^1\) Even if quality evidence is available, systems and processes in a workplace may halt the dissemination of research evidence and prevent it from flowing on to benefit clients. In fact, lack of organisational, system, referral, work or team structures or processes have been reported in 62 studies as the primary reason that guidelines and evidence are not implemented.\(^12\) Specific barriers may include information not being
available quickly, at the right time\textsuperscript{23} or systems may not be in place to remind and support evidence-based clinical decisions.\textsuperscript{106}

The culture of an organisation and interactions between staff can either foster EBP use or inhibit it.\textsuperscript{124} A recent systematic review found that medical residents cited lack of support from other staff members along with a belief that there was a low possibility for change, as major barrier to EBP use.\textsuperscript{104} More experienced staff have lower rates of EBP use\textsuperscript{50,96} and may intentionally or unintentionally be hindering implementation of research evidence.

**Strategies aiming to change health professionals’ EBP behaviour**

The following information presents findings from literature that included a systematic review and meta-analysis reporting on the effectiveness of key KT strategies in the following order: face-to-face educational meetings, retrieval of electronic health information, printed educational materials, outreach visits, opinion leaders, audit and feedback, journal clubs, financial incentives, organisational change, tailored interventions, and multifaceted interventions. Table 2 provides a summary of information presented in the research literature along with estimated effect sizes.

It is difficult to compare the relative effect of one KT strategy to another due to research studies having different outcomes, varying degrees of methodological quality of studies, and poorly reported interventions.\textsuperscript{16,65} That said, the effect sizes for many interventions have been calculated by meta-analysis (see Table 2) and reveal similar absolute median effect sizes across KT strategies.\textsuperscript{65} This could indicate that the choice of KT components is not important but rather that any intervention is better than no intervention. Grimshaw and colleagues\textsuperscript{125} however do not believe this is the case as many KT studies are cluster RCTs, powered to detect a change of 10 to 20 per cent improvement, and similarity of absolute effect sizes is therefore unsurprising; and although the absolute median effect sizes are
remarkably similar, the range is wide both within, and between KT strategies. For example, on-screen point of care computerised reminders had a range in improvement scores of +0.8% to +18.8%. This may suggest that different KT strategies are indeed more effective than others, and the relative effectiveness may be related to whether or not a KT strategy is tailored to overcome a specific barrier. Considering the similarity in effect sizes between KT strategies along with an incomplete evidence base, current research literature is unable to provide information about whether one KT strategies is more effective than another. Personnel involved in planning KT strategies therefore need to design the intervention in response to a barriers assessment and use professional judgement.

Details about the barriers assessment and KT strategies that were chosen in response to the specific EBP barriers in our context are in Chapter 3.

**Face-to-face educational meetings**

Face-to-face educational meetings include lectures, courses and workshops in various formats with the number of participants, intensity, frequency and content being highly variable in nature. Educational meetings have been heavily adopted as a strategy for improving health professionals EBP knowledge, awareness and skills. Systematic review evidence showed that educational meetings have small to moderate benefit on improving health professionals’ EBP behaviour. The lessons learned from this review of 81 EBP implementation intervention trials were that a mixture of didactic and interactive styles were more effective than either alone, and targeting simple behaviour led to the greatest behaviour change and the magnitude of the resultant change in behaviour lessened as the target behaviour increased in complexity. The authors concluded that although educational meetings had an effect on behaviour (either alone or in combination with other approaches), educational meetings alone were unlikely to change complex EBP behaviour. Educational interventions are most likely to be effective as a component of a multifaceted KT strategy, targeting context specific EBP
barriers (such as lack of knowledge), although relying solely on face-to-face education is unlikely to result in complex behaviour change.

The multifaceted KT strategy in the RCT in this thesis included a 3-day face-to-face workshop.

**Retrieval of electronic health information**

Electronic health information refers to using a computer with an Internet connection to read research articles, evidence-based guidelines or other material. Health professionals need to have access to health information to ensure that their clinical decision-making is evidence based. A systematic review examining whether retrieval of electronic health information had an impact on practices or client care was inconclusive and recommended that further research be conducted. Only two studies met eligibility and “neither study found evidence that electronic retrieval of health-care information changed professional behaviour; one study found that knowledge was improved”. A RCT detected no difference between paper-based and electronic forms but suggested that “other factors should be considered when choosing the method of presentation of guidelines, such as information-seeking time, ease of use during the consultation, ability to update, production costs, and the physicians’ own preferences”.

The present study utilised intranet-based clinical algorithms or pathways, and a highly customised evidence-based information resource (as one part of a multifaceted strategy) in an attempt to change AHPs’ EBP behaviour.

**Printed educational materials**

Educational materials refer to printed, hard copy information and may include clinical guidelines, position papers and peer-reviewed journals. Educational materials are one of the most frequently used passive dissemination strategies. Systematic review evidence suggested that printed educational materials can change health professionals’ behaviour, with active strategies being more effective than passive strategies.
are many factors that influence whether printed educational materials may lead to a change in knowledge, attitudes of behaviour of health professionals. These include clinical applicability of the information, the health professional’s perceptions about the importance of the information and readiness to adopt and apply new information.\textsuperscript{130}

The present study chose to provide educational material with active support, integrated into the health professional’s workflow.

**Outreach visits (mentoring)**

Educational outreach visits (also referred to as academic detailing) are defined as a face-to-face meeting where trained people provide health professionals with information and strategies about how they can change their practice.\textsuperscript{5} Systematic review data suggested that outreach visits consistently lead to small effects on prescribing patterns whereas the effect sizes for changes other aspects of professional practice are more variable.\textsuperscript{5} The small to moderate effect size was considered to be similar to other types of continuing medical education on behaviour change, for example, audit and feedback or educational outreach visits.

A form of outreach visits (referred to as mentoring in our study) was employed as a KT strategy in the present study.

**Opinion leaders**

Opinion leaders are defined in systematic review literature as people who are influential, likeable and respected amongst colleagues. Opinion leaders may hold a senior management or clinical role, however any health professional may be an informal opinion leader. According to systematic review data opinion leaders may promote EBP, although the best techniques to utilise opinion leaders remain unclear.\textsuperscript{131} Studies included in the systematic reviews rarely described the role of the opinion leader, and studies varied in terms of type of intervention and outcomes measured.
Opinion leaders were chosen to facilitate the 3-day workshops that formed a part of the KT strategy in the RCT reported in this thesis.

**Audit and feedback**

Audit and feedback involve providing direct feedback to health professionals regarding their practice as compared to peers and evidence-based guidelines. Audit and feedback can have a small to moderate effect on behaviour. The change is likely to be greater when the baseline practices are low and feedback is more intensive. It is unclear whether certain audit and feedback techniques are more effective than others. Audit and feedback are potentially useful tools in monitoring professional performance and may be helpful in planning when efforts to change practice are needed.

Audit and feedback were not used as a KT strategy in the RCT in our study, due to pragmatic constraints of data collection across a wide geographical area.

**Journal clubs**

Journal clubs are defined as “a group of individuals who meet regularly to discuss the clinical applicability of articles in current medical journals”. Although journal clubs are a frequently used interactive research dissemination tool there is no firm evidence supporting or refuting their effectiveness to change clinical decision making. A systematic review was unable to pool results due to heterogeneity of interventions. That said, some studies report improvements in health professionals’ reading behaviour and increased confidence in critically appraising research; however there is no evidence suggesting that this reading behaviour translates into EBP behaviour change.

Journal clubs were therefore not included in our multifaceted KT strategy.
Financial Incentives

Financial incentives are “an extrinsic source of motivation and exist when an individual can expect monetary transfer which is made conditional on acting in a particular way”. In health care, financial incentives can be used to stimulate behaviour change thus facilitating the transfer or evidence into practice. Systematic review data found that financial incentives may change behaviour, however the findings are difficult to generalise due to methodological shortcomings. Rigorous evaluation of the effect of an intervention including financial incentives is recommended, as the evidence supporting or refuting its effectiveness is limited.

In our RCT participants were provided with paid, protected time for EBP activities. This could be considered to be an indirect form of financial incentive.

Organisational change – strategic planning, management training

Organisational culture refers to shared characteristics (beliefs, values, routines, traditions) of those in the same social or organisational group. There is increasing emphasis placed on the importance of organisational culture to improve health-care performance. Although workplace culture may change as a flow-on effect from other KT strategies, no rigorous evidence exists to support interventions aimed directly at changing culture within an organisation. Even if change was induced, there is no evidence that links improvement in workplace culture to improved client outcomes.

In our study meetings with researchers, knowledge brokers, policy makers and managers were held in the year preceding the RCT and management training along with policy changes that formed part of the KT strategy.
Tailored interventions

Tailored interventions are defined as interventions that are developed following investigation into current practices and factors that may be blocking a new innovation. A recent systematic review conducted a meta-analysis of 26 studies that tailored interventions to prospectively identified barriers of change. The review found that tailored interventions were more likely to improve professional practice than no intervention or dissemination of guidelines.\textsuperscript{123} Although optimal methods for conducting barriers assessments and designing interventions remain unclear, tailoring interventions to overcome known barriers is increasingly considered to be an integral first step in a KT strategy. In our study a comprehensive assessment of barriers was done as a part of the RCT, and KT strategies were designed in response to the identified barriers. See Chapter 3 for details.

Multifaceted KT strategies

Multifaceted interventions involve “a combination of methods including two or more interventions”.\textsuperscript{137} There is no firm evidence that multifaceted strategies are more or less effective than KT strategies with only one component. Additionally, the effect size of more components in a multifaceted intervention does not seem to increase along with the number of components.\textsuperscript{138,139} It is however theoretically plausible that a multifaceted KT strategy designed in response to a thorough barriers assessment would be more effective than a single intervention.\textsuperscript{125} A systematic review (without meta-analysis) examining the benefits of multifaceted KT strategies amongst physiotherapists and occupational therapists concluded that active multifaceted KT strategies may lead to improved self-reported knowledge and EBP behaviour.\textsuperscript{6}

A multifaceted KT strategy was the chosen approach in the present study as a number of KT strategies were required to adequately address the identified EBP barriers. Chapter 3 provides more detail regarding the barriers assessment and selection of the components of the multifaceted KT strategy.
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Reference</th>
<th>Effect sizes – median absolute improvement (unless otherwise stated)</th>
<th>Number of studies/ individual participants</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face educational meetings – workshops, seminars, lectures, symposia</td>
<td>Forsetlund et al., 2009⁴ Flores-Mateo &amp; Argimon, 2007¹⁴⁰</td>
<td>6.0% (range 1.8% to 15.3%)</td>
<td>81 RCTs</td>
<td>Median absolute improvement similar to other KT strategies. Greater effect sizes with mixed interactive/didactic sessions, higher attendance and interactive sessions. Impact on more complex behaviours is less certain.</td>
</tr>
<tr>
<td>Retrieval of electronic health information including research articles, summaries</td>
<td>McGowan et al., 2009¹²⁶</td>
<td>Meta-analysis unable to be performed</td>
<td>2 RCTs</td>
<td>No improvement in practices in either study were detected.</td>
</tr>
<tr>
<td>Printed educational materials – research articles in journals, evidence-based guidelines</td>
<td>Farmer et al., 2008¹³⁰ Francke et al., 2008¹⁴¹ Giguère et al., 2012¹⁴²</td>
<td>4.3% (range -8.0% to +9.6%) for process outcomes (e.g. ordering x-rays, prescribing) Median absolute risk difference 0.13 compared to no treatment (range -0.16 to +0.36)</td>
<td>12 RCTs 11 nonrandomised studies 45 studies (14 RCTs and 31 time series)</td>
<td>No firm evidence supporting or refuting effectiveness of journal clubs.</td>
</tr>
<tr>
<td>Outreach visits (mentoring) – where trained</td>
<td>O’Brien et al., 2007⁸</td>
<td>Prescribing behaviour 4.8% (range 3.0% to 6.5%) Other behaviour 6.0% (range 3.6% to 16.0%)</td>
<td>17 RCTs</td>
<td>Effects on more complex behaviours not certain.</td>
</tr>
<tr>
<td>Journal clubs</td>
<td>Harris et al., 2011¹³⁴</td>
<td>No meta-analysis due to heterogeneity of interventions</td>
<td>18 studies (no RCTs)</td>
<td>No firm evidence supporting or refuting effectiveness of journal clubs.</td>
</tr>
<tr>
<td>Financial incentives</td>
<td>Flodgren et al., 2011⁹⁰</td>
<td>Meta-analysis unable to be performed</td>
<td>32 studies</td>
<td>Very low level evidence with serious methodological issues.</td>
</tr>
</tbody>
</table>
## Chapter 2 – Literature Review

### Intervention Reference Effect sizes – median absolute improvement (unless otherwise stated) Number of studies/ individual participants Comments

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Reference</th>
<th>Effect sizes</th>
<th>Number of studies/ individual participants</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational change</td>
<td>Parmelli et al., 2011&lt;sup&gt;135&lt;/sup&gt;</td>
<td>Meta-analysis unable to be performed</td>
<td>No studies met inclusion criteria</td>
<td>No evidence to support or refute the effectiveness of changing organisational culture.</td>
</tr>
<tr>
<td>Tailored interventions</td>
<td>Baker et al., 2010&lt;sup&gt;123&lt;/sup&gt; Cheater et al., 2005&lt;sup&gt;143&lt;/sup&gt;</td>
<td>Meta-regression (12 RCTs). Pooled odds ratio 1.52 (95% CI 1.27,1.82; p &lt; 0.001)</td>
<td>26 RCTs</td>
<td>More likely to improve professional practice than no intervention or dissemination of guidelines.</td>
</tr>
<tr>
<td>Reminders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Computer generated reminders delivered on paper</td>
<td>Arditi et al., 2012&lt;sup&gt;144&lt;/sup&gt;</td>
<td>7.0% (+3.9% to +16.4%)</td>
<td>32 RCTs</td>
<td>Two features associated with greater effect size were:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• providing space for a response on the form</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• providing an explanation for the content or advice.</td>
</tr>
<tr>
<td>(b) On-screen, point of care computerised reminders</td>
<td>Shojania et al., 2009&lt;sup&gt;145&lt;/sup&gt;</td>
<td>4.2% (+0.8% to +18.8%)</td>
<td>28 RCTs</td>
<td>Most studies have investigated effect on simple reminders. Impact on more complex systems, such as decision support for clinical decision making are less certain, with some studies showing no change.</td>
</tr>
<tr>
<td>Multifaceted interventions</td>
<td>Menon et al., 2009&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Meta-analysis not attempted</td>
<td>12 studies (4 RCTs)</td>
<td>Improvements in knowledge, skill and behaviour. No change in attitudes.</td>
</tr>
</tbody>
</table>
Knowledge translation in the allied health professions

The majority of KT research has occurred in the fields of medicine and nursing. A recent systematic review examining the effect of KT strategies on the allied health professions identified only five RCTs. Four of these were in physiotherapy and one in speech pathology. No RCTs were found in the fields of occupational therapy, social work or psychology. A description and findings of these studies summarised from the research literature are detailed in Table 3. A systematic review conducted by Menon and colleagues suggested that multifaceted KT strategies may change EBP behaviour. The more recent and comprehensive systematic review by Scott and colleagues however concluded that no clear inferences can be made about the effectiveness of KT strategies in the allied health professions due to low methodological quality, reporting bias and equivocal results. The majority of KT strategies relied solely on educational approaches (n = 23/32 included studies in the systematic review), a trend which is mirrored in nursing and medicine. Scott et al. suggested that for EBP behaviour to change, the KT intervention needs to be based on a solid theoretical framework, to target multiple levels (AHPs, decision makers), and to have significant resources to support the change.
Table 3: Evidence table – KT strategies in the allied health professions

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design</th>
<th>Area</th>
<th>Intervention (EPOC)</th>
<th>Specific intervention</th>
<th>Outcomes measured</th>
<th>Outcomes and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bekkering et al. (2005)(^{147})</td>
<td>RCT</td>
<td>Low back pain</td>
<td>1. Educational materials 2. Educational meetings</td>
<td>Multifaceted KT strategy – education, discussion, role playing, feedback and reminders</td>
<td>Adherence to guidelines measured by patient forms recording treatments. Number of treatments sessions, goals, interventions and patient education were recorded.</td>
<td>Moderate improvement adhering to guidelines</td>
</tr>
</tbody>
</table>
| Hoeijenbox et al. (2005)\(^{148}\) | RCT         | Low back pain       | 1. Educational materials 2. Educational meetings | Multifaceted KT strategy – education, discussion, role playing, feedback and reminders | Cost of care
Direct medical costs, productivity costs and quality of life were calculated. | Passive strategy more cost-effective than active strategy                              |
| Rebbeck et al (2006)\(^{149}\) | Cluster RCT | Acute whiplash      | 1. Educational meetings 2. Educational outreach visits 3. Educational materials | Multifaceted KT strategy – education by opinion leaders, 1-day workshop, educational materials (guidelines & algorithms) and 2-hr follow-up visit | Adherence to guidelines (self-report and file audit)
Knowledge of guidelines (exams)
Patient outcomes (Functional Rating Index)
Cost of care | Experimental group adhered to guidelines more (small–mod effect) & increased knowledge
No difference between groups for patient outcomes or cost of care |
<p>| Stevenson et al (2006)(^{150}) | Cluster RCT (2 clusters) | Low back pain       | 1. Educational meetings 2. Local opinion leaders | Educational meeting led by local opinion leader (5 hrs) | Treatments offered to clients. Data collected from a discharge summary where participants self-reported the various treatments that were offered | No significant differences between groups |</p>
<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design</th>
<th>Area</th>
<th>Intervention (EPOC)</th>
<th>Specific intervention</th>
<th>Outcomes measured</th>
<th>Outcomes and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennington et al (2005)15</td>
<td>Cluster RCT (17 clusters) 34 speech pathologists</td>
<td>Swallowing post-stroke</td>
<td>1. Educational meetings</td>
<td>Group A – 2.5 day workshop on critical appraisal compared to Group B – 5 day workshop on critical appraisal + change management</td>
<td>Adherence to clinical guidelines, and engagement in research activities via audit tool + file audit</td>
<td>Group B engaged in more research related activity, but 6 mths later no discernible difference between groups with regard to clinical practice was detected. Differences between departments was clear – advise to have local opinion leaders/more customised individualised approach</td>
</tr>
</tbody>
</table>
Measuring the outcomes of multifaceted KT strategies

Measuring outcomes of KT strategies is a complex, multidimensional process.\textsuperscript{151} In a multifaceted KT strategy, the measurement tools depend upon each target outcome. For example, measuring change in health professional behaviour, skill and knowledge, organisational responsiveness to change or client outcomes will each require different techniques.

Domains of evaluation

Shaneyfelt et al.\textsuperscript{152} conducted a systematic review and categorised evaluation domains into:

1) EBP knowledge
2) EBP skills
3) EBP attitudes
4) EBP behaviours
5) Client outcomes.

These categories overlap with Kirkpatrick’s\textsuperscript{153} four levels of training evaluation:

Level 1 – Reaction
- Satisfaction and opinions
- Often practical aspects, e.g. venue, food, basic course content

Level 2 – Learning, measuring changes in:
- Knowledge
- Skills
- Attitudes

Level 3 – Transfer
- Lasting behaviour change
- Did the change in knowledge, skills or attitudes carry over to another setting (work)
Level 4 - Effect

- Client outcomes
- Costs
- Organisational benefits.

Measurement of outcomes can occur at the client level, health professional level and organisational level.\textsuperscript{154} Although Shaneyfelt et al.\textsuperscript{152} found that there were some evaluation tools with strong psychometric properties, only 20\% of the studies included in the systematic review reported on reliability or validity of the instrument used.\textsuperscript{152} Additionally, these evaluation tools only measured knowledge, skill or satisfaction (Kirkpatrick Levels 1 and 2) and most others measured compliance to guidelines. Shaneyfelt et al.\textsuperscript{152} emphasise the need for future studies to use valid, reliable outcome measurement tools, ideally measuring how EBP skills are used in actual practice (Kirkpatrick Level 3). The present study aimed to measure change in behaviour, knowledge and attitudes.

**Behaviour**

Audit tools with proven validity and reliability were used by Straus et al.\textsuperscript{155} and Lucas et al.\textsuperscript{156} to measure EBP behaviour/practices (Kirkpatrick Level 3). These tools however, only measured a narrow domain of context specific EBP practice behaviour — rating of evidence levels supporting interventions by hospital doctors. There are no evaluation tools that comply with all of the following points:

1) Designed to measure EBP behaviour
2) Strong psychometric properties
3) Developed for AHPs
4) Flexible enough to be customised to specific contexts
5) Measure a broad range of EBP behaviour and domains.\textsuperscript{157}
For this reason a flexible, adaptable and individualised measurement tool was selected to measure change in practice behaviour.

**Goal attainment scale**

The measurement we undertook in this study was aimed at Kirkpatrick Levels 2, 3 and 4. Our primary aim was to change EBP behaviour. GAS is an individualised outcome measurement tool that measures individual progress towards pre-defined goals. These goals may pertain to client outcomes, service outcomes or health professional outcomes. Its most common use now is as an individualised tool to evaluate client outcomes, although it was initially developed to measure change in community mental health programs and has been used in a wide variety of areas. GAS has been used to evaluate the outcomes of educational programs, although it has not been tested for psychometric properties in these contexts. It is designed to evaluate whether pre-established goals have been attained. GAS measures change in a target behaviour using a 5-point ordinal scale describing 5 different potential outcomes. More detail about GAS is found in Chapter 3.

**Psychometric properties**

GAS was chosen as the primary outcome measurement tool for the following reasons:

1) Responsivity – GAS has established validity, reliability, and high responsivity to change, whereas systematic review evidence indicated that for nearly all valid and reliable EBP instruments, test responsivity is unknown

2) Tailoring – GAS is an individualised measure of change, and so progress towards any target behaviour (including health professional behaviours) could be validly, reliably and sensitively measured, including tailored EBP behaviours unique to the study site, such as notifications to the Cerebral Palsy Register

3) Comprehensive measurement – GAS is an individualised measure of change, and so we could comprehensively measure all desired EBP
behaviours, whereas systematic review evidence indicated that other psychometrically sound EBP instruments measure knowledge instead of behaviour, or are limited because they only measure one discrete aspect of EBP behaviour\textsuperscript{152,155,156,164,165}

4) Lack of gold standard tool – Accurate, flawless measurement of EBP behaviour is not yet established in the literature.\textsuperscript{166} Even though direct observation of EBP behaviour (such as simulated patients, video/audio recordings of practice) is perceived as methodologically preferable to indirect (proxy) reports of EBP behaviour (such as chart audit, patient report, self-report, or peer-report), systematic review evidence indicated that direct measures often fail validity testing.\textsuperscript{166} This could have introduced other flaws to our clinical trial. Moreover, collecting direct measures throughout NSW, being a state-wide service, would have introduced prohibitive trial costs (NSW’s landmass is 3.25 times larger than the United Kingdom, and is larger than California and New Mexico combined), when the cost-benefit of a potentially invalid measure is weighed up. Even though self-report proxy measures are an imperfect measure of actual behaviour,\textsuperscript{167} leading KT agencies, such as the Canadian Institutes of Health Research advocate for self-report because the process of self reflection plays a critical role in initiating behavioural changes within organisations.

In light of current EBP behaviour measurement limitations, GAS offered the best way forward since it was psychometrically sound, it comprehensively measured EBP behaviour, was practical across an entire state and could be tailored to the study site.

**Knowledge and skill**

Although there are EBP evaluation tools that measure knowledge and skill\textsuperscript{168,169}, we only needed to measure knowledge. A key component in our KT strategy was the development of an evidence-based resource that
summarised cerebral palsy research and this bypassed the need for EBP skills. We therefore developed an exam with correct/incorrect answers that was specific to the knowledge and skill base required for the participants.

**Attitudes**

**Evidence-based practice attitude scale**
The evidence-based practice attitude scale (EBPAS) is a tool developed by Gregory Aarons. Aarons developed this tool for mental health professionals working in community settings. It is has strong validity and reliability and has published normative data. Allied health professionals (working in mental health or social services) formed part of the normative sampling, however only social workers (40.7%) and psychologists (32%) were explicitly mentioned. The EBPAS has been used to measure change in EBP attitudes in other areas such as autism. The EBPAS was chosen in our RCT as a secondary outcome measurement. It is designed to measure change in attitudes towards EBP across four main domains:

1) Requirements for the use of EBP by government, management

2) Appeal (item examples: makes sense, intuitively appealing, colleagues like it)

3) Openness to change (item examples: would follow guidelines, research use is OK, like trying new things)

4) Divergence of EBP with usual practice (item examples: research not useful, clinical expertise more important than research).

**Gaps in the literature**

Although there is a growing body of research studying the effectiveness of KT strategies, there are still a number of knowledge gaps in the evidence base and these will now be described.
1. No RCTs with an evidence-based information resource as a key element of a KT strategy

Research has indicated that synthesising research in an evidence-based information resource (such as the EAS) should result in increased access. Gülmezoglu et al. conducted a cluster RCT with doctors, midwives and students working in obstetrics to measure the impact of a multifaceted intervention including an evidence-based information resource. Participants’ use of the evidence-based information resource increased, however the intervention did not affect the 10 target obstetric practices. There have been no RCTs to date using an evidence-based information resource as a key component of a KT strategy. This research program aims to fill this gap in literature by ensuring that the KT strategy is the result of careful design according to the KTA process, with ‘knowledge creation’ as a essential component. The result is a RCT that tests the effectiveness of a KT strategy centred around a highly customised information resource.

2. No studies involving AHPs have attempted to measure a wide range of EBP behaviour

The RCT and 2-year follow-up study aimed to measure a range of EBP behaviour considered to represent the activities of an evidence-based practitioner. Previous studies have either used self-developed measures or have only measured a narrow domain of EBP behaviour. Previous studies have targeted simple behaviour by either:

1) Measuring one specific intervention area, e.g. whiplash or low back pain.

2) Measuring more interventions, but only measuring adherence to guidelines, e.g. obstetrics, speech pathology.

This research program used a measurement tool with strong psychometric properties, and applied this tool to the study context with the aim of measuring the broader, more complex behaviours that lead to EBP.
3. **No RCTs sampling a range of professional groups**

The majority of KT research has involved physicians, with AHPs forming a much smaller portion.\(^{137}\) Multifaceted KT strategies have been tested using RCTs with speech pathologists,\(^{15}\) physiotherapists,\(^{147,150}\) however there are no RCTs sampling occupational therapists,\(^6\) social workers or psychologists. Both studies conducted as a part of this doctoral programme sampled speech pathologists, physiotherapists, occupational therapists, social workers and psychologists.

4. **No RCTs with AHPs that have used a strong KT theoretical framework**

Very few theories have been tested in robust research\(^{53}\) and those that have been tested have had mixed results. It is therefore recommended that a combination of different theoretical perspectives be considered to develop a sound plan.\(^2\) Interventions that are solidly based on theoretical frameworks or conceptual models are needed.\(^{43,53}\) This doctoral programme used the KTA process as a framework to develop the KT strategy. In accordance to the KTA process, a range of theories underpinned the choice of strategies employed (see Table 4).

**Rationale for the studies**

**Rationale for the randomised controlled trial**

The effect of a multifaceted KT strategy on a range of EBP behaviours, involving a number of AHP groups\(^6\) is yet to be quantified in a rigorous study. In the first study, an 8-week RCT was designed to evaluate the effectiveness of a multifaceted KT strategy comprising of a 3-day workshop, access to the EAS and policy changes (paid EBP time, mentoring, mandatory use of outcome measures and changes in documentation) to improve AHPs’ EBP behaviour. The secondary aims were to measure the effect on EBP attitudes and knowledge.
EBP behaviour, targeting a range of clinical behaviour across an array of intervention areas was sought in this study, and thus novel and unique approaches were required. In previous studies, components of KT strategies used with health practitioners have included workshops, mentoring, reminder systems, opinion leaders, outreach visits and journal clubs. The unique and key component of the present study was the EAS that summarised cerebral palsy research evidence with supporting clinical algorithms (decision-making flowcharts).

Rationale for the follow-up study

Some types of EBP behaviour may take time to develop,\textsuperscript{4,173} and behaviour change needs to be measured over a longer period to investigate the long-term intervention effectiveness. This may be especially true considering the types of organisational change initiatives that are a part of the KT strategy. For example, system changes to documenting client goals and mentoring are intervention areas that if they have an effect, may have an effect over the medium to long term. The second study, the 2-year follow-up study was therefore conducted to measure the long-term effectiveness of the KT strategy to change EBP behaviour.

Synopsis

This chapter provided background research literature related to EBP, KT and the allied health professions. Definitions of EBP and KT were provided along with a brief background and history of EBP. A range of theories and models that underpin EBP behaviour change were then described. The major barriers to EBP were detailed along with a summary of the effectiveness of a range of KT strategies. Tools measuring EBP knowledge, behaviour and attitudes were outlined and rationale for conducting the research studies was presented.

Chapter 3 details the methods for the cluster RCT that measured the effectiveness of a KT strategy aiming to change AHPs’ EBP behaviour.
CHAPTER 3
RANDOMISED CONTROLLED TRIAL
METHODS

Overview

This chapter presents the methods of a cluster RCT that investigated the effectiveness of a KT strategy with a range of AHPs by describing:

1) Aim and hypotheses
2) Trial design
3) Ethical approval
4) A description of the eligibility criteria and exclusion criteria for the study
5) Methods of blinding
6) Methods and rationale of cluster randomisation
7) Development and theoretical background of the KT intervention
8) The interventions that the KT intervention and control groups received
9) Details of the primary and secondary outcome measures
10) Procedures for the RCT
11) Information regarding data cleaning, sample size calculations and statistical analysis.

Aim and hypotheses

The primary aim of this study was to measure the effectiveness of a KT strategy to change EBP behaviours, knowledge and attitudes of AHPs. The following hypotheses were devised for testing.
Chapter 3 – Randomised Controlled Trial Methods

EBP behaviour

At the primary end-point:

1) Allied health professionals that participate in an 8-week KT strategy will have a behaviourally meaningful and statistically significantly higher self-reported EBP behaviours measured by GAS T-scores than the control group.

2) Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher peer-reported EBP behaviours measured by GAS T-scores than the control group.

3) Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher per person web hits on the EAS measured by web statistics, than the control group.

EBP knowledge

4) Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher EBP knowledge exam scores than the control group.

EBP attitudes

5) Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher EBP attitude scores on the EBPAS than the control group.

Trial design

A multi-site single-blinded, cluster RCT was conducted with AHPs at the Cerebral Palsy Alliance. RCTs are considered the gold standard design to determine whether a given intervention is effective. Figure 4 summarises the basic trial design.
Chapter 3 – Randomised Controlled Trial Methods

Figure 4: RCT trial design

Setting

Cerebral Palsy Alliance is a not-for-profit organisation providing a range of community-based interventions to people with cerebral palsy in New South Wales (NSW), Australia. NSW is the most populous state in Australia with approximately 7.25 million people (32% of Australia’s total population). Cerebral Palsy Alliance had 16 localities across NSW, organised into 4 geographically distinct regions where AHP services were provided. Each region had centralised management for the sites within its boundaries including clinical seniors, professional development activities and mentoring, and thus were considered natural cluster groupings. Regions were de-identified by assigning a number to each region to ensure confidentiality. The four regions will be referred to as cluster 1, cluster 2, cluster 3 and cluster 4 from this point onwards in this thesis. Staff members within these clusters provided direct client services including physiotherapy, speech pathology, occupational therapy, psychology and social work.
Ethics

The project was approved by the National Health and Medical Research Council Human Research Ethics Committee at Cerebral Palsy Alliance on NSW on 6 May 2009 (Approval number: 2009-05-01), and University of Notre Dame Ethics Committee on 9 September 2009 (see Appendix 2 for National Ethics Application). The study was registered with Australian New Zealand Clinical Trials Registry (ACTRN12611000529943) on 23 May 2011.

An adverse event log was not required because the intervention was educational in nature and therefore posed no risk.

Eligibility

Inclusion criteria for clusters were:
1) work sites of the study organisation where AHPs were employed
2) work sites where AHPs provided direct client services to people with cerebral palsy.

Exclusion criteria for clusters were:
1) worksites where direct client services were not provided, e.g. head office.

Inclusion criteria for participants within the clusters were:
1) qualified AHPs
2) employed at the study site
3) providers of direct clinical services to people with cerebral palsy and their families.

Exclusion criteria for participants within the clusters were:
1) managers (staff without any clinical caseload)
2) staff members without a formal allied health university qualification, such as project officers or welfare workers
3) staff who did not attend work on the days of the study intervention, e.g. annual leave taken.
Blinding

Blinding was judiciously applied wherever pragmatically possible, resulting in a single-blinded trial. This included: (1) independent evaluator-blinding to group allocation and phase of the trial when scoring outcome data, (2) partial participant and facilitator blinding to the specific EBP behaviour of interest to the investigators. Participants and workshop facilitators were clearly aware of the content of the workshops, however were not aware of which intervention (KT intervention or communication skills) was of specific interest to the researchers. Fidelity of the evaluator blinding was not formally investigated.

Although the RCT employed the gold standard design to measure a cause-effect relationship, pragmatic constraints inherent in any educational intervention prevented double-blinding.176-178

Randomisation

An independent officer not associated with the trial, used Microsoft Excel to generate random allocation numbers to create 4 opaque envelopes based upon simple randomisation without limitations.179 The independent officer randomly allocated the four geographically distinct clusters to either the KT intervention or control group using the opaque envelopes. Cluster randomisation according to the multiple worksites was chosen for two reasons. First that cluster randomisation reduced the risk of contamination that may have occurred if participants working at the same site had been randomised to different interventions. Second that the workshops were optimally suited to be delivered to whole clusters (for pragmatic and professional reasons). Cluster randomisation occurred before participants were recruited for pragmatic reasons, but group allocation notification was withheld from participants until all clusters were randomised.


## Intervention

### Assessment of barriers and facilitators

A comprehensive assessment of barriers and facilitators was done over a one-year period. This took the form of meetings between managers, policy makers, researchers, practicing senior clinicians and knowledge brokers; and observation of clinical staff. The barriers assessment, although comprehensive, was informal in nature. The barriers selected were determined by consensus between those involved in meetings throughout the year. As there is no firm evidence regarding the superiority of one KT strategy over another researchers and knowledge brokers jointly designed the KT strategy based on whether or not the barrier was modifiable by a pragmatically feasible intervention. Modifiable barriers included lack of skill, time, and knowledge. Partially modifiable or non-modifiable barriers were:

1. evidence that was considered not clinically relevant
2. staff who did not have access to full electronic databases
3. some staff had negative attitudes towards EBP.

Modifiable barriers, theoretical underpinnings and strategies for the KT strategy are detailed in Table 4. Details of how the components of our multifaceted intervention correspond to the KTA process are in Table 5.

### Development of multifaceted intervention

Strategic planning meetings were held every 6-weeks in the year leading up to the RCT and included researchers, knowledge brokers, policy makers and managers. Knowledge brokers were senior staff with allied health backgrounds (one per discipline employed in the most senior role for each discipline). Policy makers were the senior executive staff and managers, who were involved in direct management of AHPs in the organisation. Goals around EBP behaviours were set and strategies to achieve these goals were jointly selected based on barriers identified in the literature and assessment of the study site.
The EAS formed the basis of our KT strategy and was developed by research staff and knowledge brokers using freely available software (MediaWiki) (see Figure 5 and Appendix 3). Figure 5 outlines the workflow of the steps involved from the AHP’s inquiry to the information delivery. The EAS included succinct summaries of all the cerebral palsy research evidence about intervention, prognosis and outcome measurement. Intervention evidence was labeled using the traffic light system\(^{102,180}\) where each intervention was given a traffic light color with an actionable message attached. Green = ‘Go’ if high quality evidence supports the effectiveness of this intervention, Yellow = ‘measure’ where low quality or conflicting evidence supports the effectiveness of this intervention, therefore measure the outcomes of the intervention to ensure the goal is met, and RED = ‘stop’ where high quality evidence demonstrates intervention is ineffective or harmful, therefore do not use this approach. LC co-authored a journal paper that used the traffic light system as a KT tool to communicate systematic review finding for 63 cerebral palsy interventions.\(^{180}\) Decision-making algorithms with embedded evidence summaries were also available on the EAS. Each section of the EAS included abstracts of research articles, descriptions of the intervention/assessment and a hyperlink to the article.

**KT intervention group**

The KT intervention group received a KT strategy that included: (1) access to the EAS, (2) a 3-day workshop to receive user training, divided into 2 parts 8-weeks apart, and (3) policy/organisational changes designed to overcome EBP barriers (quarantined EBP time, mentoring, compulsory use of outcome measures and documentation changes including reminder systems) made available during the 8-week study period. The KT strategy was both at the cluster level and at the individual level. See Table 5 for details of intervention.
Figure 5: EAS infogram
Table 4: Theoretical basis and strategies to address modifiable barriers

<table>
<thead>
<tr>
<th>Barrier: Lack of confidence/skill searching, appraising and synthesizing research evidence</th>
<th>KT strategy</th>
<th>Underpinning theory or group of theories</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop</td>
<td>Problem-based learning, learning styles</td>
<td>Workshops used problem-based learning approach and a variety of approaches to ensure that different learning styles were catered to, maximizing the likelihood of increased confidence and skill levels.</td>
<td></td>
</tr>
<tr>
<td>EAS</td>
<td>Cognitive</td>
<td>Accurate, relevant research evidence on cerebral palsy assessment and treatment was provided via the EAS building skill by modelling synthesis and summary of treatment areas. The EAS bypassed the need for high-level appraisal skills.</td>
<td></td>
</tr>
<tr>
<td>Mentoring</td>
<td>Educational</td>
<td>AHPs were included in the problem solving process during mentoring sessions and aimed to increase confidence and build skill base.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Barrier: Lack of time</th>
<th>KT strategy</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS</td>
<td>Cognitive</td>
<td>The provision of accurate, relevant research evidence bypassed the need for extensive time spent searching and appraising research via databases and journals.</td>
<td></td>
</tr>
<tr>
<td>Paid EBP time in policy</td>
<td>Reimbursement</td>
<td>Paid, protected time for AHPs to engage in EBP activities was provided.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leadership</td>
<td>Changing policy suggested management 'buy in' and endorsement to support changes throughout the organisation (leadership theory).</td>
<td></td>
</tr>
<tr>
<td>Documentation changes including a reminder system</td>
<td>Total quality management</td>
<td>Patient documentation and work processes were reorganised to support clinical decision making and save time (reminder systems, checklists and directing participants to the EAS).</td>
<td></td>
</tr>
</tbody>
</table>
## Chapter 3 – Randomised Controlled Trial Methods

### Barrier: Evidence considered as not clinically relevant

<table>
<thead>
<tr>
<th>KT strategy</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop teaching EAS</td>
<td>Educational</td>
<td>AHPs were involved in the problem solving process, so that they ‘owned’ and were a part of the process and could see the applicability of the EAS. Having the 8-week period in between workshops, allowed independent learning and time to apply the EAS information to a real client.</td>
</tr>
<tr>
<td>EAS</td>
<td>Motivational</td>
<td>Facilitators aimed to convince AHPs of the relevance of research in their area by exploring the EAS through clinical examples and role playing</td>
</tr>
</tbody>
</table>

### Barrier: No access to full articles and research databases

<table>
<thead>
<tr>
<th>KT strategy</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS</td>
<td>Organisational learning</td>
<td>All staff members at every level of the organisation had access to current cerebral palsy evidence and exchange of information via mentoring sessions and team meetings was promoted.</td>
</tr>
</tbody>
</table>

### Barrier: Some staff with negative attitudes towards EBP

<table>
<thead>
<tr>
<th>KT strategy</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop</td>
<td>Social</td>
<td>Credible staff facilitated workshops, modelled positive attitudes and emphasised ‘buy in’ from decision-makers in the organisation.</td>
</tr>
<tr>
<td>Mentoring</td>
<td>Social</td>
<td>Mentors were selected with positive attitudes towards EBP so that target behaviour was modelled.</td>
</tr>
</tbody>
</table>
Access to the Evidence Alert System

The EAS was the cornerstone for all other interventions, representing the central funnel on the KTA. KT intervention group participants were informed about the EAS and educated in using it in the workshop. The EAS was available on the Cerebral Palsy Alliance intranet.

3-day workshop

Workshop – Part 1

Part 1 (2-days) of the workshop provided training to the participants to apply the EAS to decision-making within their daily clinical work.

A series of clinical examples were explored using the interface of the EAS, training about evidence levels, clinical decision-making algorithms and use of two psychometrically sound, cross disciplinary outcome measures. Training was delivered based on recommendations from systematic review literature that: (1) used a mix of instructional techniques including didactic and interactive styles, (2) encouraged collaboration within and between professional groups (3) used multiple media such including video, simulated clinical scenarios, slideshows and written information, (4) ensured multiple exposure to content throughout the entire KT intervention period via different modalities in the workshops, mentoring and the EAS.

The training content of the workshops provided:

1) Research evidence for; (a) goal-setting (b) prognosis (c) interventions (d) modes of service delivery and (e) outcome measurement

2) Resources to assist with clinical decision-making including; (a) the cerebral palsy EAS and (b) algorithms/decision aides.

3) Staff supports including; (a) a flowchart describing the service delivery decision-making process, (b) clearly defined staff expectations, (c) position papers to define service parameters, (d)
pathways defining service responsibilities, (e) searchable wiki with evidence summaries.

4) Skills training with practice in; (a) developing measurable goals, (b) using goal-setting measures, (c) selecting relevant prognostic messages, (d) selecting evidence and (e) selecting relevant outcome measures.

**Workshop – Part 2**

Part 2 (1-day) of the workshop 8-weeks later involved participants presenting a case study detailing how they used the EAS to inform their clinical decision-making with a real client. This was followed by discussion with a small group of colleagues designed to help participants demonstrate the integration of their learning into their own clinical work. Investigators and senior clinicians led the workshops using knowledge brokering strategies.

**Policy changes**

Policy changes that were implemented during the 8-week study period included: (1) paid, protected EBP time, (2) at least 1 scheduled mentoring session with EBP trained knowledge brokers, and informal mentoring upon request, (3) mandatory use of outcome measures, (4) changes to documentation reminding AHPs to use outcome measures and record the level of evidence for a given intervention. The 8-week implementation period allowed the participants to experience the revised workplace EBP expectations, practice using the EAS with clients, prepare their real world case study for part two of the 3-day workshop and reflect on their changes to practice. The KT strategy was directed at the cluster level (3-day workshop, access to the EAS and policy changes) and individual level (mentoring and 3-day workshop part 2).
**Control group**

The control group received an equal intensity intervention about communication skills with no EBP content using KT strategies and no use of the EAS. The intervention included: (1) a 3-day workshop about AHP-client communication skills and (2) policy changes (mentoring and quarantined time for communication skills) about communication skills. Health professional-client communication skill training was considered a valuable use of staff time, and is reported to be effective in improving communication skills.\(^{187,188}\) The content of the control group workshops were entirely different to the KT intervention group minimising contamination. To further minimise the risk of co-intervention and contamination, the control group was not informed about the EAS, paid EBP time, knowledge brokers or EBP mentoring until the end of the trial. The changes to documentation were not implemented in the control group clusters until the end of the RCT.
<table>
<thead>
<tr>
<th>KT Strategy</th>
<th>What Part of the KTA Cycle did the Intervention Impact?</th>
<th>Who Implemented It?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creating Knowledge</td>
<td>Localising Knowledge</td>
</tr>
<tr>
<td><strong>Before RCT</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Strategic planning meetings | ✓ | ✓ | ✓ | ✓ | Managers  
Human Resources  
Knowledge brokers  
Policy Makers |
| Policy Changes (policies developed but not implemented until RCT) | ✓ | ✓ | | | Managers  
Human Resources  
Knowledge brokers  
Policy Makers |
| Provision of paid, dedicated EBP time | | | | | |
| Provision of a policy endorsed EBP mentoring program | | | | | |
| Mandated and compulsory use of psychometrically sound outcome measures with all clients embedded in workflow e.g. included within mandatory Individual Family Service Plans | | | | | |
| Evidence Alert System development | ✓ | | | | Research Investigators |
| **During RCT (8-weeks; June – Aug 2009)** | | | | | |
| Skills Training Workshops (3 days) | ✓ | ✓ | ✓ | ✓ | Peers  
Knowledge Brokers  
Research Investigators |
| Paid EBP time, mentoring, compulsory use of outcome measures (see policy changes above), documentation changes including reminder systems | ✓ | ✓ | ✓ | | Managers  
Human Resources  
Knowledge brokers  
Policy Makers |
Primary outcomes

The primary endpoint was change in self-reported and peer-reported EBP behaviour from baseline to 8-weeks measured by Goal Attainment Scaling. Study outcomes were measured at the individual level and cluster level and are detailed with corresponding hypotheses in Table 6.

Goal attainment scaling

Procedure for goal attainment scaling

Participants rated themselves against the self-GAS scales, and then to limit measurement bias, in a separate environment, a well-acquainted peer rated their performance on the peer-GAS scales. The steps involved in setting GAS goals are:

1) devising goals/target behaviours that are measurable
2) defining a continuum of possible outcomes — worst expected outcome (-2), less than expected outcome (-1), expected outcome (0), more than expected outcome (+1), and best expected outcome (+2)
3) specifying the criteria for scoring at each level
4) determine current or initial performance
5) intervening for a specified period
6) determining performance attained on each objective
7) evaluating extent of attainment.189,190

The goals in our study were devised by a multidisciplinary panel of experts, familiar with practice behaviours of AHPs. Twenty-five goal scales were developed, half relating to EBP behaviours and the other half relating to communication behaviour as per the controlled comparison intervention (see self-evaluation form in Appendix 5). The questions covered goal-setting behaviour, use of outcome measures and cerebral palsy classification systems, interactions with clients and their families, use of the EAS and...
support of research (in our case the Cerebral Palsy Register). The traditionally used 5 point scale (-2 to +2) was expressed on the evaluation form as a percentage of time to reflect how often self- and peer-reported behaviour occurred. These equated to: never and 1–5% of the time (-2), 5–24% of the time (-1), 25–49% of the time (0), 50–74% of the time (+1), 75–99% of the time and always (+2). To obtain the standard raw GAS score, the percentage intervals were directly transposed back into the -2 through to +2 scores as per GAS scoring conventions. Raw GAS scores were then converted to T-scores, enabling inferential statistical analysis of continuous data.

Using a measurement tool that had strong psychometric properties was one of the strengths of our study. That said, the application of GAS in an educational context using percentage intervals to reflect the regularity of a specific behaviour is novel. Systematic reviews reveal a need for educational outcomes to be measured with validated tools.\textsuperscript{152,191,192} One criticism of GAS is that despite users’ best efforts, the intervals between GAS levels are not always exactly equal\textsuperscript{161,193,194} making statistical analysis problematic. We overcame this limitation by using percentage intervals within scale descriptors, increasing the rigour of the measurement tool.\textsuperscript{161}

**Secondary study outcomes**

**Open-ended exam questions**

Changes in EBP knowledge were measured by open-ended exam questions with pre-set answers based on published evidence. The marking schedule was pre-defined by the multidisciplinary panel of experts and was fully supported by published evidence in cerebral palsy (see Appendix 5 and 7).

**Evidence based practice attitude scale**

Self- and peer-reported changes in attitudes to EBP were measured using subsets 3 and 4 (with permission from Aarons), as subsets 1 and 2 were not relevant for the context of our study (see Appendix 5).
Use of the cerebral palsy evidence alert system

EAS utilisation was measured by number of web page hits collected via a software program that tracked cluster-specific IP addresses in batches. Web hit data collection was concealed from participants, minimising the likelihood of observer bias affecting EAS use.
<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Domain</th>
<th>Instrument</th>
<th>Psychometric properties</th>
<th>Measurement</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher self-reported EBP behaviours measured by GAS T-scores than the control group.</td>
<td>EBP behaviours (self-report)</td>
<td>GAS</td>
<td>Valid</td>
<td>The KT intervention group scores on the self-report evaluation form - GAS EBP, sum of questions 1,3,5,7,9,11, 15,17,19,21,23 converted into a T-score.</td>
<td>Primary outcome measure. Analysis by inferential statistics.</td>
</tr>
<tr>
<td>Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher peer-reported EBP behaviours measured by GAS T-scores than the control group.</td>
<td>EBP behaviours (peer-report)</td>
<td>GAS</td>
<td>Valid</td>
<td>The KT intervention groups scores on peer GAS EBP questions 1,3,5,7,9, 11,15,17,19,21,23; converted to a T-score</td>
<td>Primary outcome measure. Analysis by inferential statistics.</td>
</tr>
<tr>
<td>Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher per person web hits on the EAS measured by a web statistics, than the control group.</td>
<td>EBP behaviours</td>
<td>Frequency of use measured by web hits per person</td>
<td>N/A</td>
<td>The KT intervention group will have more page hits on the wiki than the control group at 8-weeks post intervention.</td>
<td>Secondary outcome measure. Analysis by descriptive and inferential statistics.</td>
</tr>
<tr>
<td>Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher EBP knowledge exam scores than the control group.</td>
<td>EBP knowledge</td>
<td>Exam questions</td>
<td>N/A</td>
<td>The KT intervention group scores on Open ended questions 1,2,5 &amp; 6 will significantly improve but there will be no change in the control group.</td>
<td>Secondary outcome measure. Analysis by descriptive and inferential statistics.</td>
</tr>
<tr>
<td>Hypothesis</td>
<td>Domain</td>
<td>Instrument</td>
<td>Psychometric properties</td>
<td>Measurement</td>
<td>Data</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>----------</td>
<td>------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Allied health professionals that participate in an 8-week KT strategy will have statistically significantly higher EBP attitude scores on the EBPAS</td>
<td>EBP attitudes</td>
<td>EBPAS²</td>
<td>Valid</td>
<td>Yes</td>
<td>The KT intervention group’s EBPAS score (subset 3 + subset 4) will significantly improve but there will be no change in the control group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Reliable</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sensitive to change</td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. GAS = goal attainment scaling
2. EBPAS = evidence based practice attitude scale
Procedures and data collection

LC collected data between June 2009 and August 2009 (see Figure 4). The workshops were held at the participant’s worksite or nearby venues with educational facilities large enough to host the entire cluster. The structure and measures of the study are summarised in Figure 6. The procedures and time line for the study are detailed in Table 7.

![Figure 6: Study structure and measures](image-url)
<table>
<thead>
<tr>
<th>Date</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 2009</td>
<td><strong>Randomisation</strong> — clusters randomised to KT intervention group or control group</td>
</tr>
<tr>
<td>April 2009</td>
<td><strong>Information sheet</strong> — sent to potential all participants via email (Appendix 4)</td>
</tr>
<tr>
<td><strong>KT intervention group</strong></td>
<td></td>
</tr>
</tbody>
</table>
| June 2009 – Aug 2009 | **RCT – EBP workshop Part 1 (days 1 and 2)**  
  • eligible participants invited to participate in study  
  • first author (LC) carried out coordination of voluntary consent  
  • consent forms signed  
  • baseline data collected:  
    - participants nominated a codename  
    - participants completed self-GAS, EBPAS and exam questions (Appendix 5)  
    - participants then nominated a colleague (peer) and told them their codename  
    - colleagues (peers) moved to another part of the room to complete the peer-GAS form and EBPAS (Appendix 6)  
    - GAS and EBPAS forms (baseline data) collected  
    - participants attended part 1 of EBP workshop (see Table 5) |
| **Control group** |                                                                                           |
| June 2009 – Aug 2009 | **RCT – Communication skills workshop Part 1 (days 1 and 2)**  
  • eligible participants invited to participate in study  
  • first author (LC) carried out coordination of voluntary consent  
  • consent forms signed  
  • baseline data collected:  
    - participants nominated a codename  
    - participants completed self-GAS, EBPAS and exam questions* (Appendix 5).  
    - participants then nominated a colleague (peer) and told them their codename  
    - colleagues (peers) moved to another part of the room to complete the peer-GAS form and EBPAS (Appendix 6)  
    - GAS and EBPAS forms (baseline data) collected  
    - participants attended part 1 communication skills workshop (Table 5) |
|                 | **RCT – Access to EAS and policy changes (8-week period)** (see Table 5) |
|                 | **RCT – Policy changes (8-week period):**  
  • mentoring by knowledge brokers  
  • quarantined time for communication skills planning and reflection |
### Date Procedure

<table>
<thead>
<tr>
<th>Date</th>
<th>Procedure Details</th>
<th>Location</th>
<th>KT intervention group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>June 2009 – Aug 2009</strong></td>
<td><em>RCT – Workshop Part 2 (day 3)</em></td>
<td></td>
<td>- participant attended EBP workshop part 2</td>
<td>- participant attended communication skills workshop part 2</td>
</tr>
<tr>
<td></td>
<td>• end of study data collected:</td>
<td></td>
<td>- participants nominated a codename</td>
<td>• baseline data collected:</td>
</tr>
<tr>
<td></td>
<td>• participants completed self-GAS, EBPAS and exam questions (Appendix 5)</td>
<td></td>
<td>- participants completed self-GAS, EBPAS and exam questions (Appendix 5).</td>
<td>• participants nominated a codename</td>
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<td></td>
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<td>• colleagues (peers) moved to another part of the room to complete the peer-GAS form and EBPAS (Appendix 6)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• GAS and EBPAS forms (8-week data) collected</td>
<td></td>
<td>- GAS and EBPAS forms (8-week data) collected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• participants attended part 2 of EBP workshop (see Table 5)</td>
<td></td>
<td>• participants attended part 2 communication skills workshop (see Table 5)</td>
<td></td>
</tr>
<tr>
<td><strong>Nov 2011</strong></td>
<td>Long-term follow-up data-point (see Chapters 5 and 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Data cleaning**

All items on the self and peer-reported GAS, exams and EBPAS forms were scored using two different methods and then compared to identify and thus correct scoring errors, ensuring the final score was accurate.

Scoring Method 1: All forms were scored manually and entered onto a single, hard copy summary sheet. The total scores were added up by calculator and then entered into Microsoft (MS) Excel by data entry personnel. Error formulas in MS Excel were created to ensure that the correct numbers of items were entered within an expected range of scores. Data entry personnel were trained by myself to enter data and provided with information sheets to ensure consistency of data entry. I conducted spot checks for accuracy for 10% of participants. Two data entry errors were found and each of these episodes involved the correct scores being entered in the incorrect phase of treatment.

Scoring Method 2: Each item score was individually entered into MS Excel by myself. To ensure intra-rater reliability, 10% of evaluation forms were re-scored. No entry errors were found. MS Excel formulas were created to calculate total scores and GAS T-scores.

There were no discrepancies between the scores entered via methods 1 and 2.

**Sample size and power**

The methodological decision to test the efficacy of an organisational KT strategy within one agency imposed pragmatic limitations on the obtainable sample frame. We successfully recruited 88% of the available sampling frame, however the total number of employees at the agency was less than the number of participants required to reach statistical power if correlation of outcome variables within sites was observed (intra-cluster correlation). A sample size calculation identified the probability of detecting an effect size of 1 at an alpha level of 0.05 (one-tail) and a power of 90%. For Goal
Attainment Scaling [mean T-score = 50, standard deviation (sd) = 10] an improvement of 10-points or more in the KT intervention group than the control group was sought, (improvement of 1 sd). The expert panel agreed that a 10-point increase in GAS T-scores equated to significant clinical improvement in EBP behaviours. The calculation assumed a 20% non-consent rate and a 20% attrition rate indicating a sample size requirement of 72 (38 per group) for a non-cluster trial. We enrolled 135 professionals (n = 73 interventions and n = 62 controls) at 4 sites. Based on estimating an intra-cluster correlation co-efficient (ICC) of 0.1 we calculated that the study was underpowered to demonstrate an improvement of 10 points between groups if a cluster effect of this size was observed (Variance Inflation Figure = 4.3).

### Statistical methods

All statistical analysis was carried out with individual participants as the unit of analysis on an intention-to-treat basis by using SPSS for Windows 19.0 (SPSS Inc, Chicago, IL) and SAS 9.3 (SAS Institute, Cary NC).

We conducted generalised linear regression analysis for primary and secondary endpoints, using post intervention GAS T-score as the outcome variable and adjusting for potential confounding variables (baseline GAS T-score, profession, group allocation, grade level and years in the disability field). Effect sizes with 95% confidence intervals (CIs) were calculated and significance was set at 0.05. These estimates would underestimate the standard errors and confidence intervals for the effect size if participant outcomes are correlated within cluster sites, thus mixed effects models with cluster included as a random effect were used to adjust for a cluster effect to calculate the effect size for each outcome. ICC was calculated from the mixed effects model and bootstrapping (1000 samples generated) was performed to calculate 95% CIs for the ICC.
Synopsis

This chapter reported the methods of a cluster RCT by describing the hypotheses to be tested, trial design, study eligibility, blinding and randomisation. Details of the development and final KT intervention, along with the intervention that the control group received were then presented. Outcome measurement, procedures for the study, data cleaning, sample size and statistical analyses were detailed. The next chapter presents the results from the RCT.
CHAPTER 4
RANDOMISED CONTROLLED TRIAL RESULTS

Overview

This chapter presents the results of the cluster RCT including:

1) Baseline characteristics of the AHPs included in the study, including profession, grade level, years of employment at Cerebral Palsy Alliance, years of experience in the disability field and whether or not the participant had previously attended EBP training.

2) Details about missing data

3) Statistical consideration of the clustering effect due to the method of randomisation

4) Results of the effectiveness of the KT strategy for primary and secondary outcomes.

Baseline characteristics

One hundred and thirty five AHPs (n = 73 interventions and n = 62 controls) meeting eligibility criteria agreed to participate in the study. Descriptive statistics were used to describe participant characteristics. For detailed results see Table 8.
Table 8: Baseline characteristics of participants

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<tr>
<th>Professional Background</th>
<th>Cluster 1 (n = 40)</th>
<th>Cluster 2 (n = 33)</th>
<th>Total (n = 73)</th>
<th>Cluster 3 (n = 32)</th>
<th>Cluster 4 (n = 30)</th>
<th>Total (n = 62)</th>
<th>p value*</th>
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<td>16 (22)</td>
<td>9 (28.1)</td>
<td>7 (23.3)</td>
<td>16 (25.8)</td>
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<td>Speech Pathology</td>
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<td>11 (33.3)</td>
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<td>5 (15.6)</td>
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<td>14 (22.6)</td>
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<td>Level 2 (clinical specialist)</td>
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<td>16 (48.5)</td>
<td>34 (46.6)</td>
<td>21 (65.7)</td>
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<td>37 (59.7)</td>
<td>0.122</td>
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<td>Level 3 (clinical senior)</td>
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</tr>
<tr>
<td>&lt;2-years</td>
<td>12 (30)</td>
<td>16 (48.5)</td>
<td>28 (38.4)</td>
<td>14 (43.8)</td>
<td>18 (60)</td>
<td>32 (51.5)</td>
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</tr>
<tr>
<td>2-4 years 11 months</td>
<td>5 (12.5)</td>
<td>10 (30.3)</td>
<td>15 (20.5)</td>
<td>5 (15.6)</td>
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<tr>
<td>5-9 years 11 months</td>
<td>15 (37.5)</td>
<td>6 (18.2)</td>
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<td>8 (25)</td>
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<td>&gt;10 years</td>
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### Chapter 4 - Randomised Controlled Trial Results

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<th>Years' experience in disability field</th>
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<th>Control group (%**)</th>
<th>p value*</th>
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</thead>
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<td>Cluster 1 (n = 40)</td>
<td>Cluster 2 (n = 33)</td>
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<td>11 (15)</td>
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<td>3 (91)</td>
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<td>5-9 years 11 months</td>
<td>10 (25)</td>
<td>15 (45.5)</td>
<td>25 (34.3)</td>
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<tr>
<td>&gt;10 years</td>
<td>19 (47.5)</td>
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<td>27 (37)</td>
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</table>

<table>
<thead>
<tr>
<th>Previous EBP continuing education?</th>
<th>KT intervention group (%**)</th>
<th>Control group (%**)</th>
<th>p value*</th>
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</thead>
<tbody>
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<td>Yes</td>
<td>35 (87.5)</td>
<td>29 (87.9)</td>
<td>64 (87.7)</td>
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<tr>
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<td>5 (12.5)</td>
<td>4 (12.1)</td>
<td>9 (12.3)</td>
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</tbody>
</table>

<table>
<thead>
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<th>Control group (%**)</th>
<th>p value*</th>
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<tr>
<td>Missing</td>
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<td>0 (0)</td>
</tr>
</tbody>
</table>

* Pearson's chi square test was used to determine whether distributions of variables differed from one another, resulting in a p value (p < 0.05 indicated a statistically significant difference in proportions between groups).

** Percentages have been documented to one decimal place in this table for accuracy, however have been rounded to whole numbers in the text for clear reporting.
Professional background

Included professionals were occupational therapists (n = 49; 36%), physiotherapists (n = 32; 24%), speech pathologists (n = 30; 26%), psychologists (n = 8; 6%) and social workers (n = 10; 8%). Figure 7 displays the proportion of each profession according to group allocation (KT intervention group or control group). The professional background of participants was comparable between the KT intervention group and the control group (see Table 8), indicating that there was no statistically significant difference of the distribution of professional background of participants between groups (p > 0.05).

![Figure 7: Percentage of participants in various professional backgrounds in intervention and control groups](image)

Grade level

Twenty-four per cent of the sample were employed at the Cerebral Palsy Alliance as level 1 AHPs (entry level AHP), 53% were level 2 (clinical specialist), 15% were level 3 (clinical senior with supervision responsibilities for level 1 and 2s) and the remaining 8% were either level 4 (knowledge brokers with clinical caseloads) or clinical managers (with clinical caseloads and AHP qualifications). The distributions between the KT intervention and control groups were comparable (p > 0.05) (see Table 8 and Figure 8).
Years at Cerebral Palsy Alliance and experience in the disability field

Although 45% of participants had worked at the Cerebral Palsy Alliance for less than 2 years, 34% had over 10 years’ experience in the disability field. Only 13% of participants had worked at Cerebral Palsy Alliance for more than 10 years. There were no significant differences between years of employment at the study site or overall years of experience between groups (see Table 8 and Figures 9 and 10).
English as first language

Ninety-four per cent of the sample had English as their first language meaning that 8 participants from the whole sample had a language background other than English (LBOTE) (see Table 8 and Figure 11). The KT intervention group contained 7 of the 8 participants with LBOTE, however the difference in distribution between groups was statistically insignificant ($p = 0.13$).
Previous continuing education in EBP

Eighty-eight per cent of the KT intervention group had attended an EBP seminar or workshop compared to 66% of the controls (see Table 9 and Figure 12). The distribution between groups was significant (p = 0.03) and was therefore included in the regression model as a covariate.
Participant flow

A total of 154 attendees at the EBP workshop were eligible and invited to participate in the study, with 135 (88%) providing consent and were therefore enrolled. Nineteen eligible participants elected not to take part in the study. Baseline demographic data were collected from all participants as requested by Cerebral Palsy Alliance management, although the remainder of the evaluation form was optional for those who did not participate in the study. One participant in the KT intervention group withdrew from the study via email during the 8-week intervention period (see Figure 13).

![Figure 13: Participant flow diagram for RCT – from randomisation to primary analysis](image)

Missing Data

Data were classified as missing if a participant did not submit an evaluation form or submitted a completely blank evaluation form. Missing data were analysed using the last observation carried forward analysis (LOCF). The return rate for the GAS and EBPAS ratings were between 60-82% (see Figure 13), with the primary endpoint having more missing data. The KT
intervention group had 19/73 (31%) 8-week GAS forms missing, compared to the control group who had 17/62 (30%). This difference between groups was not statistically significant (chi square p = 0.95).

**Clustering effect**

The ICC for the primary endpoints were 0.33 (95% CI 0.16, 0.69) for self-rated GAS T-scores, that is 33% of the total variation observed in self-rated GAS T-scores can be attributed to differences between the sites, (rather than differences between individuals within each site), and 0.64 (95% CI 0.36, 0.80) for peer-report GAS T-scores (see Table 9), that is 64% of the total variation observed peer-rated GAS T-scores can be attributed to differences between sites. These results demonstrate the correlation of GAS T-scores within sites was very large, whereas there was a large variation in scores between sites. This cluster effect substantially depleted the study power (because participant scores within each site cannot be regarded as independent). ICCs were smaller for secondary outcomes (see Table 9).

**Effectiveness of KT strategy**

**Primary outcome – EBP practice behaviours**

Self-rated GAS T-scores increased more in the intervention group compared to controls, however this difference was not statistically significant after adjusting for the cluster effect (effect size 4.43; 95% CI -10.63,19.49; p = 0.56) (see Table 9). Baseline self-rated GAS T-scores were a predictor in the model (effect size 0.71; 95% CI 0.52, 0.90); (p < 0.0001); indicating lower performers improved but remained lower performers, and higher performers improved and remained leading performers. No other covariates were significantly predictive of outcome.

Peer-rated GAS T-scores of the intervention group also increased compared to controls, but this difference was also not statistically significant after adjusting for the cluster effect (effect size 6.75; 95% CI -16.95, 30.44; p = 0.57)
(see Table 9). Similar to the self-rated GAS T-scores, the final peer-rated GAS T-score was predicted by the baseline peer-rated GAS T-score (effect size 0.30; 95% CI 0.15, 0.45; p < 0.0001). No other covariates were significantly predictive of peer-rated GAS T-scores. The peer-rated GAS T-scores for each cluster mirrored the self-rated GAS cluster T-scores, suggesting the observed study effects were behaviourally meaningful, despite low study power to demonstrate a statistically significant difference.

**Secondary outcomes – knowledge, attitudes and EAS**

EBP knowledge scores increased compared to controls, with a statistically significant effect size of 2.97 (95% CI 1.97, 3.97; p < 0.0001). The ICC for this outcome was zero, and this effect remained statistically significant after adjusting for the cluster effect of 2.97 (95% CI 1.97, 3.97; p < 0.0001). Baseline score (p < 0.0001) and professional category (p = 0.03) were also predictors in the model. There was minimal to no correlation between participants within sites for self- or peer-rated EBP attitudes, however we did not demonstrate a statistically significant intervention effect (see Table 9). The intervention group accessed the EAS more than the control group (KT intervention group 6123 total hits; control group 1677 hits).

**Additional analyses**

Secondary analyses examining mean outcome scores for each cluster revealed that both clusters in the KT intervention group improved their self- and peer-rated GAS T-scores as expected (see Table 10). One of the control group clusters (cluster 3) also responded as expected, with very minimal increases in self- and peer-rated GAS T-scores from baseline to 8-weeks (self-rated T-score change = 0.22; peer-rated T-score change = 2.27). The other control group cluster (cluster 4) had high baseline scores (self-rated GAS T-score = 66.41; peer-rated GAS T-score = 73.32) and further improved by 10.15 points over the 8-week study period, despite not receiving the KT strategy (see Table 10). We performed post-hoc Spearman’s correlation tests to assess for correlation between knowledge and attitude scores (at baseline, 8-weeks
and change scores) overall, by treatment group, and within individual clusters. No statistically significant positive correlations were found.

**Synopsis**

This chapter presented the cluster RCT results including baseline characteristics, missing data, clustering effect and the effectiveness of the KT strategy. The next 2 chapters (Chapters 5 and 6) present the methods and results of the 2-year follow-up study. The discussion and conclusion chapter (Chapter 7) explores the results from this chapter in more depth, as well as offering an interpretation of the RCT and follow-up study.
Table 9: Primary and secondary outcomes - RCT

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Treatment (n = 73)</th>
<th>Control (n = 62)</th>
<th>Base model</th>
<th>Mixed effects model</th>
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<td></td>
<td>n*</td>
<td>Mean (sd)</td>
<td>n*</td>
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<td></td>
<td></td>
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<tr>
<td>baseline</td>
<td>59</td>
<td>54.05 (13.80)</td>
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<td>65.96 (13.49)</td>
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<td>Peer</td>
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<tr>
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<td>61.83 (13.69)</td>
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<td>1.13 (0.93)</td>
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* Number of participants who completed outcome measure.

** EAS page hit raw data could only be collected and analysed at the cluster level, not the individual level because the electronic data were collected in batches.
Table 10: Mean outcome scores for each cluster

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<th>Outcome</th>
<th>Variable</th>
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<th>Cluster 3 (Control)</th>
<th>Cluster 4 (Control)</th>
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<td>n mean (sd)</td>
<td>n mean (sd)</td>
<td>n mean (sd)</td>
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<td></td>
<td></td>
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<td>35 50.73 (13.75)</td>
<td>24 58.88 (12.64)</td>
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<td>17 66.41 (15.46)</td>
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<td></td>
<td></td>
<td>8-weeks</td>
<td>24 66.39 (16.02)</td>
<td>27 65.58 (11.08)</td>
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<td>baseline</td>
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<td>19 64.68 (12.51)</td>
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<td>15 73.32 (12.57)</td>
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<td></td>
<td>8-weeks</td>
<td>21 72.69 (9.93)</td>
<td>23 75.69 (6.90)</td>
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<td>Peer GAS</td>
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<td>35 7.69 (2.76)</td>
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<td>28 6.50 (3.08)</td>
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<td>25 10.80 (2.37)</td>
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<td>8-weeks</td>
<td>24 2.55 (0.78)</td>
<td>26 2.70 (0.70)</td>
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<td>20 3.16 (0.58)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8-weeks</td>
<td>24 3.10 (0.59)</td>
<td>26 2.96 (0.64)</td>
<td>22 2.85 (0.60)</td>
<td>22 3.11 (0.58)</td>
</tr>
<tr>
<td>EBP attitude</td>
<td>Peer EBPAS subset 3 score</td>
<td></td>
<td>30 2.80 (0.60)</td>
<td>12 3.24 (0.63)</td>
<td>23 2.87 (0.74)</td>
<td>15 2.95 (0.73)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>baseline</td>
<td>24 2.55 (0.78)</td>
<td>26 2.70 (0.70)</td>
<td>22 2.52 (0.57)</td>
<td>22 3.01 (0.55)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8-weeks</td>
<td>24 3.10 (0.59)</td>
<td>26 2.96 (0.64)</td>
<td>22 2.85 (0.60)</td>
<td>22 3.11 (0.58)</td>
</tr>
</tbody>
</table>
## Chapter 4 – Randomised Controlled Trial Results

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Time</th>
<th>Cluster 1 (Exp)</th>
<th>Cluster 2 (Exp)</th>
<th>Cluster 3 (Control)</th>
<th>Cluster 4 (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer EBPAS subset 4 score</td>
<td>8-weeks</td>
<td>3.20 (0.47)</td>
<td>3.14 (0.65)</td>
<td>3.07 (0.63)</td>
<td>3.32 (0.57)</td>
</tr>
<tr>
<td></td>
<td>baseline</td>
<td>0.83 (0.64)</td>
<td>1.03 (1.08)</td>
<td>1.45 (0.86)</td>
<td>0.77 (0.48)</td>
</tr>
<tr>
<td>Web hits Page hits</td>
<td>8-weeks</td>
<td>2987</td>
<td>3136</td>
<td>928</td>
<td>749</td>
</tr>
</tbody>
</table>
CHAPTER 5
2-YEAR FOLLOW-UP STUDY
METHODS

Overview

This chapter details the methods of follow-up study 2-years after a multifaceted knowledge KT strategy was introduced to improve AHPs’ EBP behaviours, and includes:

1) Background information
2) Aims and hypotheses specific to the 2-year follow-up study
3) Trial design
4) Setting and eligibility criteria
5) Ethical approval
6) Procedures
7) Statistical analysis.

Background

Although AHPs EBP behaviours are known to take time to develop, few studies seek to measure longer term effectiveness of KT strategies. Measuring the impact of KT strategies at different points in time is important as behaviour change may not be immediate and may not change in a linear fashion. Measuring EBP behaviour over time may be particularly important if the strategies involved policy changes and organisational initiatives as these KT strategies may change behaviour indirectly by gradually changing culture and attitudes. Even if a KT strategy did result in immediate or behaviour change, it is recommended that longitudinal data be collected to ensure that the behaviour has been maintained.
A RCT was conducted with AHPs working at the Cerebral Palsy Alliance between June and August 2009 (see Chapters 3 and 4). Participants were cluster randomised to either the KT intervention group (KT strategy) or the control group (communication skills). EBP behaviours were measured using Goal Attainment Scaling at baseline and 8-weeks (primary endpoint). Immediately after the RCT primary endpoint, each group received the alternative intervention (see Figure 14), with the KT intervention group receiving the communication skills intervention and the control group receiving the KT intervention. Therefore the 2-year follow-up study is of one-group not two-groups, with some of the participants having 8-weeks less experience of using the KT strategies. We therefore are not looking for between group differences, instead all participants were seen has having had roughly equal exposure to the KT intervention long-term.

**Aims and hypothesis**

The primary aim of the follow-up study was to measure the effectiveness of a KT strategy on AHPs’ EBP behaviours 2-years after the KT strategy was implemented. Secondary aims were to determine the level of utilisation, patterns of use and opinions regarding usefulness of the EAS. The hypothesis for the primary aim of the follow-up study was:

1) Allied health professionals’ 2-year post KT strategy GAS T-scores will be equal to, or statistically significantly greater than the 8-week GAS scores.

In addition to this hypothesis, the study sought to answer research questions regarding the EBP behaviours of the cohort of AHPs working at the study organisation in November 2011.

2) What are GAS T-scores of AHPs working at the study site (regardless of whether they participated in the RCT or not)?

3) How do these GAS T-scores compare to the baseline and 8-week GAS T-scores?
Chapter 5 – 2-year Follow-up Study Methods

**Trial design**

A longitudinal study was conducted 2-years after the completion of the KT strategy using an online survey (Survey Monkey™ Premium). The survey provided a snapshot in time of the EBP behaviours of AHPs at Cerebral Palsy Alliance. The survey included the same questions based on GAS as used in the RCT, and some additional questions relating to the utilisation and usefulness of the EAS (see Appendix 8). An online survey was ideal as GAS questions easily translated from the paper format used in the original RCT to electronic format offered on Survey Monkey™ Premium. Survey Monkey™ was frequently used within the Cerebral Palsy Alliance for other surveys, and the survey participants were therefore familiar with the layout and style of the survey.

**Survey Design**

The survey questions were designed ensuring clear wording, grammar and layout. A covering letter was provided including information about the present study along with contact details if any questions arose (see Appendix 8). The survey was confidential and de-identified so that response collectors were unable to re-identify survey participants except by codename. Possible security breaches regarding confidentiality were reported as problematic with online surveys, especially via email, however Survey Monkey provided a high level of security.

The survey comprised of 3 sections:

1) Demographic information that mirrored the information collected in the original RCT

2) GAS questions that were included in the original RCT. Two additional GAS goals were formulated by the expert panel and added at the end of the survey. These goals were developed in response to feedback from clinical seniors and managers regarding AHPs’ use of outcome measures. Our original goals questioned whether valid, reliable
outcome measures were being used. The additional questions explored whether outcome measures were being scored completely and documented thoroughly.

3) Questions relating to the EAS. These questions were based on categories designed to evaluate the McMaster Plus web-based EBP library. The categories aimed to collect information on:
- utility of the EAS, whether survey participants found what they were looking for
- use of the EAS, what the purpose of obtaining information from the EAS was
- usefulness of the EAS, whether the survey participants found the information clinically useful.

**Pilot testing**

The online survey was pilot tested with five research staff (qualified AHPs employed as research assistants) and five untrained volunteers. Feedback was sought regarding time taken, ease of use, difficulties understanding wording or grammatical suggestions, flow and order of the survey and any technical difficulties and appearance of the survey.

**Eligibility**

All AHPs at Cerebral Palsy Alliance were invited to participate in the present study (the RCT cohort, see Chapter 3). This included both the control and experimental groups from the original RCT because after the RCT each group then received the alternative intervention to ensure equal educational exposure for all staff (see Figure 14).

**Inclusion criteria:**

1) qualified AHPs
2) employed at the study site
3) providers of direct clinical services to people with cerebral palsy and their families.
Exclusion criteria:

4) managers (staff without any clinical caseload)

5) staff members without a formal allied health university qualification, such as project officers or welfare workers.

Ethics

The original RCT ethics application included the 2-year follow-up of the RCT and as previously described was approved.

Procedures

Eligible participants were invited to participate in the study via an email sent by a senior staff member of the Cerebral Palsy Alliance. The email included a web link to the online survey. The participants had 4 weeks to complete the survey. Two email reminders were sent after 2 weeks and 3 days before the primary endpoint date, as reminders are known to increase survey response rate. The participants were asked their original codename and if they had forgotten it, were provided with a list of the codenames to assist recall.

Statistical analysis

Data analysed are summarised in Table 11. Data analysis included: (1) descriptive statistics to summarise baseline characteristics of survey participants who also were a part of the original RCT, and all eligible survey participants, (2) calculation of differences between 8-week/2-year characteristics for participant who were involved in the RCT – chi-squared test, (3) calculation of mean GAS T-scores, standard deviations and range of all eligible AHP staff. Chi-squared testing was performed to explore significant differences, and regression analysis performed to measure whether the particular covariate predicted outcome.
### Table 11: Data Analysed – follow-up study

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic information – nominal variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attendance at 2009 training</td>
<td>Whether or not the participant attended training held June-Nov 2009</td>
<td>2 (yes, no)</td>
</tr>
<tr>
<td>Cluster</td>
<td>The cluster at CP Alliance where the participant works</td>
<td>4</td>
</tr>
<tr>
<td>Profession</td>
<td>Professional qualification gained at university (if any)</td>
<td>6 (SW, PT, OT, SP, Psych, other)</td>
</tr>
<tr>
<td>Role</td>
<td>Job title/role at CP Alliance</td>
<td>9 (SW, PT, OT, SP, Psych, FT, manager, pathways, other)</td>
</tr>
<tr>
<td>Grade Level</td>
<td>Grade/level that the participant is employed as at CP Alliance (may be a different role e.g. Manager)</td>
<td>8 (level 1,2,3,4,5,manager, team leader, other)</td>
</tr>
<tr>
<td>Previous continuing education in evidence-based medicine</td>
<td>Whether the participant has attended EBP workshops (including 2009 training)</td>
<td>2 (yes, no)</td>
</tr>
<tr>
<td>Previous continuing education in communication skills</td>
<td>Whether the participant has attended workshops in communication skills (incl 2009)</td>
<td>2 (yes, no)</td>
</tr>
<tr>
<td>Engl. first language?</td>
<td>Whether English is the participant’s first language</td>
<td>2 (yes, no)</td>
</tr>
<tr>
<td>Access to the EAS*</td>
<td>How often the participant accesses the EAS</td>
<td>5 (daily, 1-4 times/wk, 1-4 times/mth, 1-4 times/yr, never)</td>
</tr>
<tr>
<td>EAS content*</td>
<td>Whether the participant normally finds what they are looking for on the EAS</td>
<td>4 (yes, no, sometimes, don’t look for specific info)</td>
</tr>
<tr>
<td>EAS content usefulness*</td>
<td>The participant’s opinion of usefulness of information on EAS</td>
<td>5 (almost always useful, often useful, occasionally useful, rarely useful, never useful)</td>
</tr>
<tr>
<td>Purpose for using EAS*</td>
<td>Purpose for using the EAS</td>
<td>4 (information for client, general interest, conference etc, service planning)</td>
</tr>
<tr>
<td><strong>Demographic information – continuous variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment years</td>
<td>How many years the participant has been employed by the organisation</td>
<td>Any number – expressed to 2 decimal places</td>
</tr>
<tr>
<td>Disability experience</td>
<td>How many years’ experience the participant has had in the disability field</td>
<td>Any number – expressed to 2 decimal places</td>
</tr>
<tr>
<td><strong>Outcome measures – continuous variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBP GAS T-scores</td>
<td>The GAS score (or T-score) is calculated using a formula devised by the original authors (Kiresuk and Sherman 1968). It has a mean of 50 and a SD of 10.</td>
<td>A numerical value to 5 decimal places</td>
</tr>
</tbody>
</table>
Calculating change in GAS T-scores

The 8-week and 2-year EBP self GAS T-score means were compared using paired t-tests (significance set at 0.05) and 95% CIs calculated. Only staff members who were participants in the RCT were included in this analysis.

Missing data

It was anticipated that there would be missing data at the 2-year mark due to staff changes and response rate of the follow-up survey. Missing data were excluded from the analysis.

Synopsis

This chapter provided information about the methods used in the 2-year follow-up study and included details of the design of the study, pilot testing, setting and participants, eligibility criteria, ethics, procedures and data analysis. The following chapter will present the results from the follow-up study. Discussion and interpretation of the follow-up study are included in the final chapter of the thesis (Chapter 7).
CHAPTER 6
2-YEAR FOLLOW-UP STUDY
RESULTS

Overview

This chapter presents the results from the 2-year follow-up study and has 2 components.

1) Results from the follow-up study relating to all survey participants. This related to the research questions:
   - What are GAS T-scores of AHPs working at the study site?
   - How do these GAS T-scores compare to the RCT baseline and 8-week GAS T-scores?

2) Results from follow-up study relating to survey participants who were a part of the RCT as well as the follow-up study. This related to the hypothesis: AHPs’ 2-year post KT strategy GAS T-scores will be equal to, or statistically significantly greater than the 8-week GAS scores.

Survey results – all survey participants

Participant flow & baseline characteristics

There were 147 AHPs working at Cerebral Palsy Alliance at the time of the survey (November 2011). Sixty-five AHPs responded, representing 44% of the sampling frame. Table 12 details the survey participants’ baseline characteristics.
## Table 12: Survey participants’ baseline characteristics (n = 65)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profession</strong></td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>13 (20)</td>
</tr>
<tr>
<td>Speech Pathologist</td>
<td>18 (27.7)</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>17 (26.2)</td>
</tr>
<tr>
<td>Psychologist</td>
<td>5 (7.7)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>5 (7.7)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (10.8)</td>
</tr>
<tr>
<td><strong>Grade level</strong></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>14 (21.5)</td>
</tr>
<tr>
<td>Level 2</td>
<td>34 (52.3)</td>
</tr>
<tr>
<td>Level 3</td>
<td>12 (18.5)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (7.7)</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
</tr>
<tr>
<td><strong>Years at Cerebral Palsy Alliance</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year 11 months</td>
<td>16 (24.6)</td>
</tr>
<tr>
<td>2-4 years 11 months</td>
<td>16 (24.6)</td>
</tr>
<tr>
<td>5-9 years 11 months</td>
<td>8 (12.3)</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>25 (38.5)</td>
</tr>
<tr>
<td><strong>Years’ experience in disability field</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year 11 months</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>2-4 years 11 months</td>
<td>12 (18.5)</td>
</tr>
<tr>
<td>5-9 years 11 months</td>
<td>14 (21.5)</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>38 (58.5)</td>
</tr>
<tr>
<td><strong>Previous continuing education in evidence-based practice?</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>59 (90.8)</td>
</tr>
<tr>
<td>No</td>
<td>6 (9.2)</td>
</tr>
<tr>
<td><strong>Is English your first language?</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>62 (95.4)</td>
</tr>
<tr>
<td>No</td>
<td>3 (4.6)</td>
</tr>
<tr>
<td><strong>Cluster</strong></td>
<td></td>
</tr>
<tr>
<td>Cluster 1</td>
<td>16 (24.6)</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>21 (32.3)</td>
</tr>
<tr>
<td>Cluster 3</td>
<td>17 (26.2)</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>11 (16.9)</td>
</tr>
<tr>
<td>Total n (%)</td>
<td>65 (100)</td>
</tr>
</tbody>
</table>

### Comparison to all staff at Cerebral Palsy Alliance

The only information available for all staff at Cerebral Palsy Alliance was professional group and cluster. The test for one proportion was performed.
to test for differences in proportion between the survey participants and all AHPs working at Cerebral Palsy Alliance.

There were no significant differences in proportions of physiotherapists or speech pathologists. There were however, statistically significant differences (p > 0.05; see Table 13) in the proportions of occupational therapists, psychologists and social workers. There were no significant differences in proportions between clusters (p > 0.05; see Table 13).

Table 13: Survey respondents’ professional backgrounds

<table>
<thead>
<tr>
<th>Profession</th>
<th>Survey participants (n = 65)</th>
<th>All allied health staff at Cerebral Palsy Alliance Nov 2011 (n = 147)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapist</td>
<td>13 (20)</td>
<td>35 (23.8)</td>
<td>0.51</td>
</tr>
<tr>
<td>Speech Pathologist</td>
<td>18 (27.7)</td>
<td>41 (27.9)</td>
<td>0.85</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>17 (26.2)</td>
<td>65 (44.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>Psychologist</td>
<td>5 (7.7)</td>
<td>4 (2.6)</td>
<td>0.01</td>
</tr>
<tr>
<td>Social Worker</td>
<td>5 (7.7)</td>
<td>2 (1.3)</td>
<td>0.001</td>
</tr>
<tr>
<td>Other</td>
<td>3 (4.6)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Survey participants (n = 65)</th>
<th>All allied health staff at Cerebral Palsy Alliance Nov 2011 (n = 147)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>16 (24.6)</td>
<td>36 (24.5)</td>
<td>0.79</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>21 (32.3)</td>
<td>41 (27.9)</td>
<td>0.61</td>
</tr>
<tr>
<td>Cluster 3</td>
<td>17 (25.7)</td>
<td>35 (23.8)</td>
<td>0.90</td>
</tr>
<tr>
<td>Cluster 4</td>
<td>11 (16.9)</td>
<td>35 (23.8)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Results relating to Evidence Alert System

Results from survey questions relating to the frequency and type of use of the EAS are detailed in Table 14. Due to pragmatic constraints we were unable to compare web page hits from the RCT period to 2-year data as the EAS was made available to all 1050 non-AHP Cerebral Palsy Alliance staff immediately after the RCT was completed. This meant that non-AHPs also used the EAS and we were therefore unable to extract accurate data for AHPs only. The follow-up survey therefore included 4 questions about use and usefulness of the EAS (see Appendix 8).
### Table 14: Evidence Alert System survey question results (n = 65)

<table>
<thead>
<tr>
<th>Question</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you access the knowledge hub (intervention section with</td>
<td></td>
</tr>
<tr>
<td>evidence levels, assessment, prognosis/prevalence or clinical algorithms)?</td>
<td></td>
</tr>
<tr>
<td>Every day</td>
<td>0</td>
</tr>
<tr>
<td>1-4 times/week</td>
<td>25</td>
</tr>
<tr>
<td>1-4 times/month</td>
<td>36.5</td>
</tr>
<tr>
<td>1-4 times/year</td>
<td>32</td>
</tr>
<tr>
<td>Never</td>
<td>6.5</td>
</tr>
<tr>
<td>Do you normally find what you are looking for?</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>30.8</td>
</tr>
<tr>
<td>No</td>
<td>6.4</td>
</tr>
<tr>
<td>Sometimes</td>
<td>48.7</td>
</tr>
<tr>
<td>I browse rather than looking for specific information</td>
<td>14.1</td>
</tr>
<tr>
<td>Is the information you find on the knowledge hub useful?</td>
<td></td>
</tr>
<tr>
<td>Almost always useful</td>
<td>15.2</td>
</tr>
<tr>
<td>Often useful</td>
<td>46.8</td>
</tr>
<tr>
<td>Occasionally useful</td>
<td>27.8</td>
</tr>
<tr>
<td>Rarely useful</td>
<td>8.9</td>
</tr>
<tr>
<td>Never</td>
<td>1.3</td>
</tr>
<tr>
<td>For what purpose do you access the knowledge hub?</td>
<td></td>
</tr>
<tr>
<td>Information seeking with a specific client(s) in mind</td>
<td>76</td>
</tr>
<tr>
<td>General interest (not related to a specific client)</td>
<td>61.3</td>
</tr>
<tr>
<td>Presentation at conference, seminar, team meeting</td>
<td>24</td>
</tr>
<tr>
<td>Service planning</td>
<td>42.7</td>
</tr>
</tbody>
</table>

### RCT follow-up study

#### Participant flow

There were 65 survey participants, 25 of whom were also participants in the 2009 RCT. De-identified data obtained from Human Resources indicated that 63/135 RCT participants had resigned from their positions at Cerebral Palsy Alliance between November 2009 and November 2011. This meant that 35% of the original participants in the RCT who still worked at Cerebral Palsy Alliance responded to the survey. Figure 14 illustrates the flow of participants from June 2009 to November 2011.
Baseline characteristics

Descriptive statistics were used to summarise participant characteristics (see Table 15).

Profession

Included professionals were physiotherapists (24%), speech pathologists (20%), occupational therapists (36%), psychologists (8%) and social workers (12%). Table 15 displays the proportion of each profession at 8-weeks (n = 135 AHPs) and 2-years (n = 25 AHPs). The professional background of...
Chapter 6 – 2-year Follow-up Study Results

participants was comparable between the 8-week group and 2-year group (see Table 15 for p values, indicating that there was no statistically significant difference of the distribution of professional background of participants between groups).

Grade level

At the 2-year mark, 20.8% of the sample were employed at the Cerebral Palsy Alliance as grade 1 AHPs, 50% were grade 2 (clinical specialist), 20.8% were grade 3 (clinical senior) and the remaining 8.4% were either consultants or clinical managers. The distributions between the 8-week and 2-year groups were comparable (see Table 15).

Years at Cerebral Palsy Alliance and years in disability

Forty-four per cent of respondents at the 2-year mark had worked for Cerebral Palsy Alliance for less that 2-years, and 20% had worked at the organisation for more than 10-years. Interestingly, 44% of respondents had over 10-years’ experience in the disability sector. These percentages mirrored the proportions in the 8-week group, with no statistically significant differences found (see Table 15).

Previous EBP training

Seventy-two per cent of respondents in the 2-year group indicated that they had participated in some form of evidence-based practice training, compared to 88% in the 8-week group. Seven respondents did not complete this question (missing data) in the survey. It can be assumed that all respondents in this group (n = 25) have had previous EBP training as they all attended the EBP workshops as a part of the RCT. P values were therefore not calculated for this variable.
English as first language

Ninety-six per cent of the 2-year group had English as their first language compared to 91% in 8-week group. These proportions were not significant (see Table 15).

Table 15: Participant characteristics (RCT participants) – follow-up study

<table>
<thead>
<tr>
<th></th>
<th>8-weeks (n = 73)</th>
<th>2-years (n = 25)</th>
<th>p value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profession</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>16 (22.0)</td>
<td>6 (24.0)</td>
<td>0.81</td>
</tr>
<tr>
<td>Speech Pathologist</td>
<td>20 (27.4)</td>
<td>5 (20.0)</td>
<td>0.41</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>23 (31.4)</td>
<td>9 (36.0)</td>
<td>0.62</td>
</tr>
<tr>
<td>Psychologist</td>
<td>7 (9.6)</td>
<td>2 (8.0)</td>
<td>0.79</td>
</tr>
<tr>
<td>Social Worker</td>
<td>7 (9.6)</td>
<td>3 (12.0)</td>
<td>0.68</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
<tr>
<td><strong>Grade level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>19 (26)</td>
<td>5 (20.0)</td>
<td>0.55</td>
</tr>
<tr>
<td>Level 2</td>
<td>34 (46.6)</td>
<td>12 (48.0)</td>
<td>0.73</td>
</tr>
<tr>
<td>Level 3</td>
<td>13 (17.8)</td>
<td>5 (20.0)</td>
<td>0.70</td>
</tr>
<tr>
<td>Other</td>
<td>6 (8.2)</td>
<td>2 (8.0)</td>
<td>0.13</td>
</tr>
<tr>
<td>Missing</td>
<td>1 (1.4)</td>
<td>1 (4.0)</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Years at Cerebral Palsy Alliance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2-years</td>
<td>28 (38.4)</td>
<td>11 (44.0)</td>
<td>0.57</td>
</tr>
<tr>
<td>2-4 years 11 months</td>
<td>15 (20.5)</td>
<td>4 (16.0)</td>
<td>0.57</td>
</tr>
<tr>
<td>5-9 years 11 months</td>
<td>21 (28.8)</td>
<td>5 (20.0)</td>
<td>0.33</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>9 (12.3)</td>
<td>5 (20.0)</td>
<td>0.13</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
<tr>
<td><strong>Years’ experience in disability field</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2 yrs</td>
<td>11 (15.0)</td>
<td>5 (20.0)</td>
<td>0.48</td>
</tr>
<tr>
<td>2-5 yrs</td>
<td>10 (13.7)</td>
<td>4 (16.0)</td>
<td>0.74</td>
</tr>
<tr>
<td>5-10 yrs</td>
<td>25 (34.3)</td>
<td>5 (20.0)</td>
<td>0.13</td>
</tr>
<tr>
<td>10+ yrs</td>
<td>27 (37.0)</td>
<td>11 (44.0)</td>
<td>0.47</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
<td>—</td>
</tr>
<tr>
<td><strong>Previous continuing education in evidence-based practice?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>64 (87.7)</td>
<td>18 (72.0)</td>
<td>—</td>
</tr>
<tr>
<td>No</td>
<td>9 (12.3)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>7 (28.0)</td>
<td>—</td>
</tr>
<tr>
<td><strong>Is English your first language?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66 (90.4)</td>
<td>23 (95.8)</td>
<td>0.36</td>
</tr>
<tr>
<td>No</td>
<td>7 (9.6)</td>
<td>1 (4.2)</td>
<td>0.36</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>1 (4.2)</td>
<td>—</td>
</tr>
</tbody>
</table>

*p values were calculated by using the Test for One Proportion.*
Long-term effectiveness of KT strategy

Comparison of means – RCT participants

Eight-week and 2-year mean Goal Attainment Scaling (GAS) T-scores were compared using paired t-tests (see Table 16). Samples compared were participants who were a part of the RCT KT intervention group at 8-weeks as well as participants at the 2-year mark (n = 19). Of the 25 survey participants who were RCT participants, n=19 were a part of the original KT intervention group, and n=6 were a part of the control group. The mean 8-week GAS T-score was 60.71 compared to the 2-year GAS T-score of 90.29.

<table>
<thead>
<tr>
<th>GAS mean T-score</th>
<th>sd</th>
<th>Mean change</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-weeks after KT strategy</td>
<td>60.71</td>
<td>19.10</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2-years after KT strategy</td>
<td>90.29</td>
<td>21.89</td>
<td>29.58</td>
<td>12.66–46.50</td>
</tr>
</tbody>
</table>

Comparison of means based on attendance at 2009 EBP training

Survey participants who attended EBP training, regardless of whether they agreed to participate in the RCT (n = 31) had a mean GAS T-score of 93.57, compared to those who were new staff whose GAS T-score of 82.45 (see Table 17). A one-sample t-test indicated that the mean difference between GAS T-scores was significant (p = 0.00). A regression analysis was performed to see if attending the 2009 EBP training was predictive of GAS T-score outcome. The finding was confirmed with an effect size of 11.12 (95% CI 1.86, 20.38; p = 0.019).
Table 17: GAS T-score comparison based on attendance at original EBP training

<table>
<thead>
<tr>
<th></th>
<th>GAS mean T-score</th>
<th>sd</th>
<th>95% CI of the difference</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents who had not attended 2009 EBP training (n = 34)</td>
<td>82.45</td>
<td>15.65</td>
<td>75.68–89.21</td>
<td>—</td>
</tr>
<tr>
<td>Respondents who had attended 2009 EBP training (n = 31)</td>
<td>93.57</td>
<td>18.65</td>
<td>87.52–99.61</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Evidence-based practice behaviours of survey participants according to cluster

The mean GAS T-score for all survey participants was 89.44 (sd 18.29). This is in contrast to the baseline GAS T-scores (prior to the RCT) of 54.05 (sd 13.81) and the 8-week KT intervention group GAS T-score (and the end of the RCT – primary endpoint) of 65.96 (sd 13.49). Respondents from cluster 4 were the highest performers, and cluster 3 were the poorest performing cluster at the 2-year mark with mean GAS T-score of 78.68 (see Table 18).

Table 18: GAS T-score according to original cluster

<table>
<thead>
<tr>
<th>Cluster</th>
<th>GAS mean T-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1 (n = 16)</td>
<td>91.15</td>
</tr>
<tr>
<td>Cluster 2 (n = 21)</td>
<td>95.94</td>
</tr>
<tr>
<td>Cluster 3 (n = 17)</td>
<td>78.68</td>
</tr>
<tr>
<td>Cluster 4 (n = 11)</td>
<td>96.42</td>
</tr>
</tbody>
</table>

Synopsis

This chapter presented the results from the 2-year follow-up study. The participant flow and results relating to all survey participants were presented first. Secondly, the flow of participants and results relating to participants who were in the original RCT as well as the 2-year survey were presented. Discussion and interpretation of these results are included in the following chapter, along with strengths, limitations, recommendations and conclusions for the entire project.
CHAPTER 7
DISCUSSION

Overview

The aim of this thesis was to measure the effectiveness of a multifaceted KT strategy to change AHPs’ EBP behaviour. We measured effectiveness by conducting a cluster RCT in 2009 and a follow-up study 2-years later. This chapter will provide interpretation of the findings along with implications and recommendations for research and practice.

1) Key findings providing a brief summary of the findings from both studies included in the doctoral programme

2) Interpretation and discussion of results regarding EBP behaviour

3) Interpretation and discussion of results regarding EBP knowledge

4) Interpretation and discussion of results regarding EBP attitudes

5) Interpretation and discussion regarding use of the EAS

6) Strengths and limitations of the studies

7) Recommendations for organisations and future research

8) Conclusions.

Key findings

Table 19: Key findings at a glance

<table>
<thead>
<tr>
<th>Study</th>
<th>EBP behaviour Self-rated (GAS)</th>
<th>EBP behaviour Peer-rated (GAS)</th>
<th>EBP knowledge (exam scores)</th>
<th>EBP attitudes (EBPAS subsets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT</td>
<td>Uncertain*</td>
<td>Uncertain*</td>
<td>Improved</td>
<td>No change**</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Improved</td>
<td>Not measured</td>
<td>Not measured</td>
<td>Not measured</td>
</tr>
</tbody>
</table>

* Uncertain = unable to confirm whether or not behaviour improved.

** No change = statistically significant improvement not detected.
Evidence-based practice behaviour

The multifaceted knowledge translation strategy did not result in statistically significant behaviour change over the 8-week RCT period

The KT intervention group in the RCT improved within the study period, but not statistically significantly more than the control group once clustering was accounted for. We consider this null finding to be a possible type II error because our study was underpowered owing to the fact that the number of participants required to account for clustering of EBP behaviours within sites exceeded the number of employees available. Owing to the type II error we remain unsure of the true effect of our KT strategy, but we discovered a number of potentially important findings that may contribute to future KT endeavours and the body of research.

Important findings

Outlying cluster

The high ICCs (ranging from 0.33 to 0.64) for EBP behaviour measures, indicated substantial correlation of behaviours within clusters, and indicated differences in behaviours between clusters. When we examined the mean change scores for each cluster, cluster 3 (who were a part of the control group) showed no statistically significant GAS T-score change from baseline to 8-weeks. Clusters 1 and 2, who received the KT strategy improved their GAS T-scores from baseline to 8-weeks. The remaining cluster (cluster 4, which was part of the control group) was an obvious outlier with the highest baseline GAS T-scores (higher than the post intervention scores of the other clusters receiving the KT intervention), high baseline knowledge scores and increased self- and peer-rated GAS T-scores over the study period.

Variability between natural groupings (such as clinical, departmental or regional) has been noted in the KT literature previously.\textsuperscript{15,164} Perhaps the high baseline EBP scores for cluster 4 reflected positive EBP culture and
practices due to cluster 4’s manager.\textsuperscript{15,83,209} The notion that a manager can strongly influence research culture is by no means new,\textsuperscript{89,164} as some opinion leaders are known to strongly influence EBP behaviour.\textsuperscript{209,210} Cluster 4’s manager was active in promoting EBP behaviour amongst staff. A large range of KT strategies were in place in cluster 4 prior to this study, including policies regarding certain EBP behaviours to be compulsory, audit and feedback, financial incentives, workshops and mentoring. It is conceivable that cluster 4 therefore had both better readiness and receptivity to EBP supports as they had essentially been engaging in active KT for a longer period than the other clusters.\textsuperscript{15} That said, positive EBP culture is considered to be related to positive EBP attitudes\textsuperscript{89} and EBPAS scores measuring attitude change of cluster 4 were no different from the other clusters at baseline or 8-weeks. This may have reflected measurement error, or may indicate that positive attitudes in cluster 4 were not necessary as mandatory policies within that cluster were the driving force behind the higher GAS scores.

**Behaviourally meaningful gains**

In the RCT, improvement in EBP behaviour was not statistically significant after adjusting for cluster effect, however similar improvements from peer-ratings suggest possible improvements that were behaviourally meaningful. The 2-year follow-up study adds weight to the notion that the improvement in the RCT was genuine, detecting improvement in EBP behaviour amongst survey participants. The large variability in behaviour observed between clusters in both the RCT and follow-up study suggests barrier assessments and subsequent KT strategies may need to target subgroups within an organisation.

**Allied health professional evidence-based practice behaviours improved over a 2-year period**

**Knowledge translation intervention group at 2-years**

Our hypothesis that AHPs’ 2-year post KT strategy GAS T-scores would be equal to or statistically significantly greater than the 8-week GAS T-scores
was confirmed (GAS T-score change = 29.58; 95% CI 12.66, 46.52; p = 0.02). This finding needs to be interpreted in light of the small sample in the 2-year group (25/135 original RCT participants responded to the survey, that is 35% of staff who were still employed). It is possible that the higher performers comprised a sizable part of the survey participants, and low responders chose not to do the survey.207,211 That said, an increase of 29.58 GAS T-score points is considered a clinically significant improvement in EBP behaviour, even if only a portion of AHP staff achieved that level of behaviour change. The fact that EBP behaviour improved over 2-years may mean that there was behaviour change during the RCT that was unable to be detected due to the type II error. Alternatively, it may suggest that EBP behaviours did not improve in the 8-week period but rather took time to improve.23 This position is supported by the fact that AHPs who received the KT strategy had statistically significantly higher 2-year GAS T-scores than AHPs who were not employed at the time of the KT strategy (93.57 compared to 82.53; p = 0.00).

It is also possible that the high GAS T-scores at 2-years are not representative of the RCT participants, and that the lower performers who did not respond would have lowered the mean score, however we are unable to confirm or deny this.

**All survey participants after 2-years**

‘All survey participants’ refers to AHPs who were a part of the RCT (n = 25), as well as AHPs who had joined the organisation since November 2009 (n = 41). The overall GAS T-score (89.44) was substantially higher than the KT intervention group’s 8-week GAS T-score, again suggesting considerable change in EBP behaviour. This however, must be considered in light of the low response rate (44% of all AHPs employed). It is plausible that the improvement in GAS T-scores was partially due to EBP behaviours being embedded in documentation and client processes. These included mandatory use of outcome measures and documentation of level of evidence
used when selecting client treatments. Interestingly, when 2-year GAS T-scores were examined according to the originally allocated clusters, one cluster (cluster 3) had a much lower mean GAS T-score than the other 3 clusters. Clusters 1, 2 and 4 all had GAS T-scores over 91, but cluster 3’s GAS T-score was 78.68. This may have been due to any of the following: (1) the documentation changes not being consistently applied in this cluster, (2) lower performers in this cluster electing to respond to the survey and the sample was therefore not representative of the entire cluster’s performance, or (3) the manager of that cluster not leading the change effectively. Whatever the reason, this finding suggests that KT strategies may need to be designed for different subgroups within an organisation, as EBP barriers may vary according to natural groupings such as worksite or profession.

Evidence-based practice knowledge

The multifaceted KT strategy improved evidence-based practice knowledge over the 8-week RCT period

Our hypothesis that the KT strategy would improve knowledge was supported with the KT intervention group knowledge exam scores showing a statistically significant improvement compared to the control group. Interestingly, knowledge scores were not affected by the cluster effect. This suggests that although participants within a cluster tend to have similar EBP behaviours, knowledge is not as susceptible to the influences of workplace context and peers. The finding also highlights how much more complex measuring and changing EBP behaviour is compared to EBP knowledge. This supports previous KT research findings that changes in knowledge do not always equate to changes in behaviour.
Evidence-based practice attitudes

The multifaceted knowledge translation strategy did not change evidence-based practice attitudes over the 8-week RCT period

Our hypothesis that EBP attitudes would improve was not proven correct and thus had to be rejected. Research measuring attitude change is conflicting, with some interventions reporting no change in attitudes and other studies reporting improvement in attitudes. We postulate the lack of change in EBP attitudes in our study may be explained by:

1) High baseline EBP attitudes, and there was conceivably a ceiling effect on the EBPAS. This was plausible as EBP had been a focus in the organisation for some time prior to the RCT. In this case, positive attitudes at baseline, increased knowledge scores and policy changes may together have resulted in the behaviourally meaningful changes observed. There is however no normative data for AHPs on the EBPAS, so it is difficult to say whether or not baseline attitudes were high compared to AHPs in other organisations.

2) EBPAS subsets potentially not being sensitive enough to detect attitude change and the psychometrics for sensitivity in this population are unknown.

3) The EBPAS being an accurate, sensitive measure and that attitudes did not improve from the KT strategy. This third possibility supports the notion that improved knowledge was not adequate to lead to statistically significant behaviour change, and that a shift in attitudes was also needed. Conversely, the behaviourally meaningful change that was observed potentially bypassed the need for attitude change by employing strategies such as mandatory use of documentation and outcome measures.
4) **EBP attitudes** taking a longer period of time than knowledge to change, and the 8-week trial was too short to detect change. We were unable to confirm or refute this, as EBP attitudes were not measured at 2-years. Interestingly, KT literature suggests that changing EBP attitudes does not necessarily lead to behaviour change\(^\text{16}\) even though there is some evidence suggesting that it is a precursor to behaviour change.\(^\text{164,215,216}\)

**Use of the evidence alert system**

**Allied health professionals accessed the Evidence Alert System and found it useful at 8-weeks and 2-years**

The RCT demonstrated increased use of our evidence-based resource (the EAS), however we were unable to confirm that this translated to a statistically significant change in EBP behaviour. This supports previous research that detected increased use and perceived usefulness of an evidence-based resource along with no changes in behaviour.\(^\text{172,203}\) The 2-year follow-up study suggested that the EAS has continued to be well accessed (25% AHPs use EAS > 1/week; 36.5% > 1/month). AHPs in study 2 reported that the EAS was almost always useful or often useful 62% of the time, and 27.8% found it occasionally useful. These results were also in-line with previous research reporting 70-80% usefulness ratings.\(^\text{203}\)

**Strength and limitations**

**Strengths**

**RCT**

The cluster RCT had a number of strengths including the rigorous design and broad robust behaviour measurement. Our chosen measurement instrument (GAS) was sensitive to change\(^\text{90,217}\) and appeared accurate as self-
and peer-rated scores mirrored each other. Distinguishing features of our study were that we measured a wide set of behaviours amongst AHPs working with people with cerebral palsy. The mix of AHPs in our sample is fairly representative of other community based disability organisations, increasing external validity. This is the first RCT in the KT literature involving social workers, psychologists or occupational therapists. The KT strategy itself was a study strength being based on a solid theoretical model, in response to a comprehensive barriers assessment, with desired outcomes clearly defined, and included a range of interventions, not only educational interventions.

2-year follow-up study

There were a number of strengths of this study. First, by using GAS as our primary outcome measure, we were able to nest this rigorous tool within a survey, making 2-year follow up feasible. Second, we measured EBP behaviour of a wide range of AHPs over a period of time, that were again a representative mix of AHPs in disability organisations. Third, the survey design enabled the development of additional questions relating to EAS use. Fourth, that data gathered provided important information for the organisation in planning future KT strategies. Fifth, the inherent strength of survey design obtained a snapshot of the EBP behaviours of the AHPs working at Cerebral Palsy Alliance at that point in time.

Limitations

RCT

There are a number of study limitations. First and foremost, the pragmatic constraints that limited the number of available clusters and participants led to low statistical power causing a probable type II error.

Second, the large differences observed between clusters suggest that we should have tailored the KT strategy to each cluster rather than the whole organisation as it appears the whole organisation was not homogenous.
Chapter 7 – Discussion

Third, the evidence base regarding whether proxy behaviour measures represent actual behaviour is not firmly established, but with preferred rival direct measures also lacking validity and reliability.\textsuperscript{189,218} Moreover, direct measurement was not affordable in our study given the geography involved, and indirect measurement tools were therefore used.\textsuperscript{163,219} To minimise measurement bias, systematic review recommendations regarding indirect measures were followed, and included using: (1) acceptable indirect measures\textsuperscript{189,219} (such as self- and peer-rated behaviour triangulated with unbiased web hit data),\textsuperscript{152} (2) measurement tools with strong psychometric properties,\textsuperscript{166} (3) more than one tool to measure behaviour change,\textsuperscript{167} and (4) a sound theoretical model as a basis of the intervention.\textsuperscript{55}

Fourth, the time frame of the trial was short considering that many EBP behaviours and system/organisational changes (such as documenting client goals and mentoring) take time to develop.\textsuperscript{173} Fifth, the return rate of the GAS exam form and EBPAS was not perfect (60–82\%), with the 8-week data having more missing data.

\textbf{2-year follow-up study}

First causal links between the original KT strategy and the 2-year data were unable to be definitively drawn for a number of reasons: (1) the nature of longitudinal design utilising survey methodology precluded certainty of findings, (2) at the 2-year mark there was no control group as both groups had received the interventions, (3) there was a lot of missing data due to staff turnover (47\%) and low response rates. Low response rates are a consistent problem in research involving health professionals.\textsuperscript{203,207} Low response rates lead to an unknown level of bias\textsuperscript{207,211} as we cannot be certain whether this sample were indeed representative of all AHPs in the organisation.
Recommendations

Future research

First, documenting the detail of each component of KT strategies along with barriers and facilitators is integral so that replication of successful strategies amongst AHPs is possible.16 Second, the RCT highlighted the methodological challenges of conducting empirical research in a community-based organisation with fixed cluster and participant numbers. Whether or not RCTs are a feasible option in community organisations is debatable. For this reason, conducting future KT research in the context of a solid theoretical framework or model, such as the KTA process is highly recommended. It may be that other research designs such as case studies, interrupted time series, qualitative studies and mixed methods are more appropriate164,220 to further explore which KT strategies are most effective. Third, the follow-up study encountered the well-reported problem amongst health professionals of low response rate, and it may be that incentives need to be offered to improve this.203 Fourth, research is needed measuring the effectiveness of KT strategies to improve not only AHPs’ EBP behaviour, but also the impact of KT strategies on client outcomes. Fifth, research is needed regarding the relative cost-effectiveness of KT strategies especially given that many components of KT strategies (workshops, paid EBP time, maintenance of evidence-based resources) are likely to be costly and ongoing.

Recommendations for organisations

Barriers assessment targeting subgroups

KT literature recommends tailoring KT strategies to overcome known barriers within organisations,65,221 however our findings suggest that this may need to go even further with KT strategies being designed for subgroups within an organisation. The impact of different workplace microcultures may mean that there are dramatically different barriers needing different KT strategies to be effective.15
Ongoing process of knowledge translation

All organisations experience turnover of staff including managers, AHPs and decision makers. When existing staff leave an organisation or new staff join there is an inevitable shift in organisational and interpersonal dynamics. The resultant dynamic may facilitate or impede the flow of research into practice. This means that monitoring EBP behaviour and assessing new barriers and facilitators is not a one-off task, but rather continuous, as depicted in the KTA process. The KTA process provides a flexible, pragmatic model to design, implement and measure a KT strategy in any setting. Decision makers need to be aware that embarking on KT to improve EBP behaviour is an ongoing long-term endeavour that may require extra resources.

Targeting managers and decision makers

Considering the importance of management-led change, targeting policy makers and managers may be beneficial. No studies directing KT to policy makers/management was found in the allied health literature. In the public health domain, Dobbins et al. found that sending individualised evidence to decision makers at the right time, led to an increase in evidence based policies. As managers are key people involved in implementing systemic changes that can lead to EBP behaviour changes, targeting KT strategies to managers and decision makers may be a wise use of resources.

Development and maintenance of evidence-based resources

 provision of high quality evidence is the cornerstone to KT, and evidence-based resources such as the EAS are therefore critical. Evidence-based resources need to be regularly updated to reflect most recent research findings and accommodate needs of AHPs. This role can be time consuming and decision makers need to ensure that adequate resources are allocated. The cost of employing staff to build and maintain an evidence-based resource may however be less than the cost of each AHP’s time to search and appraise research individually. Although resources such as the
EAS are an integral part of KT, published studies suggest that provision of evidence-based resources such as the EAS, are not enough to change EBP behaviour.\textsuperscript{13,164,203} It is therefore recommended that an evidence-based resource is one part of an ongoing KT strategy, and the EAS be developed further. In order for the EAS to be a level 5 evidence based information resource on the 5S pyramid, content would need to be integrated into client documentation systems to ensure that evidence is always a part of AHPs’ clinical decision making. Evidence that is individualised to the person and embedded so that the right information is delivered at the right time (‘push’ messages) are considered the gold standard.\textsuperscript{13,164}

**Co-operation between organisations**

Considering that the development and maintenance of evidence-based resources are costly and complex, opportunities for organisations to collaborate may be mutually beneficial.\textsuperscript{222} The opportunity for organisations to co-operate may however extend further than this. KT strategies could be designed jointly with barrier assessments conducted for each setting. Commonly beneficial KT strategies such as workshops and research syntheses could be developed and delivered collaboratively, saving significant resources and potentially improving overall outcomes.

**Conclusion**

This thesis presents original research investigating the effectiveness of KT strategies with AHPs. Two studies measuring change in EBP behaviour were conducted and although EBP behaviour appeared to improve in the hypothesised direction, methodological issues due to pragmatic constraints preclude certainty of our findings. This raises the question as to whether other research designs may be better suited to KT research in community-based organisations.\textsuperscript{164} Despite this, both studies make an important contribution to the scant AHP evidence base in KT.\textsuperscript{16,66} Our findings suggest that KT is a long-term process and KT strategies need to be customised to
subgroups within an organisation. Researchers, policy makers and clients need to effectively collaborate to ensure that reliable, relevant research becomes embedded into everyday care in an ongoing way.
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APPENDIX 1
Oxford Centre for Evidence-based Medicine

Brief description prepared by Bob Phillips.

Background

The Oxford Centre for Evidence-based Medicine (OCEBM) Levels of Evidence and Grades of Recommendation 1999 [1] were developed in response to a need for assessment of evidence beyond therapeutic interventions. They are an evolution of the Canadian Task Force on the Periodic Health Examination grading system of 1979. The development of the Oxford Levels of Evidence was in response to the writing of a series of guidelines for junior medical staff, the "Evidence-based On Call" project. They cover many aspects of the medical management of patients, including causation and diagnosis as well as therapeutic interventions.

Quality of evidence

The levels of evidence are derived from a matrix which has four axes, corresponding to the broad type of clinical question under consideration. These are "interventions/aetiology", "prognosis", "diagnosis" and "economic analysis". Each of these axes is divided into 5 broad levels of evidence, ranked from 1 (least potential bias) to 5 (most potential bias). The level allocation is primarily dependent on study design factors (e.g. randomisation in interventions, or independent reference standards for diagnosis). Other factors include outcome assessment (e.g. 'minus' when a result is too imprecise) and clinical sensibility (e.g. 'appropriate spectrum' of patients in diagnostic tests). See http://cebm.jr2.ox.ac.uk/docs/levels.htm

Strength of recommendations

The grade of recommendation is a compression of the 10 'levels' into 4 'grades', without any added deliberation or assessment. Level 1a to 1c studies give
grade A recommendations; 2a to 3b map to grade B; level 4 studies are grade C and level 5 or imprecise ('minus' level) studies give a grade D recommendation.

**Strengths and weaknesses**

The strengths of the OCEBM approach are in the detailed development of the levels of evidence. The different axes allow for questions related to diagnosis, aetiology and prognosis to be considered as 'evidence-based' as well as traditionally intervention-orientated recommendations. Another strength is in the partial incorporation of aspects of heterogeneity into the grade of recommendation. The detailed description of the study levels, and their objectivity, make reproducibility likely to be high. However, this detail may introduce problems for inexperienced users. A study estimating inter-tester reliability has been performed in the Oxford CEBM, and is under analysis (Personal Communication: RSP).

The weakness of the OCEBM approach can be summarised as the simplistic translation of level of evidence into grade of recommendation. No assessment is made of the clinical importance of the outcomes under consideration. There is no way of balancing of benefits or harms, nor assessment of applicability of the studies. There is no clear way of compiling the body of evidence (often of separate levels) into a single grade of recommendation, or differentiation of direct or indirect evidence.

**Target audiences**

The OCEBM levels of evidence and grades of recommendation are intended to be used by clinicians in practice. This approach is not intended for use by consumers or policy makers.
Guidelines made with the use of this approach

The OCEBM approach has been used most extensively by "Evidence-based On Call" to produce 37 guidelines in general (internal) acute medicine [2,3]. This project develops guidelines which are focussed currently on the needs of the postgraduate trainee clinician. The process is of systematic search of the literature, critical abstraction, explicit allocation of a level of evidence and summary into a guideline, with each statement given a summary grade of recommendation. All aspects of management, from initial presentation, diagnosis, investigation, treatment and prognostication are included in the guides.

The "Evidence-based On Call" internet system has recently been adopted by the UK National Health Service National electronic Library of Health (NeLH) [4]. An evaluation of user feedback and utilisation is planned.

Within the field of the project (guidelines in general acute medicine), the homogeneity of the clinical environment and the secondary or tertiary nature of most evidence used, ironed out some of the possible problems. Using the OCEBM approach at a different level in the health care system (e.g. primary care, where different populations are cared for) or across disciplines (e.g. with physiotherapists, when different training and structures are present) may be difficult. We are not aware of any group that has used the OCEBM grading system outside hospital medical practice.

Studies evaluating the application of guidelines made with this approach

Formal evaluations completed:

None to date.

Formal evaluations underway or planned:

The NeLH evaluation may include aspects of audit against selected "Evidence-based On Call" guidelines.
Informal evaluations:

Focus groups used during the development of the 'Evidence-based On Call' project demonstrated a desire for such information. A number of clinicians working with the developers of the "Evidence-based On Call" guidelines believed their practice had been altered by the information presented.

References

1. http://cebm.jr2.ox.ac.uk/docs/levels.html
2. http://www.eboncall.co.uk
<table>
<thead>
<tr>
<th>Grade of Recommendation</th>
<th>Level of Evidence</th>
<th>Therapy/Prevention, Aetiology/Harm</th>
<th>Prognosis</th>
<th>Diagnosis</th>
<th>Economic analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>1a</td>
<td>SR (with homogeneity) of RCTs</td>
<td>SR (with homogeneity) of inception cohort studies; or a CPG(^i) validated on a test set</td>
<td>SR (with homogeneity) of Level 1 diagnostic studies; or a CPG validated on a test set</td>
<td>SR (with homogeneity) of Level 1 economic studies</td>
</tr>
<tr>
<td></td>
<td>1b</td>
<td>Individual RCT (with narrow Confidence Interval(^ii))</td>
<td>Individual inception cohort study with ≥ 80% follow-up</td>
<td>Independent blind comparison of an appropriate spectrum of consecutive patients, all of whom have undergone both the diagnostic test and the reference standard</td>
<td>Analysis comparing all (critically-validated) alternative outcomes against appropriate cost measurement, and including a sensitivity analysis incorporating clinically sensible variations in important variables</td>
</tr>
<tr>
<td></td>
<td>1c</td>
<td>All or none(^iv)</td>
<td>All or none case-series(^v)</td>
<td>Absolute SpPins and SnNouts(^vi)</td>
<td>Clearly as good or better,(^vii) but cheaper. Clearly as bad or worse but more expensive. Clearly better or worse at the same cost.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>2a</td>
<td>SR (with homogeneity) of cohort studies</td>
<td>SR (with homogeneity) of either retrospective cohort studies or untreated control groups in RCTs</td>
<td>SR (with homogeneity) of Level ≥2 diagnostic studies</td>
<td>SR (with homogeneity) of Level ≥2 economic studies</td>
</tr>
</tbody>
</table>
|                         | 2b               | Individual cohort study (including low quality RCT; e.g., <80% follow-up) | Retrospective cohort study or follow-up of untreated control patients in an RCT; or CPG not validated in a test set | Any of:  
- Independent blind or objective comparison  
- Study performed in a set of non-consecutive patients, or confined to a narrow spectrum of study individuals (or both) all of | Analysis comparing a limited number of alternative outcomes against appropriate cost measurement, and including a sensitivity analysis incorporating clinically sensible variations in important variables |
<table>
<thead>
<tr>
<th>Grade of Recommendation</th>
<th>Level of Evidence</th>
<th>Therapy/Prevention, Aetiology/Harm</th>
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<th>Diagnosis</th>
<th>Economic analysis</th>
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<td>whom have undergone both the diagnostic test and the reference standard • A diagnostic CPG not validated in a test set.</td>
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<tr>
<td>2c</td>
<td>“Outcomes” Research</td>
<td>“Outcomes” Research</td>
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<tr>
<td>B</td>
<td>3a</td>
<td>SR (with homogeneity) of case-control studies</td>
<td></td>
<td></td>
<td>Analysis without accurate cost measurement, but including a sensitivity analysis incorporating clinically sensible variations in important variables</td>
</tr>
<tr>
<td></td>
<td>3b</td>
<td>Individual Case-Control Study</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>Case-series (and poor quality cohort and case-control studies (^{iii}))</td>
<td>Case-series (and poor quality prognostic cohort studies (^{iv}))</td>
<td>Any of: • Reference standard was unobjective, unblinded or not independent • Positive and negative tests were verified using separate reference standards • Study was performed in an inappropriate spectrum of patients.</td>
<td>Analysis with no sensitivity analysis</td>
</tr>
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<tr>
<td>D</td>
<td>5</td>
<td>Expert opinion without explicit critical appraisal, or based on</td>
<td>Expert opinion without explicit critical appraisal, or based on physiology, bench research or</td>
<td>Expert opinion without explicit critical appraisal, or based on</td>
<td></td>
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</tbody>
</table>
Appendix 1 – Oxford Centre for Evidence-based Medicine

<table>
<thead>
<tr>
<th>Grade of Recommendation</th>
<th>Level of Evidence</th>
<th>Therapy/Prevention, Aetiology/Harm</th>
<th>Prognosis</th>
<th>Diagnosis</th>
<th>Economic analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>physiology, bench research or “first principles”</td>
<td>bench research or “first principles”</td>
<td>“first principles”</td>
<td>economic theory</td>
</tr>
</tbody>
</table>

i. By homogeneity we mean a systematic review that is free of worrisome variations (heterogeneity) in the directions and degrees of results between individual studies. Not all systematic reviews with statistically significant heterogeneity need be worrisome, and not all worrisome heterogeneity need be statistically significant. As noted above, studies displaying worrisome heterogeneity should be tagged with a “-” at the end of their designated level.

ii. Clinical Prediction Guide.

iii. See note #2 for advice on how to understand, rate and use trials or other studies with wide confidence intervals.

iv. Met when all patients died before the Rx became available, but some now survive on it; or when some patients died before the Rx became available, but none now die on it.

v. Met when there are no reports of anyone with this condition ever avoiding (all) or suffering from (none) a particular outcome (such as death).

vi. An “Absolute SpPin” is a diagnostic finding whose Specificity is so high that a Positive result rules-in the diagnosis. An “Absolute SnNout” is a diagnostic finding whose Sensitivity is so high that a Negative result rules-out the diagnosis.

vii. Good, better, bad, and worse refer to the comparisons between treatments in terms of their clinical risks and benefits.

viii. By poor quality cohort study we mean one that failed to clearly defined comparison groups and/or failed to measure exposures and outcomes in the same (preferably blinded), objective way in both exposed and non-exposed individuals and/or failed to identify or appropriately control known confounders and/or failed to carry out a sufficiently long and complete follow-up of patients. By poor quality case-control study we mean one that failed to clearly define comparison groups and/or failed to measure exposures and outcomes in the same blinded, objective way in both cases and controls and/or failed to identify or appropriately control known cofounders.

ix. By poor quality prognostic cohort study we mean one in which sampling was biased in favour of patients who already had the target outcome, or the measurement of outcomes was accomplished in <80% of study patients, or outcomes were determined in an unblinded, non-objective way, or there was no correction for confounding factors.

Notes:

1. These levels were generated in a series of iterations among members of the NHS R&D Centre for Evidence-Based Medicine (Chris Ball, Dave Sackett, Bob Phillips, Brian Haynes, and Sharon Straus).

2. Recommendations based on this approach apply to “average” patients and may need to be modified in light of an individual patient’s unique biology (risk, responsiveness, etc.) and preferences about the care they receive.

3. Users can add a minus-sign “-” to denote the level of that fails to provide a conclusive answer because of:
a. EITHER a single result with a wide Confidence Interval (such that, for example, an ARR in an RCT is not statistically significant but whose confidence intervals fail to exclude clinically important benefit or harm)

b. OR an SR with troublesome (and statistically significant) heterogeneity.

c. Such evidence is inconclusive, and therefore can only generate Grade D recommendations.

Abbreviations:
SR – Systematic review
RCT – Randomised Controlled Clinical Trial
CPG – Clinical Prediction Guide
ARR – Absolute Risk Reduction
Rx – Prescription
APPENDIX 2

National Ethics Application approval letters

9 September 2009

Ms Lanie Campbell
CP Institute
P O Box 544
Darlinghurst NSW 2010

Dear Ms Campbell,

I am writing to you in regard to your NEAF Application for Ethical Clearance for your proposed research project to be undertaken as a staff research project at the University of Notre Dame Australia.

The title of this project is: "Effectiveness of Providing Communication Skills Training and Evidence Based Practice Training for Counseling Health Professionals: Clinical Decision Making and Outcomes of Care".

I am pleased to advise that your proposal has been reviewed by the University’s Human Research Ethics Committee and approval has been endorsed conditional on addressing the following:

- Researcher to include missing signature of Research on page 25

Please can you respond to the above by emailing Lorraine Mayhew at lmayhew@nmd.edu.au by Friday 25 September, 2009. Failure to respond could result in a suspension of the approval of ethics clearance. Should the design of the study, the choice of instrument, or its manner of administration be altered in any significant way as the study progresses, you will be required to provide an update of your clearance application for fresh consideration by the University.

On behalf of the University and the Human Research Ethics Committee, I wish you well with what promises to be a most interesting and valuable study.

Yours sincerely,

Lorraine Mayhew
Executive Officer, Human Research Ethics Committee
Research Office

cc: A/Professor Victor Nossar Acting Dean, School of Medicine, Sydney
    Professor George Mendz, School of Medicine, Sydney
Dear Ms Campbell

8th May 2012

Re: Effectiveness of providing communication skills training and evidence based practice training for changing health professionals clinical decision making and outcomes of care

Cerebral Palsy Alliance (formerly The Spastic Centre) Ethics Committee reviewed and approved your research application as above on 6th May 2009.

Unfortunately, the Ethics Committee has not received a report from your project’s Chief Investigator and I write to remind you that your last report was due on 1st May 2010.

I refer you to your original approval letter which outlined that under the 2007 National Statement for HREC’s, your ethics approval was granted on the condition of you agreeing to:

- Provide a summary of your progress on a yearly basis to the committee. A final report on completion and notification of any publications from this project is also requested. Failure to submit required reports will result in withdrawal of consent for the project to continue.

The Ethics Committee has noted with some disappointment your delay in responding to this obligation. If there has been any change in circumstances regarding your project with respect to its discontinuation or if you require an extension of ethics approval should your project not be completed within the time period specified in your approval letter, please advise us immediately.

If this however does not apply, the Ethics Committee requests that you provide a copy of a progress report by 8th June 2012 so that this can be tabled for the following Ethics Committee. Further delay may jeopardise the continued ethics approval.

Please do not hesitate to contact Deborah Hoffman, General Manager Strategy Research & Planning on (02) 9479 7223 if you wish to discuss any matter concerning this letter.

Yours sincerely

[Signature]

Andrew Buchanan
Chair, Ethics Committee
Member of the Board of Directors, Cerebral Palsy Alliance
Cerebral Palsy Alliance Ethics Committee is a NHMRC HREC: EC00402
APPENDIX 3
Evidence Alert System

Home page with four main sections – assessment, intervention, prognosis/prevalence and clinical algorithms. The following screenshots will show information within each of these sections.

Evidence Based Clinical Decision Making

The main aim of moving towards a model that encompasses evidence based decision making is for clients to be offered the best possible interventions for their individual situation. We have summarised the research findings in a number of areas relating to assessing and treating people with cerebral palsy. The information in this Evidence Based Clinical Decision Making section aims to provide a simple way to search the literature and appraise the evidence. You can search by word, for example ‘casting’, or you can browse through the 4 sections listed below.

Assessment
Intervention
Prognosis/Prevalence
Clinical Algorithms

What is Evidence Based Decision Making?

Evidence based decision making or evidence based practice (EBP) is the use of current best research evidence in making decisions about health care (Sackett et al, 2000). The essence of this thinking is that best available research evidence should be used to underpin clinical decision making to maximise health care outcomes for recipients of care (Stevenson et al, 2006).

Evidence based decision making can be thought of as an overlap between research findings, clinical expertise and client values. In this model, research findings are the major factor that influence clinical decisions. The following diagrams help illustrate these components of EBP.
Assessment

The assessment section includes goal setting, classification, outcome measure and assessment tools that are useful in clinical practice. There are a number of reasons to assess including wanting to diagnose, predict the course of a condition (prognosis) or measure change over time.

Contents

1 Useful definitions
   1.1 Norm referenced
   1.2 Criterion referenced
   1.3 Likert scale
2 Goal setting outcome measurement tools
3 Classification tools
4 Assessment Tools
5 Discriminative Assessment Tools
   5.1 Physiotherapy Assessment Tools
   5.2 Occupational Therapy
   5.3 Speech Pathology
   5.4 Psychology
   5.5 Others

Useful definitions

Norm referenced

Norm-referenced tests measure the performance of a person in relation to (compared with) a specific population (Spittle, 2008).

Criterion referenced

Criterion-referenced tests have criteria or a minimum competence that must be reached to score an item or pass the test. This compares the person’s performance with the test content, rather than a population (Spittle, 2008).
Assessment - Examples of types of assessments included

**Occupational Therapy**
- Assisting Hand Assessment
- Bruininks Oseretsky test of Motor Proficiency, second edition (BOT-2)
- Sensory Profile
- Computer Access Technology Options (COMPASS)
- Beery VMI
- Test of visual perceptual skills 3rd edition (TVPS-3)
- Evaluation tool of children’s handwriting-Manuscript (ETCH-M)
- Handwriting Speed Test

**Speech Pathology**
- Australian CELF-u (Clinical Evaluation of Language Fundamentals)
- Australian CELF-Preschool 2
- TAACL-R (Test for auditory comprehension of language-revised)
- Renfrew Action Picture Test
- Preschool Language Scale (PLS-4)
- Photo Articulation Test (PAT-3)
- Goldman Fristoe Test of Articulation
- Reynell Developmental Language Scales III
- Triple C Assessment
- Hundred Pictures Naming Test
- Peabody Picture Vocabulary Test-III
- Bracken basic concept scale (BBCS-3:R)

**Psychology**
Assessment - Example of an assessment that an occupational therapist might use

Bruininks Oseretsky test of Motor Proficiency, second edition (BOT-2)

Purpose/Description

Measures 53 gross and fine motor skills across 8 subtests (fine motor precision, fine motor integration, manual dexterity, bilateral coordination, balance, running speed and agility, upper limb coordination and strength). Norm referenced.

Population

- People aged 4 – 21 years

Go back to Assessment page

Go back to Evidence Based Clinical Decision Making

Categories: Evidence Based Clinical Decision Making | Assessment
Appendix 3 – Evidence Alert System

Intervention index page (p 1/2) (listed alphabetically: A through to M) - all interventions that have been rated are listed here

- Alternative and Complementary Approaches
- Augmentative and Alternative Communication
- Behaviour (Positive Support)
- Biofeedback
- Botulinum Toxin A
- Casting
- Conductive Education
- Context Therapy
- Communication Training
- Constraint Induced Movement Therapy (CIMT)
- Cognitive Orientation to Daily Occupational Performance (CO-OP)
- Dysarthria Therapy
- Dysphagia - postural and diet modification
- Dysphagia - Gastrostomy
- Early Intervention
- Electrical Stimulation (NMES & FES)
- Equipment and Assistive Technology
- Exercise
- Functional Training
- Fundoplication
- Gait Training
- Goal Directed Training (GDT)
- HABIT
- Handwriting Training
- Hippotherapy
- Home Programs
- Hydrotherapy/Aquatic Therapy
- Hyperbaric Oxygen
- Intrathecal Baclofen
- Literacy Interventions
- Massage

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Appendix 3 – Evidence Alert System

Intervention index page (p 2/2) (alphabetically: M through to W) – all interventions that have been rated are listed here

- Massage
- Neurodevelopmental Therapy
- Occupational Therapy
- Oral Motor Treatment
- Parent Education
- Phonological Awareness and Articulation Therapy
- Physiotherapy
- Play Therapy
- Pragmatics
- Seating
- Sensory Integration
- Speech and Language Therapy (general)
- Splinting and Orthotics
- Solution-focused brief therapy (SFBT)
- Strength Training
- Stretching/Range of Motion Exercises
- Surgical Interventions
- Training, Information Sharing and Support
- Treadmill Training
- Weight Bearing Exercise
- Whole Body Vibration

Go back to Evidence Based Clinical Decision Making

Category: Evidence Based Clinical Decision Making
Intervention - Example of an intervention (Botulinum Toxin A) (p 1/2)

**Aim**

Use injections of botulinum toxin to provide a short-term reduction to spasticity in muscles, providing potential opportunity to develop motor skills or facilitate care. Therapy often used in conjunction with Botulinum Toxin A to improve outcomes.

**Level of Evidence**

There is strong evidence that Botulinum Toxin A reduces spasticity in the following areas: paediatric upper limb, paediatric lower limb, adult upper limb, adult lower limb.

There is strong evidence that Botulinum Toxin A increases function in the following areas: paediatric upper limb, paediatric lower limb.

There is low level published research evidence supporting the effectiveness of Botox to increase function for: adult lower limb and adult upper limb.

Action: Caution - use this intervention and measure its effectiveness using an outcome measure (CDPM or GAS).
Intervention - Example of an intervention (Botulinum Toxin A) (p 2/2)

Relevant Articles

Background

Objective measurement of clinical findings in the use of botulinum toxin type A for the management of children with cerebral palsy

Roslyn N. Boyd and H. Kerr Graham, European Journal of Neurology Volume 6 Issue S4,3-35

Clinicians use a range of clinical and objective measures to quantify the positive and negative features (impairments) of the upper motor neurone syndrome. These measures play an important role in the assessment and selection of suitable candidates for intervention and monitoring of outcome. Intervention strategies often focus on the positive features; however, outcome may be more contingent upon the severity of the negative features. The clinical protocol for patient selection and treatment used by our multidisciplinary team is presented, together with details of the assessment procedure. Measurement tools in routine use are described, including: the Modified Ashworth Scale, the Modified Tardieu Scale (‘R1’), muscle length by joint range of motion ‘R2’, three-dimensional gait analysis, assessments of strength by the Medical Research Council Scale, Selective Motor Control, the Gross Motor Function Measure and the Observational Gait Scale. Three case studies of children with cerebral palsy who underwent botulinum toxin type A treatment as part of their management of gait disorder are presented, a 2-year-old girl with mild hemiplegia (‘true equinus’), a 3-year-old boy with moderate hemiplegia (‘apparent equinus’) and a 6-year-old girl with diplegia, where a targeted approach was used to treat a distal problem and resulted in correction of a proximal problem.

Upper Limb

Repeat injection of botulinum toxin A is safe and effective for upper limb movement and function in children with cerebral palsy.


The efficacy of repeated botulinum toxin A (BTX-A) injections in two and three dose regimes, together with occupational therapy, on upper limb movement and function, was studied using an evaluator blinded, randomized, controlled two-group trial. Forty-two children (31 males, 11 females; range 2-8 y; mean 4 y 19 d)
Prognosis/Prevalence

Behaviour and Mental Health
Epilepsy
Hearing Impairment
Hips/Orthopaedic Deformity
Incontinence
Intellectual Disability/Cognitive Functioning
Motor Function
Pain
Quality of Life
Sleep
Speech and Swallowing
Upper Limb
Visual Impairment
Other - including life expectancy, epidemiology, descriptions

Go back to Evidence Based Clinical Decision Making

Category: Evidence Based Clinical Decision Making
**Ambulatory Predictors**

Predicting future ambulation influenced by:

- Motor milestones at 2 years (ability to roll, sit, or stand)
- Type of CP
- Blindness
- Sitting at 2 yrs = strong walking predictor (ie 26x more likely to walk)
- Sitting independently at 2 yrs but not pulling to stand =
- 50% chance of walking +/- support by 6 yrs
- Sitting independently & pulling to stand at 2 yrs =
- 76% chance of walking +/- support by 6 yrs
- 40% chance of full ambulation by 14 yrs
- Very few children who roll but not sit independently at 2 yrs (GMFCS level IV) achieve full ambulation
- Of those who achieve full ambulation by 10 yrs, 96% were walking with support by 6 yrs

Follow the link to view Gross Motor Function curves.

**Prognosis/Prevalence of Motor Function - Relevant Articles**

**Gross muscle morphology and structure in spastic cerebral palsy: a systematic review.**


Aim: This systematic review and critical evaluation of the literature was conducted to determine how gross muscle morphology and structure are altered in individuals with spastic cerebral palsy (CP). Method: Electronic databases were searched for articles describing studies of muscle morphological and structural properties in individuals with spastic CP. Data describing muscle fascicle length, belly length, fascicle angle, cross-sectional area, volume, and thickness were extracted and effect sizes were computed for comparisons between individuals with spastic CP and typically developed individuals, between the paretic and non-paretic side in individuals with hemiplegia for all muscles examined, and across the full spectrum of gross motor function in
Clinical Algorithms

Clinical algorithms are also known as decision making trees. They are not meant to be prescriptive but rather assist you, the client, their family/carers and your team to make clinical decisions in a streamlined, consistent way. It also helps you to offer evidence based interventions to your clients resulting in the best possible outcomes.

The clinical algorithms are a work in progress, just like the rest of the wiki and we welcome comments and suggestions. Please email *Lanie Campbell*.

- Assistive Technology - Notetaker
- Assistive Technology - Switching
- Behaviour Management - Tantrums
- Botox - Lower Limb
- Botox - Upper Limb
- Cognitive Assessment
- Communication Assessment
- Communication - Non-verbal - Pre-Intentional
- Communication - Non-verbal - Intentional/Informal
- Communication - Non-verbal - Symbolic
- Communication - Verbal - Articulation
- Equipment
- Family Support
- Handwriting
- Mealtime
- Motor Training
- Orthotics
- Seated Mobility
- Self Care
- Sleep
Clinical Algorithms – example

Mealtime Management

Consider referral to dietitian for nutritional plan

Under/overweight, lost/gained weight unexpectedly?

YES  NO

Monitor weight over time

Liaise with nurse &/or dietitian to write non oral feeding procedures

Non-oral nutrition?

YES  NO

Assess oral intake

Physical assistance required to eat/drink?

YES  NO

SP/OT assessment of feeding skills

1. Consider adaptive equipment
2. Consider positioning strategies

Coughing/gagging during meals?

YES  NO

Assess assistive mealtime strategies

1. Consider pace modification &/or bolus size
2. Consider positioning strategies

Full swallowing assessment complete?

YES  NO

Mouth or teeth problems affecting
Evidence Based Decision-Making & Communication Skill Study

• Information Sheet for Staff Participants

What is evidence based practice?
Evidence based practice (EBP) is the use of current best research evidence in making decisions about health care. Health professionals’ agree that EBP is the optimal approach to providing services. EBP compels health professionals to ask important clinical questions, to attain and interpret the findings, and most importantly integrate the answers into healthcare services to optimise clinical outcomes.

The benefits of adopting a systematic EBP approach to health care are multiple: (a) increasing both the effectiveness and efficiency of the services provided; (b) assisting allied health professionals to be more reflective and analytical, whilst remaining creative; (c) providing justification of the need for allied health interventions; and (d) enhancing the credibility of the professions.

Good communication between health professionals and clients/patients is essential for the delivery of high quality care (Fellowes et al, 2008) and for communicating research findings to health consumers. Research has shown that communication skills training programmes in oncology are effective for improving communication skills; (Fellowes et al, 2008; Gysels et al; 2005), however there little to no research of this topic area in the disability field.

What is the purpose of the study?
You are invited to participate in a research project about the impact of providing an evidence-based practice (EBP) library along with a one/two day workshop on clinical decision-making and outcomes of care. The training and all tasks associated with it are compulsory for Spastic Centre allied health and community links staff to attend. The research project component is voluntary and is no extra work on top of the training; you just submit your assessment tasks to the research team to be included in the study. All information that is included in the research study is de-identified. You will assign yourself a code name and the researchers will not be able to re-identify you.

There are 3 broad aims of this study.
1. To find out whether the EBP library along with training for 3 days (2 days initially and 1 day 8 weeks later) changes the clinical decisions that the participants (allied health staff) make before/after the training
2. To find out whether the EBP library along with training for 3 days changes client outcomes
### What will you need to do?

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<tbody>
<tr>
<td>1</td>
<td>Information</td>
<td>First we would make sure you are fully aware of what is involved in the study and ensure that you meet the criteria to be involved in the study.</td>
</tr>
<tr>
<td>2</td>
<td>Consent</td>
<td>We would then ask you to sign a consent which ensures you have read and understood the material provided about the study and that you are willing to participate. We would also ensure that you have a consent form signed from the client/s that you plan to work with during the project.</td>
</tr>
<tr>
<td>3</td>
<td>Baseline Assessment</td>
<td>At the commencement of the training sessions, time will be set aside to complete the baseline assessments. There are a range of assessments, these include: completing a clinical case scenario exam, a survey questionnaire, and a case study form. You will be able to use whatever resources you normally use at work to complete these types of tasks, e.g. client files, computer, books</td>
</tr>
<tr>
<td>4</td>
<td>Randomisation</td>
<td>Your regional office will be randomised to one of 2 groups, either: evidence decision-making training or advanced communication training. You will not get a choice which group you are randomised to, but you will get to participate in both groups. After you have finished one type of training then you will proceed to the other type of training.</td>
</tr>
</tbody>
</table>
| 5 | Training | Evidence-based decision-making  
You will be provided with 2-days of workshop training on how to use an EBP library to assist you with decision making.  
Advanced communication training  
You will be provided with 2-days of workshop training on how to hone your communication skills necessary for delivering prognostic messages to clients and their families.  
Part 1  
Eight weeks later, you will present a case-study to your peers in the group using power-point about how you have integrated using the EBP library with a client on your case-load and what happened  
Part 2  
Eight weeks later, you will present a case-study to your peers in the group using power-point and an audio-tape about how you have integrated using the communication techniques with a client on your case-load and what happened |
| 6 | Midway Assessment | After the first 2 parts of the training is complete, you will complete the mid-way assessments. These include: completing a clinical case scenario exam, a survey questionnaire, and a case study form.  
Part 3  
Advanced communication training  
You will then be provided with the 2-days of workshop training on how to hone your communication skills necessary for delivering prognostic messages to clients and their families.  
Evidence-based decision-making  
You will then be provided with 2-days of workshop training on how to use an EBP library to assist you with decision making.  
Part 4  
Another eight weeks later, you will present a case-study to your peers in the group using power-point about how you have integrated using the EBP library with a client on your case-load and what happened  
Another eight weeks later, you will present a case-study to your peers in the group using power-point and an audio-tape about how you have integrated using the communication techniques with a client on your case-load and what happened |
| 7 | Final Assessment | After the training is complete, you will complete the final assessments. These include: completing a clinical case scenario exam, a survey questionnaire, and a case study form. |
The research team will collect all work that consenting participants have completed to analyse.
Appendix 4 – Information Sheet for Staff Participants

Are there benefits in participating?
Both workshops are considered to be beneficial for the professional development of allied health staff at The Spastic Centre. The EBP workshop aims to equip participants with the confidence, knowledge and practical skills to find, interpret and apply the latest evidence into their daily work. The Communication Skills workshop uses case studies and problem based learning to explore the approaches of delivering prognostic messages to clients and their carers.

Are there any discomforts, side effects and risks involved with the study?
There are no anticipated risks from being involved in this study. That said, in both workshops participants will be encouraged to reflect on their current therapy practice and this may be a challenging process for some participants. Some participants may find that the information being presented is quite different from their current practice and this also may be confronting. If you experience any distress from participating in this study – contact another investigator, your manager or the staff helpline.

Privacy and Disclosure of Data
The research team will respect all aspects of your privacy and you can be assured that your personal details will remain confidential at all times. Only the researchers will have access to information about you and the other participants and it will always be viewed in de-identified format. When the project is finished, a report about the study will be written. This report will be available for other people to read. The report will only present statistical and research findings. It will not reveal identifying information about any individual and no one will be named. All study information will be stored in locked cupboards or password protected electronic files.

Consent and Withdrawal
Participation in the research component of the training examining the effectiveness of EBP intervention is entirely voluntary. We will only include your information if you sign a consent form. If, in the future, you change your mind about being involved, you can withdraw your consent to participate. You do not need to provide any reason. You may access the information collected about you at any stage, by contacting The Spastic Centre. You will be informed about your progress throughout the study and will also be provided with a copy of the study results.

This Information Sheet is for you to keep. If you have any questions or would like to know more about this project, please contact:

Lanie Campbell
Research Assistant
Cerebral Palsy Institute
• Ph: 9802 4497
Email: lcampbell@tscnsw.org.au

Iona Novak
Head of Research
Cerebral Palsy Institute
Ph: 98024492
Email: inovak@tscnsw.org.au

Should you wish to talk to someone not involved in the study or make a complaint about the conduct of the research project, please contact:

Human Research Ethics Committee
The Spastic Centre
Telephone: 9479 7200
Email: cbeckett@tscnsw.org.au
APPENDIX 5
Self-evaluation Form

<table>
<thead>
<tr>
<th>PART 1:</th>
<th>Participant Information (8 questions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART 2:</td>
<td>Self-Ratings of Communication, Coaching, Goal-Setting, Evidence Based Practice &amp; Outcome Measurement Competencies (25 questions)</td>
</tr>
<tr>
<td>PART 3:</td>
<td>Evidence Based Practice &amp; Outcome Measurement Competencies (6 open-ended questions)</td>
</tr>
<tr>
<td>PART 4:</td>
<td>Evidence-Based Practice Attitude Scale Items (8 questions)</td>
</tr>
</tbody>
</table>
**PART 1: Participant Information**

1. Profession
   - ○ Conductor
   - ○ Early Educator
   - ○ OT
   - ○ PT
   - ○ Psych
   - ○ SP
   - ○ SW
   - ○ Welfare
   - ○ Other (please specify)

2. I am employed at The Spastic Centre as …….. (eg. Speech Pathologist, Family Support Worker)

3. Employment
   I have been working at The Spastic Centre for … ______ year/s

4. Grade Level
   I am employed as a …
   - ○ Level 1
   - ○ Level 2
   - ○ Level 3
   - ○ Manager (PM, RM)
   - ○ Other or N/A

4. Clinical experience in the disability field
   Including my time at The Spastic Centre I have been working with people with disabilities for … ______ year/s

5. Previous continuing education
   I have attended evidence based practice training before.
   - ○ Yes
   - ○ No

6. Previous continuing education
   I have attended communication skills training before.
   - ○ Yes
   - ○ No

* The same codename that you chose the first time you completed this form.
7. Language

English is my first language.

Yes ☐ No ☐
### PART 2: Self-Ratings of Communication, Coaching, Goal-Setting, Evidence Based Practice & Outcome Measurement Competencies

**INSTRUCTIONS:** Select the answer that most accurately reflects your practice today. If you do not know what an abbreviation or term means, tick ‘never’.

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1. I develop and document measurable goals with families/clients</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>2. I explore the feelings of families/clients during conversations</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>3. I conduct and document COPM interviews with families/clients to assist with service planning</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>4. I explore and express understanding to families/clients when strong emotions are present</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>5. I construct and document GAS scales to describe the expected outcome from intervention for families/clients</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>6. I undertake “difficult conversations” with families/clients rather than avoid the topic</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>7. I score and document my client’s COPM and GAS measures and use this information for planning</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>8. I name emotions that families/clients are experiencing during conversations</td>
<td>Never</td>
<td>1- 5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
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<tr>
<td>9. I determine and document my client's GMFCS or MACS level to help inform decision-making</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>10. I ask families/clients if they have access to personal support when I detect anxiety, or depression, or distress</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>11. I ask parents/clients to consent to joining the CP register and notify them to the register</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>12. I confirm that families/clients understood what I meant, even when the topic is difficult</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>13. I communicate news or facts to families/clients, to help them develop realistic expectations from intervention</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
</tr>
<tr>
<td>14. I use empathetic and supportive statements in response to emotion</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>15. I identify if a goal (in my speciality) is realistic based on assessment information and prognostic evidence</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>16. I ask open-ended questions to illicit more information</td>
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<tr>
<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>17. I reword goals with families/clients to be realistic, if they set goals that are unrealistic</td>
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<tr>
<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>18. I draw solutions out of families/clients rather than directing them to answers</td>
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<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>19. I check what interventions (in my speciality) have higher levels of supporting evidence, using e.g. databases, CATs</td>
<td></td>
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<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<td>20. I listen, reflect and give feedback for the greater part of conversations</td>
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<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>21. I select interventions with the highest levels of evidence that match the goals identified by my families/clients using a systematic EBP approach, e.g. CATs, PICO searches</td>
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<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>22. I prepare for conversations that I anticipate will be difficult prior to the meeting</td>
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<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>23. I communicate the outcomes of intervention to families/clients using outcome measures, even when goals aren’t achieved</td>
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<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>Question</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
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<tr>
<td>24. I name the issue when mine and the family’s/client’s viewpoints conflict</td>
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<tr>
<td>25. I summarise and check that the client understands the information I have shared</td>
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</table>
PART 3: Evidence Based Practice & Outcome Measurement Competencies

1. Name up to two valid, reliable, sensitive to change outcome measures that could be used with a client with cerebral palsy.

2. Choose 3 interventions from the list (attachment) and state the level of research evidence according to the STOP, MEASURE, GO system (attached).

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Stop/Measure or Go?</th>
</tr>
</thead>
</table>

3. A client is referred who wants to improve his walking, especially at school. He walks independently but falls quite a lot. He also is being bullied at school but is too frightened to tell anyone. He wonders if his poor articulation might have something to do with why he is bullied. He wants the bullying to stop but is not sure how to make it happen. Write one hypothetical goal that you could set for this client.

4. A client is referred who has a GMFCS of 5. He is 5 years old. What key messages would you be telling his parents regarding expectations for his future? OR an existing adult client stops being able to walk due to pain and wants to use a wheelchair. What key messages would you be telling them regarding this decision.

5. What types of studies/articles are considered to be high evidence?

Name 2 interventions for people with cerebral palsy that have high level evidence supporting their effectiveness.
### Part 4: Evidence-Based Practice Attitude Scale Items

**INSTRUCTIONS:** Select the answer that most accurately reflects your attitude today

**NOTE:** Manualized therapy, treatment, or intervention refers to any intervention that has specific guidelines and/or components that are outlined in a manual and/or that are to be followed in a structured or predetermined way.

<table>
<thead>
<tr>
<th>Item</th>
<th>Not at All</th>
<th>To a Slight Extent</th>
<th>To a Moderate Extent</th>
<th>To a Great Extent</th>
<th>To a Very Great Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to use new types of therapy/interventions to help my clients</td>
<td></td>
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<tr>
<td>I am willing to try new types of therapy/interventions even if I have to follow a treatment manual</td>
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<tr>
<td>I know better than academic researchers how to care for my clients</td>
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<tr>
<td>I am willing to use new and different types of therapy/interventions developed by researchers</td>
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</tr>
<tr>
<td>Research based treatments/interventions are not clinically useful</td>
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<tr>
<td>Clinical experience is more important than using manualized therapy/interventions</td>
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<tr>
<td>I would not use manualized therapy/interventions</td>
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<tr>
<td>I would try a new therapy/intervention even if it were very different from what I am used to doing</td>
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</tbody>
</table>
APPENDIX 6  
Peer Evaluation Form

<table>
<thead>
<tr>
<th>PART 1:</th>
<th>Peer-Ratings of Communication, Coaching, Goal-Setting, Evidence Based Practice &amp; Outcome Measurement Competencies (25 questions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART 2:</td>
<td>Evidence-Based Practice Attitude Scale Items (8 questions)</td>
</tr>
</tbody>
</table>
### Part 1: Peer-Ratings of Communication, Coaching, Goal-Setting, Evidence Based Practice & Outcome Measurement Competencies

**INSTRUCTIONS:** Select the answer that you think most accurately reflects your colleague. If you do not know what an abbreviation or term means, tick ‘never’.

<table>
<thead>
<tr>
<th><strong>Competency</strong></th>
<th><strong>Never</strong></th>
<th><strong>1-5% of the time</strong></th>
<th><strong>5-24% of the time</strong></th>
<th><strong>25-49% of the time</strong></th>
<th><strong>50-74% of the time</strong></th>
<th><strong>74-99% of the time</strong></th>
<th><strong>Always</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>They develop and document measurable goals with families/clients</td>
<td></td>
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<tr>
<td>They explore the feelings of families/clients during conversations</td>
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<tr>
<td>They conduct and document COPM interviews with families/clients to assist with service planning</td>
<td></td>
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<td>They explore and express understanding to families/clients when strong emotions are present</td>
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<tr>
<td>They construct and document GAS scales to describe the expected outcome from intervention for families/clients</td>
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<tr>
<td>They undertake “difficult conversations” with families/clients rather than avoid the topic</td>
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<tr>
<td>They score and document their client’s COPM and GAS measures and use this information for planning</td>
<td></td>
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<tr>
<td>Task</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
<td>Always</td>
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<tr>
<td>They name emotions that families/clients are experiencing during conversations</td>
<td>○</td>
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<td>○</td>
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<tr>
<td>They determine and document their client’s GMFCS or MACS level to help inform decision-making</td>
<td>○</td>
<td>○</td>
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<tr>
<td>They ask families/clients if they have access to personal support when they detect anxiety, or depression, or distress</td>
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<tr>
<td>They ask parents/clients to consent to joining the CP register and notify them to the register</td>
<td>○</td>
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<tr>
<td>They confirm that families/clients understood what they meant, even when the topic is difficult</td>
<td>○</td>
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<tr>
<td>They communicate news or facts to families/clients, to help them develop realistic expectations from intervention</td>
<td>○</td>
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<tr>
<td>They use empathetic and supportive statements in response to emotion</td>
<td>○</td>
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<tr>
<td>They identify if a goal (in their speciality) is realistic, based on assessment information and prognostic evidence</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Behavior</td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
<td>Always</td>
</tr>
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<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>They ask open-ended questions to illicit more information</td>
<td>❌</td>
<td>❌</td>
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<td>❌</td>
<td>❌</td>
<td>❌</td>
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<tr>
<td>They reword goals with families/clients to be realistic, if they set goals that are unrealistic</td>
<td>❌</td>
<td>❌</td>
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<td>❌</td>
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<tr>
<td>They draw solutions out of families/clients rather than directing them to answers</td>
<td>❌</td>
<td>❌</td>
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<td>❌</td>
<td>❌</td>
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<tr>
<td>They check what interventions (in my speciality) have higher levels of supporting evidence, using e.g. databases, CATs</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
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</tr>
<tr>
<td>They listen, reflect and give feedback for the greater part of conversations</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
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</tr>
<tr>
<td>They select interventions with the highest levels of evidence that match the goals identified by my families/clients using a systematic EBP approach, e.g. CATs, PICO searches</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>They prepare for conversations that they anticipate will be difficult prior to the meeting</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>They communicate the outcomes of intervention to families/clients using outcome measures, even when goals aren’t achieved</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>1-5% of the time</td>
<td>5-24% of the time</td>
<td>25-49% of the time</td>
<td>50-74% of the time</td>
<td>74-99% of the time</td>
<td>Always</td>
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<tr>
<td>-------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td><strong>They name the issue when theirs and the family's/client’s viewpoints conflict</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>They summarise and check that the client understands the information they have shared</strong></td>
<td></td>
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</tr>
</tbody>
</table>
### Part 2: Evidence-based practice attitude scale

**INSTRUCTIONS:** Select the answer that most accurately reflects your attitude today

**NOTE:** Manualized therapy, treatment, or intervention refers to any intervention that has specific guidelines and/or components that are outlined in a manual and/or that are to be followed in a structured or predetermined way.

<table>
<thead>
<tr>
<th></th>
<th>Not at All</th>
<th>To a Slight Extent</th>
<th>To a Moderate Extent</th>
<th>To a Great Extent</th>
<th>To a Very Great Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>They like to use new types of therapy/interventions to help their clients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They are willing to try new types of therapy/interventions even if they have to follow a treatment manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They think know better than academic researchers how to care for their clients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They are willing to use new and different types of therapy/interventions developed by researchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They think that research based treatments/interventions are not clinically useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They think that clinical experience is more important than using manualized therapy/interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They would not use manualized therapy/interventions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>They would try a new therapy/intervention even if it were very different from what they are used to doing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**APPENDIX 7**

**Marking Criteria for Exam**

**PART 3: Evidence Based Practice & Outcome Measurement Competencies**

**Scoring criteria**

Name up to two valid, reliable, sensitive to change outcome measures that could be used with a client with cerebral palsy.

- COPM
- GAS
- GMFM


**Notes:** GMFCS is a classification system, not an outcome measure

SP/Psych assessments are not outcome measures

Choose 3 interventions from the list (attached*) and state the level of research evidence according to the STOP, MEASURE, GO system (attached).

6 Points in total - 2 points for each correctly chosen intervention and matching evidence level

- If an intervention is written with no level of evidence = 0 points
- If intervention is written with partially correct level of evidence = 1 point

<table>
<thead>
<tr>
<th>Intervention examples</th>
<th>Stop/Measure or Go? examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botox</td>
<td>Green – 1 point as it is a partially correct answer</td>
</tr>
<tr>
<td></td>
<td>Green/Orange – 2 points as Botox evidence varies according to intervention area</td>
</tr>
</tbody>
</table>

A client is referred who wants to improve his walking, especially at school. He walks independently but falls quite a lot. He also is being bullied at school but is too frightened to tell anyone. He wonders if his poor articulation might have something to do with why he is bullied. He wants the bulling to stop but is not sure how to make it happen. Write one hypothetical goal that you could set for this client.
1 point for each SMART component – no half points allowed.

Specific – Is it clear what is going to be achieved?
Measurable – Is there a clear way stated to measure the progress and achievement of the goal?
Achievable/realistic – Is this goal realistic for the client? Is the time frame realistic?
Relevant - Is this a goal that will directly affect the client’s stated problem?
Time framed – Is a specific time frame mentioned?


<table>
<thead>
<tr>
<th>What types of studies/articles are considered to be high evidence? (max 2 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 point each for:</td>
</tr>
<tr>
<td>Randomised controlled trials, RCTs</td>
</tr>
<tr>
<td>Systematic reviews</td>
</tr>
<tr>
<td>½ point each for:</td>
</tr>
<tr>
<td>Meta-analysis</td>
</tr>
<tr>
<td>Cochrane Collaboration reviews</td>
</tr>
</tbody>
</table>

Name 2 interventions for people with cerebral palsy that have high level evidence supporting their effectiveness. (max 2 points)

See Evidence Alert System for evidence levels.
1 point for any GREEN intervention.
½ point for an intervention that is GREEN + ORANGE/RED
APPENDIX 8
2-year Follow-up Survey

It is 2 years since staff at the CP Alliance attended Life Needs Training. Life Needs Training included 2 modules (1) Evidence based Clinical Decision Making and (2) Communication and Coaching Skills. If you attended Life Needs Training in 2009, you will remember completing evaluation forms at the start and finish of each training module. This follow-up questionnaire is similar to the forms you completed 2 years ago. If you did not attend Life Needs Training we would still like you to complete the questionnaire. The questionnaire will take approximately 15 minutes and is completely confidential.

Codename

☐ I attended Life Needs Training and remember my codename
☐ I attended Life Needs Training and have forgotten my codename
☐ I did not attend Life Needs Training
| My codename is... |   |
Here is a list of the codenames from 2009. Look through the list to see if it helps jog your memory. If you don’t remember, please give yourself a new codename that is not on the list below.


My codename is....
Choose a codename that is NOT on the list below.


My codename is...
How long have you been an employee at the CP Alliance?
years
months

In which region of the CP Alliance do you work?
- North & East
- South West
- Hunter
- Rural
- Other (please specify)

What is your role at the CP Alliance?
- conductor
- early educator
- family therapist
- manager
- occupational therapist
- physiotherapist
- psychologist
- social worker
- speech pathologist
- Other (please specify)

What is your grade level?
- Level 1
- Level 2
- Level 3
- Level 4
- Manager (PM/PM)
- Other (please specify)

How long have you worked in the disability field?
years
months
Appendix 8 – 2-year Follow-up Survey

What is your background/professional training?
- education
- occupational therapy
- physiotherapy
- psychology
- speech pathology
- social work
- welfare
- Other (please specify)

Have you ever attended evidence based practice training? If you attended Life Needs Training, answer ‘yes’.
- yes
- no

Have you ever attended communication skills training? If you attended Life Needs Training, answer ‘yes’.
- yes
- no

Is English your first language?
- Yes
- No

How often do you access the knowledge hub (intervention section with evidence levels, assessment, prognosis/prevalence or clinical algorithms)?
- Every day
- 1-4 times/week
- 1-4 times/month
- 1-4 times/year
- Never

Comments

179
## Do you normally find what you are looking for?
- Yes
- No
- Sometimes
- I browse the knowledge hub rather than looking for specific information

Comments

## Is the information you find on the knowledge hub useful?
- Almost always useful
- Often useful
- Occasionally useful
- Rarely useful
- Never useful

Comments

## For what purpose do you access the knowledge hub? (you can select multiple answers)
- Information seeking with a specific client(s) in mind
- General interest (not related to a specific client)
- Presentation at conference, seminar, team meeting
- Service planning

Other (please specify)
### Appendix 8 – 2-year Follow-up Survey

<table>
<thead>
<tr>
<th>Task</th>
<th>Frequency Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>I develop and document measurable goals with families/clients</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
<tr>
<td>I explore the feelings of families/clients during conversations</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
<tr>
<td>I conduct and document COPM interviews with families/clients to assist with service planning</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
</tbody>
</table>
### Appendix 8 – 2-year Follow-up Survey

**I express understanding to families when they have difficult emotions and explore these emotion further**
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

**I construct and document GAS scales to describe the expected outcome from intervention for families/clients**
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

**I undertake “difficult conversations” with families/clients rather than avoid the topic**
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

**I score and document my client’s COPM and GAS measures and use this information for planning**
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always
### Appendix 8 – 2-year Follow-up Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I name emotions that families/clients are experiencing during conversations</strong></td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 75-99% of the time, Always</td>
</tr>
<tr>
<td><strong>I determine and document my client’s GMFCS or MACS level to help inform decision-making</strong></td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 75-99% of the time, Always</td>
</tr>
<tr>
<td><strong>I ask families/clients if they have access to personal support when I detect anxiety, or depression, or distress</strong></td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 75-99% of the time, Always</td>
</tr>
<tr>
<td><strong>I ask parents/clients to consent to joining the CP register and notify them to the register</strong></td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 75-99% of the time, Always</td>
</tr>
<tr>
<td>Statement</td>
<td>Options</td>
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<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>I confirm that families/clients understood what I meant, even when the topic is difficult</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
<tr>
<td>I communicate news or facts to families/clients, to help them develop realistic expectations from intervention</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
<tr>
<td>I use empathetic and supportive statements in response to emotion</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
<tr>
<td>I identify if a goal (in my speciality) is realistic based on assessment information and prognostic evidence</td>
<td>Never, 1-5% of the time, 5-24% of the time, 25-49% of the time, 50-74% of the time, 74-99% of the time, Always</td>
</tr>
</tbody>
</table>
I ask open-ended questions to elicit more information
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 74-99% of the time
- Always

I reword goals with families/clients to be realistic, if they set goals that are unrealistic
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 74-99% of the time
- Always

I draw solutions out of families/clients rather than directing them to answers
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 74-99% of the time
- Always

I check what interventions (in my speciality) have higher levels of supporting evidence, using e.g. databases, CATs
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 74-99% of the time
- Always
Appendix 8 – 2-year Follow-up Survey

I listen, reflect and give feedback for the greater part of conversations
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

I select interventions with the highest levels of evidence that match the goals identified by my families/clients using a systematic EBP approach, e.g. CATs, PICO searches
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

I prepare for conversations that I anticipate will be difficult prior to the meeting
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

I communicate the outcomes of intervention to families/clients using outcome measures, even when goals aren't achieved
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always
### I name the issue when mine and the family's/client's viewpoints conflict
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

### I summarise and check that the client understands the information I have shared
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

### I conduct follow-up assessments for GAS and COPM to measure outcomes for my clients/families at the planned time
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always

### I score and document GAS and COPM re-assessment totals/t-scores and calculate change scores
- Never
- 1-5% of the time
- 5-24% of the time
- 25-49% of the time
- 50-74% of the time
- 75-99% of the time
- Always
APPENDIX 9
Journal paper accepted for publication by Implementation Science

A KT intervention including the Evidence Alert System to improve clinician’s evidence-based practice behavior – a cluster randomized controlled trial

Lanie B Campbell¹§, Iona Novak², Sarah McIntyre³, Sarah J Lord⁴

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Word count: abstract – 323, manuscript excluding references – 5417
Appendix 9 – Journal paper accepted for publication by *Implementation Science*

**Background:** It is difficult to foster research utilization amongst allied health professionals (AHPs). Tailored, multifaceted knowledge translation (KT) strategies are now recommended but are resource intensive to implement. Employers need effective KT solutions but little is known about; (a) the impact and viability of multifaceted KT strategies using an online KT tool (b) their effectiveness with AHPs and (c) their effect on evidence-based practice (EBP) decision-making behavior. The study aim was to measure the effectiveness of a multifaceted KT intervention including a customized KT tool, to change EBP behavior, knowledge and attitudes of AHPs.

**Methods:** Evaluator-blinded, cluster randomized controlled trial conducted in an Australian community-based cerebral palsy service. 135 AHPs (physiotherapists, occupational therapists, speech pathologists, psychologists and social workers) from 4 regions were cluster randomized (n=4), to either the KT intervention group (n=73 AHPs) or the control group (n=62 AHPs), using computer-generated random numbers, concealed in opaque envelopes, by an independent officer. The KT intervention included 3-day skills training workshop and multifaceted workplace supports to redress barriers (paid EBP time, mentoring, system changes and access to an online research synthesis tool). Primary outcome (self- & peer-rated EBP behavior) was measured using the Goal Attainment Scale (individual level). Secondary outcomes (knowledge and attitudes) were measured using exams and the Evidence Based Practice Attitude Scale.

**Results** The intervention group’s primary outcome scores improved relative to the control group, however when clustering was taken into account, the findings were non-significant: self-rated EBP behavior [effect size 4.97 (95% CI - 10.47,20.41)(p=0.52)]; peer-rated EBP behavior [effect size 5.86 (95% CI -
Appendix 9 – Journal paper accepted for publication by *Implementation Science*

17.77,29.50](p=0.62)]. Statistically significant improvements in EBP knowledge were detected [effect size 2.97 (95% CI 1.97,3.97](p<0.0001)]. Change in EBP attitudes was not statistically significant.

**Conclusions** Improvement in EBP behavior was not statistically significant after adjusting for cluster effect, however similar improvements from peer-ratings suggest behaviorally meaningful gains. The large variability in behavior observed between clusters suggests barrier assessments and subsequent KT interventions may need to target subgroups within an organization.

**Trial Registration** Registered on the Australian New Zealand Clinical Trials Registry (ACTRN12611000529943).

**Key words**

KT, allied health, evidence-based practice, online KT tool.
Appendix 9 – Journal paper accepted for publication by *Implementation Science*

**Introduction**

Cerebral palsy is the most common physical disability in childhood. Of people with cerebral palsy, 3 in 4 are in pain; 1 in 2 have an intellectual disability; 1 in 3 cannot walk; 1 in 3 have a hip displacement; 1 in 4 cannot talk; 1 in 4 have epilepsy; 1 in 4 have a behavior disorder; 1 in 4 have bladder control problems; 1 in 5 have a sleep disorder; 1 in 5 dribble; 1 in 10 are blind; 1 in 15 are tube fed; and 1 in 25 are deaf. Allied health professionals (AHPs) who treat people with cerebral palsy are therefore faced with complex clinical decision-making. Also, like many other fields, new evidence-based cerebral palsy treatments are rapidly emerging. AHPs provide the majority of health services to these people and therefore need to have up-to-date knowledge and skills in providing evidence-based interventions. AHPs endorse providing evidence-based care, but good-will alone does not guarantee the latest research is translated and applied within practice. Survey research suggests that there is a significant gap between best available evidence and what treatments are actually offered to people with cerebral palsy. Lack of time, lack of skill searching and appraising research, and lack of access to databases compounded by large volumes of published research are barriers to new knowledge being translated in a timely and efficient way.

Knowledge translation (KT) strategies including workshops, mentoring, outreach visits, audit and feedback, and reminders and memos aim to embed research into practice and lead to small to moderate changes in health professional’s behavior. Even though KT is an emergent science, it is known that KT strategies should be tailored to be context specific, and planned in response to a thorough assessment of barriers and facilitators. Although there is no firm evidence that
multifaceted strategies are more effective than single interventions it is plausible that they would be more effective if each component and the overall strategy were designed in response to a barriers analysis\textsuperscript{65}. In the field of cerebral palsy a tailored KT intervention was pilot tested with good results, but the lack of a controlled comparison group precludes certainty of the findings\textsuperscript{102}.

In addition to tailoring KT interventions, it is recommended that theory is used to guide the KT journey\textsuperscript{55}. A number of KT frameworks have been proposed, that incorporate key theories suited for various target settings and professional groups. One example is the knowledge-to-action process (KTA)\textsuperscript{51} (Figure 1) which provides a comprehensive and flexible framework to guide and monitor a multifaceted KT intervention. Although the use of theory is recommended there are few rigorous studies detailing the application of theory to a KT intervention\textsuperscript{53}.

Central to the KTA process, and indeed the basic unit of a KT intervention is up-to-date research being available and accessible to the target group\textsuperscript{51,65}. The basis of a KT intervention is synthesis of research in the form of systematic reviews, evidence summaries or online KT tools. Although health professionals generally prefer systematic reviews to original research articles\textsuperscript{67} they still report that systematic reviews do no always answer their clinical questions\textsuperscript{13,68}. There is an increasing call for customized, easy to read summaries. Straus and Haynes (2009) describe the ‘5S’ model\textsuperscript{13,118} for organizing evidence-based information resources (Figure 2).
model is displayed in a pyramid with 5 levels (studies, syntheses, synopses, summaries, systems) that aim to be increasingly readable, reliable and relevant as one moves up the pyramid. The top two levels (summaries and systems) may also be referred to as KT tools. Straus and Haynes recommend a top down approach for answering clinical questions.

<Insert figure 2 approximately here - 5S pyramid with examples from the allied health professions (adapted from Straus & Haynes, 2009)>

Previous studies measuring the effectiveness of evidence-based information resources (5S pyramid level 3) detected a change in use however did not detect a change in EBP behavior. Dobbins and colleagues found that targeted messages (5S pyramid level 3-4) were more effective than knowledge brokering and access to research evidence for incorporating evidence into public health policies and programs. Although evidence-based information resources are available for AHPs (PEDro, OTseeker, SpeechBite) they are at 5S pyramid level 3 (synopses), and no studies have rigorously evaluated the usefulness of these tools. There are no KT tools (5S pyramid levels 4 or 5) found in literature specifically targeting AHPs working with people with cerebral palsy.

KT tools presenting up to date research in a user-friendly way, is however only one piece of a KT strategy. Changing EBP behavior is complex as there is a range of behaviors required to be an ‘evidence-based AHP’. Previous studies have either used self-developed measures or have only measured a narrow domain of EBM
behavior. KT research in the allied health professions measuring EBP behavior across a range of AHPs is also absent from our evidence base.

The primary aim of this cluster RCT was to evaluate the effectiveness of a multifaceted KT intervention for improving EBP behavior of AHPs. The central element of the KT intervention was an online evidence-based information resource called the Evidence Alert System (EAS). The EAS contained actionable messages (5S pyramid level 4 and 5), clinical decision-making tools and used the ‘top-down’ approach. The other elements of the multifaceted intervention (workshop, mentoring and documentation changes) reinforced, educated and supported the approach set out in the EAS ensuring that the decision-making tools were embedded into the participant’s workflow. The secondary aims were to measure the effect of the KT intervention on EBP knowledge and attitudes. Our study sought to address key gaps in the current KT evidence by: (a) using an RCT to measure the effect of a multi-component KT intervention centred around the EAS (b) measuring a wide range of EBP behaviors, and (c) sampling a wide range of AHPs. Aims were measured at the individual participant level. Findings are reported according to the updated CONSORT statement for cluster randomized trials.

Methods

Trial design and study setting
A multi-site evaluator-blinded, cluster RCT was conducted in a community based cerebral palsy service in New South Wales (NSW), Australia. NSW is the largest state with a population of approximately 7.25 million people (32% of Australia’s total population). The cerebral palsy service had 16 sites across NSW, organized
into 4 geographically distinct regions, where AHP services were provided. Each region had centralized management for the sites within its boundaries including clinical seniors, professional development activities and mentoring, and thus were considered natural cluster groupings. An independent officer not associated with the trial, used computer generated random numbers, to create four opaque envelopes based upon simple randomization. Four geographically distinct clusters were randomized to the intervention or control group. Cluster randomization was chosen to reduce risk of contamination that may have occurred if individuals working at the same site were randomized to different interventions. Individual participants were consented after randomization for pragmatic reasons. The first author (LC) obtained participant’s written consent and data collection took place before and after the workshops, at worksites or nearby locations, between June 2009 and August 2009.

Ethics
The project was approved by the National Health and Medical Research Council Human Research Ethics Committee at Cerebral Palsy Alliance (Approval number: 2009-05-01) and University of Notre Dame Ethics Committee. The study was registered with Australian New Zealand Clinical Trials Registry (ACTRN1261100529943).

Participants
Eligible participants were AHPs employed at the study site providing direct clinical services to people with cerebral palsy and their families. Figure 3 shows the flow of participants through the study. Exclusion criteria were: (1) managers (non-clinical staff); (2) staff without university qualifications, and (3) staff who were not scheduled to work on the day of the workshops.
Intervention

Theoretical model

The theoretical model underpinning the project was the KTA process (Figure 1) developed by KT field leaders. The KTA process first, involves knowledge creation (i.e. production of research syntheses) and second, knowledge application (i.e. identification of the research-practice gap, adaption of the research syntheses to local context; identification of utilization barriers; selection of tailored KT strategies to redress barriers; monitoring, evaluating and sustaining EBP implementation use). Emerging evidence suggests that KT interventions underpinned by theory may be superior to those that are not theoretical-informed although more research is needed to confirm this. The advantage of theory-informed KT interventions is that they offer a generalizable framework for other researchers and organizations and provide guidance for designing KT interventions to overcome known barriers.

Assessment of barriers and facilitators

A comprehensive assessment of barriers and facilitators was done over a one-year period. This took the form of (a) meetings between managers, policy makers, researchers, senior clinicians and knowledge brokers (b) observation of clinical staff. As there is no firm evidence regarding the superiority of one KT intervention over another researchers and knowledge brokers jointly designed the KT intervention based on whether or not the barrier was modifiable by a pragmatically feasible
Modifiable barriers included lack of (a) skill (b) time and (c) knowledge. Partially modifiable or non-modifiable barriers were: (a) that evidence was considered not clinically relevant (b) that staff did not have access to full electronic databases and (c) some staff had negative attitudes towards EBP. Modifiable barriers, theoretical underpinnings and strategies for the KT intervention are detailed in Table 1. Details of how the components of our multifaceted intervention correspond to the KTA process are shown in Table 5.

**Development of multifaceted intervention**

Strategic planning meetings were held every 6-weeks in the year leading up to baseline and included researchers, knowledge brokers, policy makers and managers. Knowledge brokers were senior staff with allied health backgrounds (one per discipline employed in the most senior role for each discipline). Policy makers were the senior executive staff and managers involved in direct management of AHPs in the organization. Goals around EBP behaviors were set and strategies to achieve these goals were jointly selected based on barriers literature and assessment of the study site. The EAS formed the basis of our KT intervention and was developed by research staff and knowledge brokers using freely available software MediaWiki (Figure 4). The EAS included succinct summaries of all the CP research evidence about intervention, prognosis and outcome measurement. Intervention evidence was labeled using the traffic light system where each intervention was given a traffic light color with an actionable message attached. Green='Go' if high quality evidence supports the effectiveness of this intervention, Yellow='measure' where low quality or conflicting evidence supports the effectiveness of this intervention, therefore measure the outcomes of the intervention to ensure the goal is met, and RED='stop'
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where high quality evidence demonstrates intervention is ineffective, therefore do not use this approach. Decision making algorithms with embedded evidence summaries were also available on the EAS. Each section of the EAS included abstracts of research articles, descriptions of the intervention or assessment and a hyperlink to access the full article.

*Insert Figure 4 approximately here - Infogram showing the Evidence Alert System (EAS)*

**Experimental group intervention**

The intervention group (total n=73; region A=39; region B=34) received a multifaceted KT intervention. (1) 3-day skills training workshop that included: Part 1 (2 days) of the interactive workshop provided training to apply the EAS to decision-making within daily clinical work. A series of clinical examples were explored using the interface of the EAS, training about evidence levels, clinical decision-making algorithms and use of two psychometrically sound, cross disciplinary outcome measures. Part 2 (1 day) of the workshop 8-weeks later involved participants presenting a case study detailing how they used the EAS to inform their clinical decision-making with a real patient. This was followed by discussion with a small group of colleagues designed to help participants demonstrate the integration of their learning into their own clinical work. Investigators and each senior clinician led the workshops using knowledge brokering strategies. There was a mix of instructional techniques including didactic, interactive, role-playing and reflection. There was collaboration within and between professional groups. (2) Access to the EAS, (3) policy changes that participants were informed of included: paid,
quarantined EBP time, changes to client documentation including reminders to use the EAS, embedding outcome measurement within workflow and mentoring by knowledge brokers.

The KT intervention was directed at the cluster level (3-day workshop-part 1, access to the EAS and policy changes) and individual level (mentoring, and 3-day workshop-part 2). Details of the KT intervention are shown in Table 5.

<Insert Tables 1 & 2 approximately here>

Control group

The control group (total n=62; region C=29, region D=33) received an equal intensity intervention about communication skills with no EBP content and no use of the EAS: (1) 3-day workshop about AHP-client communication skills and (2) workplace supports (paid communication time, strategic planning, mentoring) about communication skills. To minimize the risk of contamination, the control group was not informed about the EAS, paid EBP time, knowledge brokers or mentoring until the end of the trial. The changes to documentation were not implemented in the control group clusters until the end of the RCT.

Outcome measures

Primary outcome

The primary endpoint was change in self- and peer-rated EBP behavior from baseline to 8-weeks (individual and cluster level) measured using Goal Attainment Scaling (GAS). Participants rated themselves against the self-GAS scales, and then to limit measurement bias, in a separate environment, a well-acquainted peer rated their performance on the peer-GAS scales. Selection of the GAS instrument increased
study rigor because it overcame known instrumentation limitations in the KT literature surrounding EBP behavior measurement, including: (1) Responsivity – GAS has established validity, reliability, and exquisite responsivity to change, whereas systematic review evidence indicates that for nearly all valid and reliable EBP instruments, test responsivity is unknown.\(^\text{152}\); (2) Tailoring – GAS is an individualized measure of change, and so progress towards any target behavior (including health professional behaviors\(^\text{163}\)) could be validly, reliably and sensitively measured, including tailored EBP behaviors unique to the study site e.g. notifications to the Cerebral Palsy Register; (3) Comprehensive measurement – GAS is an individualized measure of change, and so we could comprehensively measure all desired EBP behaviors, whereas systematic review evidence indicates that other psychometrically sound EBP instruments measure knowledge instead of behavior, or are limited because they only measure one discrete aspect of EBP behavior\(^\text{152,155,164,165}\); (4) Lack of gold standard tool – Accurate, gold-standard, flawless measurement of EBP behavior is not yet established in literature.\(^\text{166}\) Even though direct observation of EBP behavior (such as simulated patients, video/audio recordings of practice) is perceived as methodologically preferable to indirect (proxy) reports of EBP behavior (such as chart audit, patient report, self-report, or peer-report), systematic review evidence indicates that direct measures often fail validity testing.\(^\text{166}\) This could have introduced other flaws to our clinical trial. Moreover, collecting direct measures throughout NSW, being a state-wide service, would have introduced prohibitive trial costs (NSW’s landmass is 3.25 times larger than the United Kingdom, and is larger than California and New Mexico combined), when the cost-benefit of a potentially invalid measure is weighed-up. Even though self-report proxy measures are an imperfect measure of actual behavior\(^\text{167}\), leading
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KT agencies, such as the Canadian Institutes of Health Research advocate for self-report because the process of self reflection plays a critical role in initiating behavioral changes within organizations. In light of current EBP behavior measurement limitations, GAS offered the best way forward since it was psychometrically sound, it comprehensively measured EBP behavior, was practical across an entire state and could be tailored to the study site.

The GAS scales were devised by a multidisciplinary panel of experts familiar with EBP behaviors of the eligible AHPs, as per literature recommendations for scale establishment. Twenty-five goal scales were developed, half relating to EBP behaviors and the other half relating to communication behavior for the control group. The scales measured EBP behaviors such as: use of gold standard goal-setting tools to plan services; use of cerebral palsy classification systems to accurately prognosticate; use of evidence (e.g. via the EAS) to quickly choose evidence-based classification systems, interventions and outcome measures; and use of gold standard outcome measures to routinely evaluate services. The GAS scales are available from the corresponding author by request. As per the test manual, raw scores were converted to GAS T-scores, enabling inferential statistical analysis of continuous data.

*Secondary outcomes*

Self- and peer-rated attitude changes were measured using subsets 3 and 4 of the Evidence Based Practice Attitude Scale (EBPAS)\(^{124}\), which is psychometrically permissible. EBP knowledge was measured via open-ended exam questions with right/wrong answers, pre-defined by the panel of experts, derived from published evidence.
EAS utilization was measured by number of web page hits collected via a software program that tracked cluster-specific IP addresses in batches. Web hit data collection was concealed from participants, minimizing the likelihood of observer bias affecting EAS use.

Adverse events: An adverse event log was not required because the intervention was educational in nature and therefore posed no risk.

**Blinding**

Blinding was judiciously applied wherever pragmatically possible, resulting in a single-blinded trial. This included: (1) independent evaluator blinding to group allocation and phase of the trial when scoring outcome data (2) partial participant and facilitator blinding to the specific EBP behavior of interest to the investigators. Participants and workshop facilitators were clearly aware of the content of the workshops, however were not aware of which intervention (KT intervention or communication skills) was of specific interest to the researchers. Fidelity of the evaluator blinding was not formally investigated.

**Sample size**

We sought to test the efficacy of an organizational KT intervention and therefore conducted the study within one agency, which is the largest of its kind in Australia. This methodological decision imposed pragmatic limitations on the obtainable sample frame. We successfully recruited 88% of the available sampling frame, however the total number of employees at the agency was less than the number of participants required to reach statistical power if correlation of outcome variables within sites was observed (intra-cluster correlation). A sample size calculation
identified the probability of detecting an effect size of 1 at an alpha level of 0.05 (one-tail) and a power of 90%. For Goal Attainment Scaling [mean T-score=50, standard deviation (sd)=10] an improvement of 10-points or more in the KT intervention group than the control group was sought, (improvement of 1 sd). The expert panel agreed that a 10-point increase in GAS T-scores equated to significant clinical improvement in EBP behaviors. The calculation assumed a 20% non-consent rate and a 20% attrition rate indicating a sample size requirement of 72 (38 per group) for a non-cluster trial. We enrolled 135 professionals (n=73 interventions and n=62 controls) at 4 sites. Based on estimating an intra-cluster correlation co-efficient (ICC) of 0.1 we calculated that the study was underpowered to demonstrate an improvement of 10 points between groups if a cluster effect of this size was observed (Variance Inflation Figure =4.3).

Statistical analysis

All statistical analysis was carried out with individual participants as the unit of analysis on an intention-to-treat basis by using SPSS for Windows 19.0.0 (SPSS Inc, Chicago, IL) and SAS 9.3 (SAS Institute, Cary NC).

We conducted generalized linear regression analysis for primary and secondary endpoints, using post intervention GAS T-score as the outcome variable and adjusting for potential confounding variables (baseline GAS T-score, profession, group allocation, grade level and years in the disability field). Effect sizes with 95% confidence intervals (CIs) were calculated and significance was set at 0.05. These estimates would underestimate the standard errors and confidence intervals for the effect size if participant outcomes are correlated within cluster sites, thus mixed
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effects models with cluster included as a random effect were used to adjust for a
cluster effect to calculate the effect size for each outcome\textsuperscript{195}. ICC was calculated
from the mixed effects model and bootstrapping (1000 samples generated) was
performed to calculate 95\% confidence intervals for the ICC.

Results

A total of 135 AHPs (n=73 interventions and n=62 controls) were recruited (see
Figure 3), which was 88\% of the available sampling frame. At baseline, participant
attributes were mostly comparable between groups, the exception being prior EBP
education attendance (88\% compared to 66\% for controls) (see Table 3). To account
for this baseline difference, prior EBP education was treated as a covariate in the
regression model. Included professionals were physiotherapists (24\%), speech
pathologists (26\%), occupational therapists (37\%), psychologists (6\%) and social
workers (7\%). 64\% of participants had over 5 years experience working with people
with disabilities although 63\% of the cohort had worked at the study site for less than
5 years. 94\% of the sample had English as their first language. The return rate for the
GAS and EBPAS ratings were between 60-82\% (see Figure 3), with the primary end-
point having more missing data. The KT intervention group had 19/73 (31\%) 8-week
GAS forms missing, compared to the control group who had 17/62 (30\%). This
difference between groups was not statistically significant (chi square p=0.95).

<Insert Table 3 approximately here>

Clustering effect

The ICC for the primary endpoints were 0.33 ( 95\% CI 0.16,0.69) for self-rated GAS
T-scores, that is 33\% of the total variation observed in self-rated GAS T-scores can
be attributed to differences between the sites, (rather than differences between individuals within each site), and 0.64 (95% CI 0.36, 0.80) for peer-report GAS T-scores (Table 4), that is 64% of the total variation observed peer-rated GAS T-scores can be attributed to differences between sites. These results demonstrate the correlation of GAS T-scores within sites was very large, whereas there was a large variation in scores between sites. This cluster effect substantially depleted the study power (because participant scores within each site cannot be regarded as independent). ICCs were smaller for secondary outcomes (Table 4).

**Effectiveness of KT intervention**

*Primary outcome – EBP behaviors*

Self-rated GAS T-scores increased more in the intervention group compared to controls however this difference was not statistically significant after adjusting for the cluster effect; Effect size 4.43 [95% CI -10.63 to 19.49 (p=0.56)] (Table 4).

Baseline self-rated GAS T-scores were a predictor in the model [Effect size 0.71 (95% CI 0.52–0.90) (p<0.0001)]; indicating lower performers improved but remained lower performers, and higher performers improved and remained leading performers. No other covariates were significantly predictive of outcome.

Peer-rated GAS T-scores of the intervention group also increased compared to controls, but this difference was also not statistically significant after adjusting for the cluster effect: effect size 6.75 [95% CI -16.95 to 30.44 (p=0.57)] (Table 4).

Similar to the self-rated GAS T-scores, the final peer-rated GAS T-score was predicted by the baseline peer-rated GAS T-score [effect size 0.30 (95% CI 0.15–0.45) (p<0.0001)]. No other covariates were significantly predictive of peer-rated GAS T-scores. The peer-rated GAS T-scores for each cluster mirrored the self-rated GAS cluster T-scores, suggesting the observed study effects were behaviorally
meaningful, despite low study power to demonstrate a statistically significant
difference.

<Insert Table 4 approximately here>

Secondary outcomes – EBP knowledge and attitudes
EBP knowledge scores increased compared to controls, with a statistically significant
effect size of 2.97 (95% CI 1.97, 3.97, p<0.0001). The ICC for this outcome was
zero, and this effect remained statistically significant after adjusting for the cluster
effect: 2.97 (95% CI 1.97, 3.97, p<0.0001). Baseline score (p<0.0001) and
professional category (p=0.03) were also predictors in the model. There was minimal
to no correlation between participants within sites for self- or peer-rated EBP
attitudes, however we did not demonstrate a statistically significant intervention
effect (Table 4). The intervention group accessed the EAS more than the control
group (KT intervention group 6123 total hits; control group 1677 hits).

Secondary analyses examining mean outcome scores for each cluster revealed that
both clusters in the KT intervention group improved their self- and peer-rated GAS
T-scores as expected (Table 5). One of the control group clusters (cluster 3) also
responded as expected, with very minimal increases in self- and peer-rated GAS T-
scores from baseline to 8-weeks (self-rated T-score change = 0.22; peer-rated T-
score change=2.27). The other control group cluster (cluster 4) had high baseline
scores (self-rated GAS T-score=66.41; peer-rated GAS T-score=73.32) and further
improved by 10.15 points over the 8-week study period, despite not receiving the KT
intervention (Table 5). We performed post-hoc Spearman’s correlation tests to assess
for correlation between knowledge and attitude scores (at baseline, 8-weeks and
change scores) overall, by treatment group, and within individual clusters. No statistically significant positive correlations were found.

<Insert Table 5 approximately here>

**Discussion**

We conducted a cluster RCT to evaluate whether a multifaceted KT strategy changed AHP’s EBP behaviors. Both clusters in the KT intervention group improved within the study period, but not statistically significantly more than the control group. We consider this null finding to be a probable type II error because our study was underpowered owing to the fact that the number of participants required to account for clustering of EBP behaviors within sites exceeded the number of employees available. Our study demonstrated increased use of our evidence-based resource (the EAS), however we were unable to confirm that this translated to a statistically significant change in EBP behavior. This finding is in line with previous research involving evidence-based resources.\(^{172,203}\) Owing to the type II error we remain unsure of the true effect of our KT intervention, but we discovered a number of potentially important findings that may contribute to future KT endeavours and the body of research.

The high ICCs (ranging from 0.33 to 0.64) for EBP behavior measures, indicated substantial correlation of behaviors within clusters, and indicated differences in behaviors between clusters. When we examined the mean change scores for each cluster, one of the four clusters (cluster 4), which was randomly allocated to the control group, was an obvious outlier with high baseline GAS T-scores, high
baseline knowledge scores and increased self- and peer-rated GAS T-scores over the study period.

Variability between natural groupings (such as clinical, departmental or regional) has been noted in the KT literature previously. Perhaps the high baseline EBP scores for the cluster 4 reflected positive EBP culture and practices due to cluster 4’s manager. The notion that a manager can strongly influence research culture is by no means new, as some opinion leaders are known to strongly influence EBP behavior. The cluster 4’s manager was active in promoting EBP behavior amongst staff. A large range of KT interventions were in place in cluster 4 prior to this study, including audit and feedback, financial incentives, workshops and mentoring. It is conceivable that cluster 4 therefore had both better readiness and receptivity to EBP supports as they had essentially been engaging in active KT for a longer period than the other clusters. That said, positive EBP culture is considered to be related to positive EBP attitudes and EBPAS scores measuring attitude change of cluster 4 were no different from the other clusters at baseline or 8-weeks. This may have reflected measurement error, or may indicate that positive attitudes in cluster 4 were not necessary as mandatory policies within that cluster were the driving force behind the higher GAS scores.

Secondary outcomes

Our hypothesis that the KT intervention would improve knowledge was supported with the KT intervention group knowledge exam scores showing a statistically significant improvement compared to the control group. This finding supports previous research suggesting that knowledge change alone does not consistently
translate into behavior change. Interestingly, change in knowledge scores was not affected by the cluster effect suggesting that knowledge is not as susceptible to peer influences as behavior.

We found no correlation between behavior, knowledge and attitude change scores within and between clusters. Attitudes remained unchanged. We hypothesise the lack of change in EBP attitudes in our study may be explained by: (1) high baseline EBP attitudes and there was conceivably a ceiling effect on the EBPAS. This was plausible as EBP had been a focus in the organization for some time prior to the RCT. In this case, positive attitudes at baseline, increased knowledge scores and policy changes may together have resulted in the behaviorally meaningful changes observed. There is however no normative data for AHPs on the EBPAS, so it is difficult to say whether or not baseline attitudes were high compared to AHPs in other organisations; (2) EBPAS subsets potentially not being sensitive enough to detect attitude change and the psychometrics for sensitivity in this population are unknown; (3) the EBPAS being an accurate, sensitive measure and that attitudes did not improve from the KT intervention. This third possibility supports the notion that improved knowledge was not adequate to lead to statistically significant behavior change, and that a shift in attitudes was also needed. Conversely, the behaviorally significant change that was observed potentially bypassed the need for attitude change by employing strategies such as mandatory use of documentation and outcome measures; and (4) EBP attitudes taking a longer period of time than knowledge to change, and the 8-week trial was too short to detect change.

Strengths and Limitations
The study had a number of strengths including the rigorous design and broad robust behavior measurement. Our chosen measurement instrument (GAS) was sensitive to change and appeared accurate as self- and peer-rated scores mirrored each other. Distinguishing features of our study were that we measured a wide set of behaviors amongst AHPs working with people with cerebral palsy. The mix of AHPs in our sample is fairly representative of other community based disability organizations, increasing external validity. This is the first RCT in the KT literature involving social workers, psychologists or occupational therapists. The KT intervention itself was a study strength being based on a solid theoretical model, in response to a comprehensive barriers assessment, with desired outcomes clearly defined, and included a range of interventions, not only educational interventions.

There are a number of study limitations. First and foremost the pragmatic constraints that limited the number of available clusters and participants led to low statistical power causing a probable type II error. Second, the large differences observed between clusters suggests that we potentially should have tailored the KT intervention to each cluster rather than the whole organization. Third, the evidence base regarding whether proxy behavior measures represent actual behavior is not firmly established, but with preferred rival direct measures also lacking validity and reliability. Moreover, direct measurement was not affordable in our study given the geography involved, and indirect measurement tools were therefore used. To minimize measurement bias, systematic review recommendations regarding indirect measures were followed, and included using: (1) acceptable indirect measures (such as self- and peer-rated behavior triangulated with unbiased web hit data), (2) measurement tools with strong psychometric
properties (3) more than one tool to measure behavior change, and (4) a sound theoretical model as a basis of the intervention. Fourth, the time frame of the trial was short considering that many EBP behaviors and system/organizational changes (such as documenting client goals and mentoring) take time to develop. A follow-up study is needed to measure whether the EBP behaviors were sustained. Fifth, the return rate of the GAS exam form and EBPAS was not perfect (60-82%), with the 8-week data having more missing data.

Conclusions

KT literature recommends tailoring KT interventions to overcome known barriers within organizations, however our findings suggest that this may need to go even further with KT interventions being designed for subgroups within an organization. The impact of different workplace culture may mean that there are dramatically different barriers needing different KT interventions to be effective. Considering the importance of management-led change, targeting policy makers and managers may be beneficial. This has been done in the public health sector, however no studies customizing KT to policy makers/management was found in the allied health literature. Our study provides extremely rich pilot study data to planning and conducting an adequately powered cluster RCT in future.

Our study highlighted the methodological challenges of conducting empirical research in a community-based organization with fixed cluster and participant numbers. Whether or not RCTs are a feasible option in community organizations is debatable, and it may be that other research designs are more appropriate. Researchers, policy makers and clients need to effectively collaborate to ensure that
reliable, relevant research becomes embedded into everyday care in a timely way.

Considering that the cornerstone of KT is access to reliable research, the authors plan to make the EAS publically available.

**Acknowledgements:** The authors would like to thank Cerebral Palsy Alliance for their support of this study, for understanding the importance of EBP and adopting systemic changes. The authors also wish to acknowledge the clinical consultants (Cathy Morgan, Salli-Ann Craik, Natalie Morton, Leigha Dark & Elise Stumbles) and research staff at Cerebral Palsy Alliance for their leadership, contributions and assistance, and most importantly we would like to thank staff for their participation in the study.

**Contributors:** The study was carried out as part of a Doctor of Philosophy candidature by the first author. Staff at the Research Institute of Cerebral Palsy Alliance (the study site) assisted in study design and developing the Evidence Alert System (searching databases for articles, synthesising results, converting the information to electronic format). Staff from the Research Institute and senior staff at Cerebral Palsy Alliance facilitated the workshops that formed part of the KT interventions (experimental and control groups). The participants of the study were all staff at the Cerebral Palsy Alliance. All authors had full access to all of the data, including statistical reports and tables and take responsibility for the integrity of the data and accuracy of the data analysis.
Table 1 – Theoretical basis and strategies to address modifiable barriers

<table>
<thead>
<tr>
<th><strong>KT intervention</strong></th>
<th><strong>Underpinning theory or group of theories</strong></th>
<th><strong>Strategy/rationale</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop</td>
<td>Problem based learning, learning styles</td>
<td>Workshops used problem based learning approach and a variety of approaches to ensure that different learning styles were catered to, maximizing the likelihood of increased confidence and skill levels.</td>
</tr>
<tr>
<td>EAS</td>
<td>Cognitive</td>
<td>Accurate, relevant research evidence on cerebral palsy assessment and treatment was provided via the EAS building skill by modeling synthesis and summary of treatment areas. The EAS bypassed the need for high-level appraisal skills.</td>
</tr>
<tr>
<td>Mentoring</td>
<td>Educational</td>
<td>AHPs were included in the problem solving process during mentoring sessions and aimed to increase confidence and build skill base.</td>
</tr>
</tbody>
</table>
### Barrier: Lack of Time

<table>
<thead>
<tr>
<th>KT intervention</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS</td>
<td>Cognitive</td>
<td>The provision of accurate, relevant research evidence bypassed the need for extensive time spent searching and appraising research via databases and journals.</td>
</tr>
<tr>
<td>Paid EBP time in policy</td>
<td>Reimbursement</td>
<td>Paid, protected time for AHPs to engage in EBP activities was provided</td>
</tr>
<tr>
<td></td>
<td>Leadership</td>
<td>Changing policy suggested management ‘buy in’ and endorsement to support changes throughout the organization (leadership theory)</td>
</tr>
<tr>
<td>Documentation changes including a reminder system</td>
<td>Total quality management (TQM)</td>
<td>Patient documentation and work processes were reorganized to support clinical decision making and save time (reminder systems, checklists and directing participants to the EAS)</td>
</tr>
</tbody>
</table>
**BARRIER: EVIDENCE CONSIDERED AS NOT CLINICALLY RELEVANT**

<table>
<thead>
<tr>
<th>KT intervention</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop teaching EAS</td>
<td>Educational</td>
<td>AHPs were involved in the problem solving process, so that they ‘owned’ and were a part of the process and could see the applicability of the EAS. Having the 8 week period in between workshops, allowed independent learning and time to apply the EAS information to a real client</td>
</tr>
<tr>
<td>EAS</td>
<td>Marketing</td>
<td>Facilitators aimed to convince AHPs of the relevance of research in their area by exploring the EAS through clinical examples and role playing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An appealing product (the EAS) was developed and this was disseminated in a variety of ways (workshop, mentoring, documentation changes)</td>
</tr>
</tbody>
</table>
**Barrier: No access to full articles and research databases**

<table>
<thead>
<tr>
<th>KT intervention</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS</td>
<td>Organizational learning</td>
<td>All staff members at every level of the organization had access to current cerebral palsy evidence and exchange of information via mentoring sessions and team meetings was promoted</td>
</tr>
</tbody>
</table>

**Barrier: Some staff with negative attitudes towards EBP**

<table>
<thead>
<tr>
<th>KT intervention</th>
<th>Group of theories that the intervention relates to</th>
<th>Strategy/rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop</td>
<td>Social</td>
<td>Credible staff facilitated workshops, modeled positive attitudes emphasized ‘buy in’ from decision-makers in the organization</td>
</tr>
<tr>
<td>Mentoring</td>
<td>Social</td>
<td>Mentors were selected with positive attitudes towards EBP so that target behavior was modeled</td>
</tr>
</tbody>
</table>
### Table 5– KT intervention with corresponding KTA phases

<table>
<thead>
<tr>
<th>KT INTERVENTION</th>
<th>WHAT PART OF THE KTA CYCLE DID THE INTERVENTION IMPACT?</th>
<th>WHO IMPLEMENTED IT?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creating Knowledge</td>
<td>Localising Knowledge</td>
</tr>
<tr>
<td><strong>Before RCT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic planning meetings</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td><strong>Policy Changes (policies developed however not implemented until RCT)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of paid, dedicated EBP time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provision of a policy endorsed EBP mentoring program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandated and compulsory use of psychometrically sound outcome measures with all clients embedded in workflow e.g. included within mandatory Individual Family Service Plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Evidence Alert System development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>During RCT (8-weeks; June – Aug 2009)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills Training Workshops (3-days)</td>
<td></td>
<td>•</td>
</tr>
<tr>
<td>Paid EBP time, mentoring, compulsory use of outcome measures (see policy changes above), documentation changes including reminder systems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 - Baseline characteristics of participants

<table>
<thead>
<tr>
<th></th>
<th>KT Intervention n=73 (%)</th>
<th>Control n=62 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professional Background</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>23 (31)</td>
<td>26 (42)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>16 (22)</td>
<td>16 (26)</td>
</tr>
<tr>
<td>Speech Pathologist</td>
<td>20 (27)</td>
<td>16 (25)</td>
</tr>
<tr>
<td>Psychologist</td>
<td>7 (10)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>7 (10)</td>
<td>3 (5)</td>
</tr>
<tr>
<td><strong>Grade Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>19 (26)</td>
<td>14 (23)</td>
</tr>
<tr>
<td>Level 2 (clinical specialist)</td>
<td>34 (47)</td>
<td>37 (60)</td>
</tr>
<tr>
<td>Level 3 (clinical senior)</td>
<td>13 (18)</td>
<td>8 (13)</td>
</tr>
<tr>
<td>Manager or other</td>
<td>7 (9)</td>
<td>2 (3)</td>
</tr>
<tr>
<td><strong>Years' experience in disability field</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 years</td>
<td>11 (15)</td>
<td>16 (26)</td>
</tr>
<tr>
<td>2-4 years 11 months</td>
<td>10 (14)</td>
<td>12 (19)</td>
</tr>
<tr>
<td>5-9 years 11 months</td>
<td>25 (34)</td>
<td>14 (23)</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>27 (37)</td>
<td>20 (32)</td>
</tr>
<tr>
<td><strong>Previous EBP continuing education?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>64 (88)*</td>
<td>41 (66)*</td>
</tr>
<tr>
<td>No</td>
<td>9 (12)*</td>
<td>21 (34)*</td>
</tr>
</tbody>
</table>

* Significant difference between groups at baseline therefore treated as a covariate in the analysis.
Table 4 – Primary and secondary outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Treatment n=73</th>
<th>Control n=62</th>
<th>Base model Difference (95% CI)</th>
<th>p</th>
<th>ICC (95% CI)</th>
<th>Mixed effects model Difference (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBM Behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self baseline 8-weeks</td>
<td>59 54.05 (13.80)</td>
<td>45 55.42 (10.92)</td>
<td>5.08 (0.40,10.55)</td>
<td>0.07</td>
<td>0.33 0.16 (10.63,19.69)</td>
<td>4.43 (-0.56,10.56)</td>
<td>0.05</td>
</tr>
<tr>
<td>Peer baseline 8-weeks</td>
<td>52 61.83 (13.69)</td>
<td>43 61.52 (16.95)</td>
<td>7.86 (1.97,13.75)</td>
<td>0.01</td>
<td>0.64 0.36 (16.95,30.44)</td>
<td>6.75 (-0.57,10.57)</td>
<td>0.57</td>
</tr>
<tr>
<td>Peer subset 3 baseline 8-weeks</td>
<td>44 74.26 (8.51)</td>
<td>42 68.41 (16.63)</td>
<td>4.43 (-10.63,19.49)</td>
<td>0.56</td>
<td></td>
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</tr>
<tr>
<td>EAS page hits**</td>
<td>6123</td>
<td>1677</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>EBM Knowledge baseline 8-weeks</td>
<td>57 7.91 (3.05)</td>
<td>50 8.09 (3.52)</td>
<td>3.29 (2.25,4.33)</td>
<td>&lt;0.0001</td>
<td>0.01 (0.0,0.26)</td>
<td>3.29 (2.18,4.40)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>EBP attitude EBPAS Self subset 3</td>
<td>55 2.67 (0.75)</td>
<td>47 2.57 (0.70)</td>
<td>-0.27 (-0.57,0.03)</td>
<td>0.08</td>
<td>0.0 0.00 (0.0,0.32)</td>
<td>-0.27 (-0.08,0.08)</td>
<td>0.08</td>
</tr>
<tr>
<td>Peer subset 3 baseline 8-weeks</td>
<td>42 2.93 (0.63)</td>
<td>38 2.90 (0.72)</td>
<td>0.03 (-0.22,0.28)</td>
<td>0.82</td>
<td>0.0 0.00 (0.0,0.25)</td>
<td>0.03 (-0.37,0.43)</td>
<td>0.88</td>
</tr>
<tr>
<td>subset 4</td>
<td>weeks</td>
<td>baseline</td>
<td>8-weeks</td>
<td>32</td>
<td>3.19 (0.61)</td>
<td>0.37 (0.42)</td>
<td>(0.0, 0.51)</td>
</tr>
<tr>
<td>---------</td>
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<td>-------------</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>0.89 (0.78)</td>
<td>32</td>
<td>0.87 (0.75)</td>
<td>1.13 (0.93)</td>
<td>-0.23 (-0.75, 0.23)</td>
<td>0.37 (0.75, 0.23)</td>
</tr>
</tbody>
</table>

* Number of participants who completed outcome measure

** EAS page hit raw data could only be collected and analyzed at the cluster level, not the individual level because the electronic data was collected in batches.
Table 5 - Mean outcome scores for each cluster

<table>
<thead>
<tr>
<th>Variable</th>
<th>Outcome score N, mean (sd) per cluster</th>
<th>time</th>
<th>Cluster 1 (Exp)</th>
<th>Cluster 2 (Exp)</th>
<th>Cluster 3 (Control)</th>
<th>Cluster 4 (control)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EBP behavior</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>Self GAS</em></td>
<td></td>
<td></td>
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<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>     50.73 (13.75)</td>
<td>     24</td>
<td></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-weeks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>     66.39 (16.02)</td>
<td>     27</td>
<td></td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Peer GAS</strong></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>     60.19 (14.26)</td>
<td>     19</td>
<td></td>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-weeks</td>
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</tr>
<tr>
<td>     72.69 (9.93)</td>
<td>     23</td>
<td></td>
<td>21</td>
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<tr>
<td><strong>EBP knowledge</strong></td>
<td></td>
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<tr>
<td><em>Exam score</em></td>
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<tr>
<td>Baseline</td>
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</tr>
<tr>
<td>     7.69 (2.76)</td>
<td>     22</td>
<td></td>
<td>35</td>
<td></td>
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<tr>
<td>8-weeks</td>
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<tr>
<td>     10.80 (2.37)</td>
<td>     27</td>
<td></td>
<td>25</td>
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<tr>
<td><strong>EBP attitude</strong></td>
<td></td>
<td></td>
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<tr>
<td><em>Self EBPAS subset 3 score</em></td>
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<tr>
<td>Baseline</td>
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<tr>
<td>     2.73 (0.73)</td>
<td>     20</td>
<td></td>
<td>35</td>
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<tr>
<td>8-weeks</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>     2.55 (0.78)</td>
<td>     26</td>
<td></td>
<td>24</td>
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<tr>
<td><strong>Self EBPAS subset 4 score</strong></td>
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<td>Baseline</td>
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<tr>
<td>     2.86 (0.48)</td>
<td>     35</td>
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<tr>
<td>8-weeks</td>
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<td></td>
<td></td>
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<tr>
<td>     3.10 (0.59)</td>
<td>     26</td>
<td></td>
<td>24</td>
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<tr>
<td><strong>Peer EBPAS subset 3 score</strong></td>
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</tr>
<tr>
<td>     2.80 (0.60)</td>
<td>     12</td>
<td></td>
<td>30</td>
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<tr>
<td>8-weeks</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>     3.20 (0.47)</td>
<td>     16</td>
<td></td>
<td>16</td>
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<tr>
<td><strong>Peer EBPAS subset 4 score</strong></td>
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<td></td>
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</tr>
<tr>
<td>Baseline</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>     0.83 (0.64)</td>
<td>     12</td>
<td></td>
<td>30</td>
<td></td>
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<td>8-weeks</td>
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</tr>
<tr>
<td>     1.05 (0.86)</td>
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<td>16</td>
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<tr>
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<td>     2987</td>
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<td>2987</td>
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</tbody>
</table>
References


6. Davis D: Continuing education, guideline implementation, and the emerging transdisciplinary field of knowledge translation. *Journal of Continuing Education in the Health Professions* 2006, **26**:5-12.


10. O’Connor S, Pettigrew C: The barriers perceived to prevent the successful implementation of evidence based practice by speech and language therapists. *International Journal of Language & Communication Disorders* 2009, **44**:1018-1035.


Appendix 9 – Journal paper accepted for publication by Implementation Science


52. Rogers EM: **Diffusion of innovations.** Free Pr; 1995.

53. Aarons G, Sawitzky A: **Organizational climate partially mediates the effect of culture on work attitudes and staff turnover in mental health services.** *Administration and Policy in Mental Health and Mental Health Services Research* 2006, 33:289-301.


Email from the Implementation Science Editorial Team confirming that this paper has been accepted for publication

Authors: Lanie Campbell, Iona Novak, Sarah McIntyre and Sarah Lord
Title: A KT intervention including the Evidence Alert System to improve clinician’s evidence-based practice behavior - a cluster randomized controlled trial
Journal: Implementation Science
MS: 1772872852901505

Dear Dr Novak,

Peer review of your manuscript (above) is now complete and we are delighted to accept the manuscript for publication in Implementation Science.

Before publication, our production team needs to check the format of your manuscript, to ensure that it conforms to the standards of the journal. They will get in touch with you shortly to request any necessary changes or to confirm that none are needed.

If you have any problems or questions regarding your manuscript, please do get in touch.

Best wishes,

Prof Bridie Kent
The Implementation Science Editorial Team

e-mail: impsei@biomedcentral.com
Web: http://www.implementationscience.com/
APPENDIX 10
Conference presentations and posters

Publications in peer reviewed journals


Conference presentations


Award

Poster won top ten abstract prize at Evidence Live 2013 conference. URL link: http://www.evidencelive.org/2013/top-abstracts