Comparison of Evidence Based Practice Behaviors on a Simulated Case Among Occupational Therapy Students and Expert Occupational Therapy Clinicians

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February 2011

A thesis submitted to the

Faculty of Graduate Studies and Research

in partial fulfillment of the requirements for

the degree of Doctor of Philosophy

Dedication

To my family,

Nicholas, Harry and Zoe

Acknowledgements

The writing of a dissertation is not possible without the personal and professional support of numerous people. Thus, my sincere gratitude goes to my professors, colleagues, fellow graduate students, my parents, my siblings, all my friends, and my family for their love, support, and patience over the last few years.

I would like to extend my sincere gratitude to my esteemed advisor, Dr. Alenoush Saroyan for her expert guidance, continued support and encouragement throughout my doctoral studies. A special thank you to my dissertation committee members, Dr. Susanne P. Lajoie, Dr. Laurie M. Snider and Dr. W. Dale Dauphinee. Your expertise and valuable feedback were instrumental to the completion of this dissertation. I am forever indebted to Dr. Laurie Snider for seeing something in me 13 years ago and inviting me to join the occupational therapy faculty at McGill University. Thank you for opening the doors to the world of academia.

I wish to express my sincere gratitude to Professor Sandra Everitt and Dr. Bernadette Nedelec for their enduring encouragement and friendship. Bernadette, I thank you for the stimulating conservations, for giving me much needed perspective and for engaging me in countless scholarly debates. Sandra, thank you for sharing your wisdom, for listening, for always offering such sound advice but most importantly, I wish to thank you for the prayers.

A special thank you to fellow graduate students, Heidi Clavet, Gina Franco, Dawit Getahun, Ahmed Ibrahim and Julie Timmermans for their

assistance during data collection and data analysis. Also, I would like to thank Jill Boruff, McGill University Health Sciences liaison librarian for her assistance with the literature search for parts of the dissertation. I would like to acknowledge the Fonds Québécois de Recherche sur la Société et Culture, the Department of Educational and Counseling Psychology and Education Graduate Students' Society, Faculty of Education, the Canadian Occupational Therapy Foundation and the Centre de Recherche Interdisciplinaire en Réadaptation du Montréal Métropolitain for their financial support.

I am very grateful to the students and professors at the School of Physical and Occupational Therapy of McGill University. To my students, you make me a better teacher. To my colleagues, thank you for providing a stimulating academic environment and for inspiring and encouraging my commitment to scholarship.

I am especially grateful to my parents. I thank you for your love, your support and your encouragement. Thank you for teaching me about hard work and persistence. Thank you for instilling in me a thirst for knowledge, for ensuring that I had access to a world of opportunities and for wanting so much more for me than you ever had. To my father, thank you for always having so much faith in me and constantly reminding me that I would succeed in all my endeavors.

Lastly, I would like to thank my husband and children without whom this journey would not have been possible. To my beautiful angels Harry and Zoe, thank you for all that you teach me on a daily basis, for your beautiful laughter and for having changed my life. You are my most precious gifts, you are my guiding lights. To my husband, I owe you my deepest gratitude. Thank you for

loving me, for making me laugh and for always telling me that “everything would be ok”. Thank you for holding my hand and supporting me through some difficult times. I don’t know what I would have done without you. Mostly, thank you for believing in me and helping me believe in myself. You are my pillar. You are forever in my heart.

Abstract

The national occupational therapy (OT) professional association of Canada expects graduates and practicing clinicians to demonstrate the knowledge, skills and attitudes to carry out evidence-based practice (EBP). Evidence-based OT practice involves a process whereby therapists combine expert judgment and clinical experience with available scientific evidence and client choices, to make a clinical decision for a given client. Although academic programs are urged to design curricula that will promote EBP competencies, there are currently no available guidelines to support faculty in the design of an EBP curriculum. Identifying the trajectories of EBP competencies as they develop across the levels of professional education in OT can inform the instructional design required to foster the necessary EBP knowledge and skills across the different levels. The purpose of this doctoral study was to compare EBP behaviours among OT students and expert OT clinicians on a written simulated case and identify the extent to which their practices reflected features of EBP. The practice behaviours of expert clinicians (n = 7) were identified and subsequently used to create a reference model for EBP. Then the EBP behaviours of students (n = 53) in three different academic levels in a professional Master's entry-level OT program and a new group of experienced clinicians (n = 9) were compared to the practice behaviours depicted in the reference model. The EBP reference model illustrates two types of decisions, those based on scientific evidence and those that were primarily driven by clinical experience. Comparisons of EBP behaviours of students and experienced clinicians showed that students had greater breadth of

knowledge of EBP aspects taught in the OT program. Experienced clinicians' practice behaviours were most consistent with the decisions illustrated in the model in the aspects of EBP which appeared to depend upon clinical experience. This study has implications for both OT education and clinical practice. The reference model can be used as a practice framework to guide therapists through clinical decision-making in one area of OT practice. In OT education, the model can be used as a framework for teaching and assessment of expert decision-making. The identified gaps in students' knowledge can guide faculty as they monitor and update the EBP content within the OT curriculum.

Résumé

L'association nationale regroupant les professionnels en ergothérapie du Canada s'attend à ce que les diplômés et les cliniciens fassent preuve des connaissances, des compétences et des attitudes requises pour exercer une pratique basée sur des données probantes (PBDP). Une telle pratique repose sur une démarche décisionnelle associant expertise, et expérience clinique aux données scientifiques à la disposition des cliniciens et aux choix de chaque client. Même si les programmes universitaires sont orientés vers la rédaction de cursus favorisant l'acquisition de compétences associées à une PBDP, il n'existe à l'heure actuelle aucune directive pour guider le personnel enseignant dans l'élaboration d'un cursus favorisant la PBDP. La détermination de l'évolution des compétences en PBDP à tous les niveaux de la formation professionnelle en ergothérapie peut éclairer la conception pédagogique nécessaire à l'acquisition des connaissances et compétences liées à la PBDP aux divers paliers. L'objectif de cette recherche de doctorat était de comparer les comportements typiques d'une PBDP chez les étudiants en ergothérapie et chez les cliniciens experts dans le cadre d'un exercice de simulation écrit et de déterminer à quel point leurs pratiques reflètent les caractéristiques de la PBDP. La description des comportements professionnels de cliniciens experts (n = 7) a permis de créer un modèle de référence de PBDP. Les comportements liés à la PBDP des étudiants (n = 53) à divers niveaux d'étude de maîtrise en ergothérapie et d'un nouveau groupe de cliniciens expérimentés (n = 9) ont alors été comparés aux comportements professionnels décrits dans le modèle de référence. Ce modèle de PBDP illustre deux types de décisions, celles

qui sont fondées sur des preuves scientifiques et celles qui sont principalement motivées par l'expérience clinique. La comparaison des comportements typiques de la PBDP chez les étudiants et chez les cliniciens expérimentés a révélé que les étudiants avaient plus de connaissances sur les aspects de la PBDP enseignés dans le programme d'ergothérapie. Les comportements professionnels des cliniciens expérimentés correspondaient plus étroitement avec les décisions décrites dans le modèle comme étant des aspects de la PBDP qui semblaient liés à l'expérience clinique. Cette étude a des répercussions tant pour la formation en ergothérapie que pour la pratique clinique. Le modèle de référence peut servir de cadre décisionnel en pratique dans un domaine particulier de l'ergothérapie. Dans le programme de formation des ergothérapeutes, le modèle peut servir de cadre d'enseignement et d'évaluation de l'expertise décisionnelle. Les lacunes cernées quant aux connaissances des étudiants peuvent orienter le corps professoral qui fera le suivi et la mise à jour du contenu lié à la PBDP dans le cursus en ergothérapie.

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Manuscript 2: Development of an Occupational Therapy Evidence-Based Practice Reference Model

Contributions of Authors

The first manuscript in this dissertation was co-authored with Dr. Alenoush Saroyan, my academic advisor and Dr. W. Dale Dauphinee, a member of my dissertation committee. This manuscript was originally written as my comprehensive examination. During the comprehensive examination process, I received minimal guidance for writing this paper. The guidance consisted of approval of the reading list and formative feedback one month prior to submitting the examination. Following the examination, I revised the content of the paper so that it could serve as the literature review and theoretical basis for my doctoral work. I, as first author, then turned the literature review into a proposal for publication. When the manuscript was accepted for publication (with minor revisions), Dr. Saroyan, Dr. Dauphinee and I collaborated to review and edit the manuscript to address the reviewers' comments. The relative contributions of the authors were 75% myself, 15% Dr. Saroyan, and 10% Dr. Dauphinee. The second manuscript was co-authored with Dr. Saroyan and Dr. Susanne P. Lajoie, another member of my doctoral dissertation committee. Both Dr. Saroyan and Dr. Lajoie were involved in the design of the study. Dr. Saroyan provided continuous feedback on various drafts of the manuscript, and Dr. Lajoie provided feedback regarding the main findings and the theoretical framework. Dr. Lajoie read the paper twice before it was ready to be submitted for publication. The relative contributions of the authors were 75% myself, 15% Dr. Saroyan and 10% Dr. Lajoie. The paper has been submitted to a peer-reviewed journal in the rehabilitation sciences. The third manuscript was co-authored with Dr. Saroyan

and Dr. Laurie M. Snider, the fourth member of my dissertation committee. Dr. Saroyan assisted with conceptualizing and operationalizing the data analysis and the synthesis of results. Dr. Snider's expert contribution consisted of feedback with synthesis of results and discussion as well as with the elaboration of the major conclusions regarding OT education and practice. As was the case for manuscripts 1 and 2, I as the first author, wrote the paper. Drs. Saroyan and Snider read the paper twice prior to it being included in the present dissertation. The relative contributions of the authors were 75% myself, 15% Dr. Saroyan and 10 % Dr. Snider. This manuscript will be submitted for publication following the oral examination of the thesis.

Chapter I: Introduction

Occupational therapy (OT) is the "art and science of enabling engagement in everyday living through occupation; of enabling people to perform the occupations that foster health and well-being; and of enabling a just and inclusive society so that all people may participate to their potential in the daily occupations of life" (Townsend & Polatajko, 2007, p. 372). The OT process involves assessing, planning, implementing, monitoring, modifying and evaluating the client's occupational engagement in self-care, work, study, volunteerism and leisure (Canadian Association of Occupational Therapists, CAOT, 2007). Occupational therapists (OTs) are expected to use a systematic approach based on evidence and professional reasoning, to enable their clients to develop the means and opportunities to identify and engage in the occupations of life (Canadian Association of Occupational Therapists, 2007).

In 2005, the Canadian Association of Occupational Therapists (CAOT) academic accreditation standards were revised to reflect continuing changes in OT education. By 2008, all OT programs in Canada offered Master's entry level professional programs. Consequently, a new standard of scholarly activity and research was added to support the use of scientific evidence in education and practice. The expected OT educational outcomes for academic accreditation and the scope of OT practice are delineated in the *Profile of Occupational Therapy Practice in Canada (2007).* The intent of this document, developed by the CAOT in 2005 and revised in 2007, is to "reflect current evidence in the areas of competency and OT practice and integrate new information and models within a

continuum of skills and knowledge needed by the occupational therapy workforce to meet health needs" (Profile of Occupational Therapy Practice in Canada, CAOT, 2007). *The Profile* identifies the seven main roles of OTs as: expert in enabling occupation, communicator, collaborator, practice manager, change agent, scholarly practitioner and professional. Two of the roles, the 'expert in enabling occupation' and the 'scholarly practitioner', call for the judicious use of scientific findings in clinical practice. Hence, these two roles provide the context to exercise the concept of evidence-based practice (EBP). According to a position statement on EBP released in 2009 by the CAOT, OTs are "urged to adhere to evidence-based practice since consumers, payers and practitioners want services based on the best available evidence regarding their effectiveness. OTs believe that EBP is a major element of what is now described as "best practice" (CAOT Joint Position Statement on Evidence-Based Occupational Therapy, http://www.caot.ca.).

OTs have traditionally taken evidence-based medicine as a starting point for evidence-based occupational therapy (Law & Baum, 1998). Evidence-based medicine originated at McMaster University's medical school in the 1980's. It is described as a problem-based clinical learning strategy for students and clinicians involved in making decisions for the care of their clients (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, Taylor, 1997). Rosenberg & Donald (1995) described evidence-based medicine as "finding, appraising and using contemporaneous research findings as the basis for clinical decisions" (p.1122). Sackett et al., (1996) expanded on this definition to suggest that evidence-based

medicine is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual clients" (p.71). For evidence-based medicine to be effective and improve clinical outcomes, it must integrate clinical expertise with the best available external evidence from systematic research and the involvement of client choice. Evidence-based practice and evidence-based health care are terms that have since been extended to the broader health care context including OT (Bennett & Bennett, 2000).

OTs in all areas of practice are faced with the challenge of providing evidence-based services. It is no longer acceptable to claim that client outcomes are improved with existing services. OT clinicians must explain not just what they do, but why and how they do it (Holm, 2000). Evidence-based occupational therapy practice requires that therapists make sound decisions regarding the selection of assessments and effective treatment interventions in a variety of contexts. These decisions are informed by a critical review of the research literature, expert consensus, and professional experience (Clark, Scott & Krupa, 1993; Dubouloz, Egan, von Zweck & Vallerand, 1999; Kirby & McKenna, 1989). In addition, OTs must work in partnership with the client in order to be congruent with the enabling occupation and client-centered philosophies of OT, and to assist the client in naming and prioritizing occupational performance issues. Together, the therapist and client formulate targeted outcomes, and commit to specific intervention plans and methods of evaluating desired outcomes (Egan et al., 1998; Fearing, Law & Clark, 1997). Thus, the OT evidence-based clinical decision-making approach calls for close collaboration between the therapist and the client.

The OT must take into account the client's needs, wishes and expectations in every step of the EBP process.

EBP has garnered a great deal of attention in the last two decades, particularly for its potential to improve client outcomes. There have also been several changes in health care delivery that have thrust the clinical community towards this fairly new paradigm of health care practice. These changes include advances in technology, a proliferation of scientific findings regarding effective treatments, growing expectations from clients to receive the best possible care from competent professionals, demands for cost effective therapies and professional accountability (Bennett & Bennett, 2000; Evidence-Based Medicine Working Group, 1992; Lloyd-Smith, 1997; Profetto-McGrath, 2005). An emphasis on bridging the research-practice gap has also contributed to the growing interest in EBP (Graham & Tetroe, 2007).

The rising status of EBP has also lead to a burgeoning of research on a number of issues, including the stages involved in the process (Rosenberg & Donald, 1995; Sackett et al., 2000), the diffusion of new knowledge and research findings (Hallas & Mazureck, 2003; Humphris et al., 2000, Welsh & Lyons, 2001; Forbes & Griffiths, 2002; Hammel, 2001; Herbert et al., 2001; Miles et al., 2004), the gaps between EBP and actual practice (Menon, Korner-Bitensky & Strauss, 2010; Saleh et al., 2008; Salbach, Jaglal, Korner-Bitensky, Rappolt, & Davis, 2007) and the outcomes of educational initiatives targeting students' and clinicians' EBP knowledge, skills and attitudes (Dawes et al., 2005; Coomarasamy & Khan, 2004; Coomarsamy, Taylor & Khan's, 2003; Hyde &

Milne, 2006; Norman & Shannon, 1998). Although most of this literature originates from medicine and nursing, OT researchers have also been generating scientific evidence that can be used to inform practice in a number of clinical areas and have recently begun identifying strategies that can support clinicians in integrating evidence in clinical practice (Menon, Korner-Bitensky, Kastner, McKibbon, & Straus, 2009).

Despite the growing status of EBP, there is compelling evidence that available research findings are not routinely integrated in OT practice (Cameron et al., 2005; Salls, Dolhi, Silverman & Hansen, 2009; Korner-Bitensky et al., 2006; Philibert, Snyder, Judd, & Windsor, 2003). The gap between actual OT practice and EBP has been attributed in part to negative attitudes towards research (Craik & Rappolt, 2003) and a lack of confidence and skill in interpreting, synthesizing and applying research findings during the decision-making process (Dubouloz et al., 1999; Salbach et al., 2007; Teasell et al., 2008; Welch & Dawson, 2006). If clinicians are to embrace and successfully apply EBP principles in their practice, they will need to acquire the requisite knowledge, skills and attitudes in their formal education and then apply these skills to a variety of clients in clinical practice. To this end, OT programs ought to consist of curricula that promote the requisite entry-level EBP competencies. In fact, the role of OT programs in ensuring that graduates are evidenced-based practitioners is clearly affirmed in a CAOT position statement regarding OT education in Canada (2008):

> "advanced skills and knowledge are expected for beginning occupational therapists for accountability for professional decisions and for autonomous practice in diverse environments with multicultural populations. Occupational therapists must provide evidence-based and occupationally focused services, and have the ability to market their services in an expanding and competitive global environment. This is true now and will be increasingly more important within the next ten years" *(*CAOT position statement: Entry-level education of occupational therapists in Canada, http://www.caot.ca.)

While it is imperative that exposure and instruction in EBP begin as early as possible in the career of an OT and ideally at the pre-licensure level, at the present time, there is little empirical evidence of improved EBP educational outcomes and no validated methods for teaching and evaluating EBP competencies in OT professional programs. In addition, there is inconclusive evidence regarding the most effective strategies for incorporating and sustaining EBP behaviors in the OT clinical setting. If academic institutions are to successfully design curricula that promote the development of EBP competencies, they will need input from researchers regarding effective strategies for teaching and assessing EBP. In the pursuit of this larger objective, research should shed light on the baseline, how EBP develops and is mastered at the pre -licensure level, from novice students to entry-level professionals. Mapping the developmental trajectory of EBP competencies across an OT program of study can identify strengths and weaknesses of the curriculum and facilitate the design

of instruction that will better foster the required EBP knowledge, skill and attitudes at those different levels.

The objectives of this doctoral study were twofold: 1) to identify and represent the EBP behaviors of expert OT clinicians by means of a reference model in one area of practice, 'prevention of falls in the geriatric population' and 2) to compare the EBP behaviors of students at different levels in a professional Master's entry-level OT program and experienced clinicians relative to this model. The research contained in this doctoral study was intended to answer the following research question: "What differences exist in evidence-based practice behaviors, as elicited using a written clinical vignette, between OT students at different levels of their professional education and experienced OT clinicians?" The dissertation is comprised of three manuscripts and is structured in the following manner. The first manuscript draws from the educational psychology literature and the EBP literature in the health professions to provide a critical review that examines the theoretical underpinnings of EBP, EBP-related skills, the role of expertise in EBP and the effectiveness of various EBP teaching and assessment interventions. The paper concludes with suggestions for teaching and evaluating EBP that have solid grounding in educational theory and can inform the design of the EBP curriculum in OT programs. The second manuscript describes the process of generating an OT reference model in the area of falls prevention and the resulting tree structure decision model, incorporating the use of EBP in this area. The third manuscript describes the results of a cross-sectional study of EBP behaviors of OT students and experienced OT clinicians.

Specifically, the third paper describes the degree to which OT students from three different academic levels and experienced clinicians adhere to EBP principles when presented with a simulated scenario and the extent to which these behaviors are consistent with the reference model discussed in the second manuscript.

Bridging Manuscript

Evidence-Based Practice in Occupational Therapy: A Review of Theoretical Assumptions and Effectiveness of Teaching and Assessment Interventions

As a health care practice paradigm, evidence-based practice (EBP) has received a great deal of attention in the last 20 years particularly for its potential to support best practice and improve client outcomes. The fundamental premise of EBP is that research and scientific findings are the basis for determining best practices in a field. In the health professions, EBP has been defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. EBP means integrating individual clinical expertise with the best available external clinical evidence from systematic research (Sackett et al., 1996).

Given the rise in available scientific evidence in a number of clinical practice areas and mounting pressures from regulatory bodies and professional associations, occupational therapists (OTs) are being increasingly expected to apply the principles of EBP during the occupational therapy (OT) client-centered decision-making process. Though this expectation has been and continues to be strongly advocated, OTs' uptake of scientific findings has been far from optimal. In fact, several studies have shown that OT clinicians have been slow to both embrace and adhere to EBP. This literature has identified the causes of clinicians' limited uptake of scientific evidence and provided a solid foundation for recent research programs that are attempting to inform the development and

implementation of strategies to support OTs in adopting EBP. Most studies to date have focused on EBP by practicing clinicians with little attention to the developing therapist. Accordingly, there is presently no literature on the initial stages of OT competency development with respect to the competencies associated with EBP. Furthermore, there is currently no evidence that OT professional programs are successfully promoting EBP competencies and that graduates possess the required EBP knowledge, skills and attitudes when they begin clinical practice. Given that all Canadian professional OT programs have moved to Master's entry level curricula and that graduates from these programs are expected to be better consumers of research evidence than previous generations of OTs, the National OT association and its accrediting council have strongly recommended that professional programs promote EBP competencies. Academic institutions must therefore ensure that graduates from current and future OT programs are evidence-based practitioners. In the absence of systematic or empirically supported models for teaching and evaluating EBP in OT academic programs, the development of EBP competencies is left to chance with outcomes that are, at best, haphazard. Designing curricula that effectively foster EBP competencies requires a thorough grasp of the EBP process, its theoretical underpinnings and the existing literature on the effectiveness of teaching and assessment of EBP in the health professions. A review that highlights these elements currently does not exist in OT. Drawing from the literature in educational psychology and EBP in the health professions, the purpose of the paper is to provide a critical review of EBP that addresses these

key aspects. The review is intended to highlight the current literature on EBP in the health professions in general and in OT in particular as well as inform the design of the EBP curriculum in OT programs.

Chapter II: Manuscript 1

Evidence-Based Practice in Occupational Therapy: A Review of Theoretical Assumptions and Effectiveness of Teaching and Assessment Interventions

From: Thomas, A., Saroyan, A., & Dauphinee, W. D. (2010). Evidence-Based Practice: A Review of Theoretical Assumptions and Effectiveness of Teaching and Assessment Interventions in the Health Professions. *Advances in Health Sciences Education (DOI: 10.1007/s10459-010-9252-6online first).*

Abstract

Occupational therapists are expected to use a systematic approach based on evidence, professional reasoning and client preferences to help individuals improve their function in the occupations of life. In other words, they are expected to work within an evidence-based practice (EBP) context. This expectation has had an impact on occupational therapy academic programs' mandates to prepare entry-level clinicians who demonstrate competence in the knowledge, skills and behaviors for the practice of evidence-based occupational therapy. If the EBP approach is to be entrenched in the day to day practice of future clinicians, a pedagogically sound approach would be to incorporate EBP in every aspect of the curriculum. This, however, would require a comprehensive understanding of EBP: its basis, the principles that underpin it and its effectiveness in promoting core professional competencies. The existing literature does not elucidate these details nor does it shed light on how requisite

competencies for EBP are acquired in professional education in general and in occupational therapy education in particular. Drawing from educational psychology and EBP in the health professions, this paper provides a critical review of the evidence that supports EBP and the effectiveness of EBP teaching and assessment interventions in professional heath sciences programs and offers suggestions for the design of EBP instruction in occupational therapy education, grounding recommendations in educational theory.

Introduction

Evidence-based practice (EBP) is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual clients (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996). Continuing expectations from clients to receive the best possible care, the call for cost effective therapies, a significant rise in available scientific evidence and greater professional accountability have created a shift in the way we think and implement best practice, making EBP a desirable approach in health care delivery (Bennett & Bennett, 2000; Evidence-Based Medicine Working Group, 1992; Lloyd-Smith, 1997). In particular, policy-makers, academics and clinicians have been studying the facilitators and barriers to the implementation of evidence in clinical practice, the issues surrounding diffusion of new knowledge and more recently, the outcomes of educational initiatives that target students' and clinicians' attitudes and skills in EBP.

As health care professionals, occupational therapists (OTs) are expected to work within an EBP context. According to the Canadian Association of Occupational Therapists (CAOT, 2002), OTs are expected to use a systematic approach based on evidence, professional reasoning and client preferences to help individuals improve their function in the occupations of life. The scope of OT practice in Canada, delineated in the *Profile of Occupational Therapy Practice in Canada* (2007), identifies the seven main roles of occupational therapists as 1) Expert in enabling occupation, 2) Communicator, 3) Collaborator, 3) Practice manager, 5) Change agent, 6) Scholarly practitioner, and 7) Professional. The

"expert in enabling occupation" and the "scholarly practitioner" roles call for the use of research evidence for clinical decision making. In other words, the concept of EBP is most relevant to these two roles. The Profile (CAOT, 2007) defines the competent OT as: "An occupational therapist that meets or exceeds the minimal and ongoing performance expectations and demonstrates the requisite knowledge, skills, and abilities for safe and effective practice of occupational therapy at the beginning of and throughout their career" (p. 4).. Occupational therapists who are proficient in a role also "have the knowledge, skills, and abilities of the competent practitioner but may vary in how the competency is performed (e.g., ease of performance, professional sophistication, artistry of practice)" (p. 4).

Notwithstanding the "expert" designation attributed to the first role, OT graduates are expected to perform at a competent level in all roles upon graduation. The move towards proficiency occurs with acquisition of experience throughout clinic practice (CAOT, 2007). Initially, EBP skills are developed within the context of academic OT programs. This is affirmed in a 2008 position statement by the CAOT regarding entry-level education of occupational therapists in Canada: "…Occupational therapists must provide evidence-based and occupationally focused services, and have the ability to market their services in an expanding and competitive global environment. This is true now and will be increasingly more important within the next ten years" (CAOT position statement: Entry-level education of occupational therapists in Canada, http://www.caot.ca.). At the Master's entry level, Canadian OT academic programs prepare entry-level clinicians who demonstrate competence in the knowledge, skills and behaviors for

the practice of evidence-based health care. OT academic programs must determine how to promote EBP skills, to increase awareness of evidence sources, to ensure a widespread change in attitudes to evidence use (Turner, 2001), and ultimately to produce evidence-based scientific practitioners (Rothstein, 1998). If the EBP approach is to be entrenched in the day to day practice of future clinicians, a pedagogically sound approach would be to incorporate EBP in every aspect of the curriculum. This, however, would require a comprehensive understanding of EBP: its basis, the principles that underpin it and the most effective methods for teaching and evaluating it. A comprehensive review that elucidates these details does not exist. The existing literature does not shed light on how requisite competencies for EBP are acquired in professional education in general and in OT education in particular. It is still not an established fact that OT academic programs are successful in fostering EBP related competencies through various courses and/or practica nor that these skills are reinforced and honed systematically as students advance in their programs to the extent that at the time of graduation, they have acquired the basic skills of EBP. In the absence of systematic or empirically supported models for teaching and evaluating EBP in OT academic programs, the development of EBP skills promoted by the professional bodies are left to chance with outcomes that are, at best, haphazard. To address this shortcoming, a logical starting place would be to develop a comprehensive understanding of the concept of EBP, aspects of the curricula and teaching approaches that foster it, and the actual trajectory of development both in academic courses and clinical practica.

Drawing from educational psychology and EBP in the health professions, this paper provides a critical review that examines 1) the theoretical underpinnings of EBP, 2) the literature on EBP-related skills, 3) the role of expertise in EBP, and 4) the literature on the effectiveness of various interventions on EBP teaching and assessment. The paper concludes with suggestions for teaching and evaluating EBP that have solid grounding in educational theory and can inform the design of the EBP curriculum in OT programs.

Epistemological Foundation of EBP, Related Skills and the Role of Expertise in the Development of EBP Competence

Epistemological and Theoretical Foundations of EBP

Although many professional societies, funding agencies and the public have embraced EBP, they have done so without an apparent consideration of the serious criticisms that have been made regarding its epistemological foundations. Determining what can adequately and legitimately (Maynard, 1994) be considered as evidence has been central to many EBP discussions, contributing to much of the divide between opponents and proponents of the EBP movement (Mowinski-Jennings & Loan, 2001). Opponents claim that EBP uses a very narrow concept of evidence, essentially discrediting practitioner experience as well as professional reflection and intuition, in favor of population-based research and large scale clinical trials (Mitchell, 1999; Morse, 2005; Rolfe, 1999; Stetler et al., 1998; Webb, 2001). Others attribute their skepticism to EBP's strict reliance on the evidence hierarchy, and the narrow and overly prescriptive nature of

systematic reviews (Marks, 2002). The randomized controlled trial (RCT) is also frequently criticized for producing findings that are often inapplicable to specific clients (Rolfe, 1999; Welsh & Lyons, 2001). Yet another criticism of EBP is the apparent lack of regard for qualitative research. Because EBP has been primarily grounded in quantitative approaches and experimental designs, findings from qualitative studies have seldom been considered as legitimate sources of evidence. Consequently, critics argue that qualitative research has not taken its rightful place within EBP, despite the momentum this approach is gaining in the health professions particularly for its potential to better capture the complex relationships of clients and their experience of illness (Forbes & Griffiths, 2002; Hammel, 2001; Herbert et al., 2001; Miles et al., 2004).

In a recent paper on the epistemological inquiries in EBP, Djulbegovic, Guyatt, and Ascroft (2009) challenged the criticisms regarding EBP, stating that these criticisms are related to classical debates regarding the nature of science and knowledge. The authors suggest that EBP should be "conceptualized as an evolving heuristic structure that helps improve client outcomes rather than be viewed as a new or scientific theory that is concerned with changing the nature of medicine" (p. 158). These criticisms necessitate that scholars reflect upon and address the issues raised in the ongoing debates in order to establish a more comprehensive conceptualization of EBP. For the purpose of this paper and this doctoral dissertation, we will draw on Sackett et al.'s (2000) definition of evidence as the knowledge obtained from findings of empirical studies which are ranked according to levels of evidence outlined in Table 1.

Table 1

Levels of Evidence for Interventions

Levels of evidence	Type of study
1a	Systematic reviews with homogeneity of randomized controlled trials (RCTs)
1b	Individual RCTs with narrow confidence interval
1c	All or none
2a	Systematic reviews of cohort studies
2b	Individual cohort studies and low-quality RCTs
2c	Outcomes research; ecological studies
3a	Systematic reviews of case-control studies
3b	Individual case-controlled study
4	Case series and poor-quality cohort and case-control studies
5	Expert opinion

Note: Adapted from *Evidence-Based Medicine: How to Practice and Teach EBM* (2nd ed.) (p. 169) by Strauss et al., 2000, Edinburgh, Scotland: Churchill Livingston Inc., and Phillips et al. (1998), Oxford Centre for Evidence-Based Medicine (Updated by Jeremy Howick March 2009).

While there is no definitive or widely accepted descriptive statement of EBP, there are working definitions that are useful to advance EBP enquiry. A fundamental question is whether there is a theory associated with EBP. While none has been identified in the literature, we contend that it is possible to think about EBP from a theoretical perceptive by broadening the conceptualization and accounting for concepts such as knowledge production, knowledge acquisition and knowledge use. In EBP, knowledge in the form of scientific discoveries or research evidence on the effectiveness of treatment interventions is intended to be exchanged between researchers and professionals in a mutually created and socially constructed context. For example, researchers who produce findings from effectiveness studies, disseminate results through scholarly publications and

presentations. Clinicians as consumers of research findings, consider the evidence in light of their clients' needs and their context. Clinicians then act upon available knowledge by relating it to what they already know, developing new understandings and, in many cases, monitoring their understanding throughout the process. As such, knowledge is not an inert object "sent" by researchers and "received" by clinicians. Rather it is a fluid set of understandings shaped both by those who produce it (researchers) and by those who use it (practitioners). The meaning of research evidence and how it fits with a particular client is, therefore, constructed and interpreted by the clinician, who acts as an active problem-solver and a constructor of personal knowledge, rather than as a more passive receptacle of information (Hutchison & Huberman, 1993).

These ideas are consistent with social-constructivist perspectives and are applicable to the enterprise of EBP (Fuhrman, 1994). The fundamental premise of constructivism is that knowledge is a human construction and the learner is an active participant in the learning process (Vygotsky, 1978). Constructivism is based on three assumptions about learning (Driscoll, 1994; Gredler, 1997; Savery & Duffy, 1995; Slavin, 1994, Steffe & Gale, 1995). First, learning is a result of the individual's interaction with the environment. What a learner comes to understand is a function of the context of learning, the goals of the learner and the activity the learner is involved in. In EBP, the individual retrieves research evidence and considers it in relation to personal experience and to clients' needs. EBP is hardly ever a private effort devoid of any input from the social environment. Exchanges with peers and collaboration with the client enhance the

EBP process. The second assumption is that cognitive dissonance, the uncomfortable tension that comes from holding two conflicting thoughts concurrently, is a primary stimulus for learning. In EBP, this tension can arise from, for example, competing opinions about a preferred line of assessment. An attempt to address the uncertainty can stimulate information seeking activities, which result in alternative or broader approaches to the selection and administration of a clinical assessment. This information seeking can ultimately enhance learning. The third assumption is that the social environment plays a critical role in the development of knowledge. For instance, other individuals in the environment may put the learner's understanding to test and offer competing views that will question the viability of the learner's knowledge. In the EBP process, this can occur during client-clinician or clinician-clinician encounters concerning the nature, quality and relevance of the scientific evidence. These parallels suggest that social-constructivist theory is a suitable lens through which to examine EBP.

The Evidence-Based Practice of OT: Steps and Supporting Skills

The interaction of research evidence with clinical expertise and client input helps with the clinical decision-making process involved in EBP (Bennett & Bennett, 2000; Haynes, Deveraux, & Guyatt, 2002; Rappolt, 2003; Sackett et al., 1997). Clinical decisions made in OT are the end point of a process requiring clinical reasoning, problem solving and awareness of the client and his/her context (Clark, Scott & Krupa, 1993; Dubouloz, et al., 1999). Reagon, Bellin and Boniface (2008) proposed a framework that presents evidence-based OT as an

iterative process in which theory, evidence and practice mutually inform one another. This framework uses a broader view of 'evidence' because it considers sources of evidence other than that which come from empirical research and randomized clinical trials. Text books, research, colleagues, clinical experience, clients and their families, outcome measurement, and observation constitute acceptable sources of evidence (Bennett & Bennett, 2000; Egan et al., 1998). In addition to this broader conceptualization of evidence, there is one other characteristic difference between EBP in OT and this approach in other health professions such as medicine. The client-centered evidence-based practice of OT, positions the client at the center of the decision-making process. It values the scientific evidence and the clinician's knowledge and expertise for decision-making but it also acknowledges the client's knowledge and experiences as essential to the EBP process (CAOT, 1999; Egan et al., 1998; Hammel, 2001).

The steps involved in the evidence-based OT process are essentially similar to the evidence-based medicine approach. The steps include 1) posing a clinical question, 2) searching the literature, 3) appraising the literature, 4) considering research evidence in clinical decision-making and 5) reviewing the procedure and outcome of the EBP process (Rosenberg & Donald, 1995; Sackett et al., 1997; Sackett et al., 2000; Sackett & Strauss, 1998). The two approaches are compared in Table 2.

Table 2

Comparison of Evidence-Based Medicine and Evidence-Based Occupational Therapy

EBP steps	Evidence-based medicine (Strauss et al., 2005)	Client-centered evidence-based occupational therapy practice (Hammell, 2001)
Step 1	Convert the need for information on prevention, diagnosis, prognosis, treatment, causation etc, into an answerable question	Define a question arising from client-identified issues. *(these may be prelims derived from, for example, an individual client, a family or consumer groups)*
Step 2	Track down the best available evidence with which to answer that question/search the literature	Search the literature for relevant current research papers that are grounded in the client's perspective.
Step 3	Critically appraise that evidence for its validity, impact, and applicability	Critically evaluate the evidence for its relevance and usefulness.
Step 4	Integrate the critical appraisal with clinical expertise and with the client's unique biology, values and circumstances	Integrate the best research evidence with clinical expertise and client choice. *(this will entail sharing information in a mutually educational process, the role of the OT being to interpret and explain the evidence that was evaluated in step 3 and to seek an understanding of how these findings relate to this particular client or group of clients)*
Step 5	Evaluate one's effectiveness and efficiency in executing steps 1-4 and seeking ways to improve both next time	Evaluate the effectiveness of subsequent interventions in relation to the initial client-identified needs *(this will be in cooperation with the client to ensure relevance and timeliness of evaluation)*

Skills that support EBP

The literature offers some insight into the essential skills for successful EBP, although claims are not always substantiated empirically. In a paper on expertise in evidence-based OT, Rappolt (2003) claimed that successful EBP is a function of research skills, knowledge and experience. She asserted that therapists must demonstrate the ability to identify clinical issues, gather and appraise evidence, demonstrate good problem solving skills, and have sufficient knowledge and experience to draw from in order to make clinical decisions. This author derived the skill sets from a review of the premises and methods involved in evidence-based OT rather than from an empirical study. In an early paper, Lloyd-Smith (1997) discussed the historical developments of EBP and offered practical solutions for overcoming barriers to the use of evidence. The paper placed the emphasis on searching, retrieving and critically appraising the literature (Steps 2 and 3 of the EBP process), which he described as being a major focus of OT curricula. However, it fell short in accounting for the skills that may be involved in the other steps (Steps 1, 4 and 5). Miles et al. (2004) also claimed that judgment is a necessary skill in EBP because research facts "never really speak for themselves" and thus there needs to be an interpretative role for the therapist "using an evidential knowledge base" (p. 133). In a theoretical paper on critical thinking and EBP in nursing, Profetto-McGrath (2005) discussed the importance of critical thinking as an essential skill to support the decision making needed in EBP. She claimed that questioning, critical appraisal, evaluation and application are required skills for critical thinking but did not provide any

empirical support for these claims nor did she attempt to find justification for her claim in the expertise literature. Craik and Rappolt (2003) examined the self-reported use of research in practice of expert OTs in order to identify the processes involved in translating research into practice. They concluded that clinical experience and structured reflection were "necessary components for building knowledge, applying research findings to clinical care" and "decision making" (p. 271). Mattingly and Fleming (1994) demonstrated how and why generating clinical questions and hypotheses are necessary for the development of expertise in clinical reasoning which they claim was a required EBP skill. Using a grounded theory approach, Craik and Rappolt (2006) examined the self-reported research utilization behaviors of 11 OTs working in stroke rehabilitation. They found that clinicians' experiences, their active engagement in continuing education, their involvement in research and their mentoring of students contributed to their capacity to successfully translate research findings in OT practice. Together, this literature suggests that the EBP approach requires OTs to draw on clinical experiences, teaching and reflective practice skills, as well as critical thinking and problem solving skills in order to identify a clinical problem. Then, through the appropriate use of evidence, they ought to formulate a plan to address the client's problem. The studies suggest that in order to apply research findings in clinical decision making, clinicians must be able to pose a good clinical question, and have the skill sets that facilitate the searching and appraisal of the literature. For the most part, these are theoretically driven descriptive statements that capture and represent the EBP steps. However, they do not

identify or explain what cognitive and metacognitive skills support the successful implementation of EBP.

The Nature of Expertise and its Role in EBP

Successful application of research evidence in clinical practice is believed to be a function of expertise in a domain (one of the three necessary components of effective EBP) (Davidoff, 1999; Haynes, 2002; Rappolt, 2003; Rolfe, 1999; Sackett, et al., 1996). How is expertise characterized? What differentiates an expert from a novice? How does expertise influence EBP? Despite the paucity of literature on EBP expertise there is extensive research on expertise in general and expertise in the professions in particular that can shed light on these questions.

The nature of expertise has been studied using two approaches (Chi, 2006): (1) the study of 'exceptional people' (Chi, 2006, p. 21) to understand how they perform in their domain and how they differ from the general population (absolute expertise), and (2) the study of experts relative to novices in a specific domain which assumes that expertise is a level of performance that novices can achieve over time with intentional practice (relative expertise). This body of research has provided a solid foundation for elaborating on how experts acquire, process and use knowledge and problem solving skills (Alexander, 2003; Lajoie, 2003). It has also contributed to our understanding of the process and the trajectory of expertise development in a domain. This rich literature, particularly the insights it provides on key characteristics which differentiate experts from novices, the features of professional expertise and expertise development, is

instrumental in understanding the trajectory of expertise development in EBP. The following section addresses these dimensions.

*Characteristics of expertise and expert-novice differences***.**

Nine salient features are used to characterize expertise and underscore expert-novice differences. First, experts reach superior performance levels in their domain not only because of years of experience but because of deliberate practice. Deliberate practice involves supervision, feedback on well-defined tasks to improve certain aspects of performance and opportunity to improve upon performance (Ericsson, 1993, 1998, 2001, 2004). Second, experts excel in their domains because of a great amount of knowledge in their field (Bransford, Brown & Cocking, 2000; Ericsson & Smith, 1991; Lesgold et al., 1988). Third, experts' knowledge is hierarchical, well organized and structured in a way that allows it to be retrieved quickly, more accurately for solving problems and with minimal cognitive effort. The highly structured nature of the knowledge also enables individuals to free up short-term memory so as to a) acquire any necessary new and missing information and b) process other aspects of the task (Ericsson & Smith, 1991). Fourth, experts can execute skills with greater automaticity and exert greater cognitive control of their performance when control is needed (Ericsson, 2006). Fifth, experts focus on the conceptual features of the problem. They see patterns, cues and underlying principles that assist with problem resolution (Chi, Feltovich & Glaser, 1981; Lesgold, et al., 1988). Sixth, experts are attuned to the affordances provided by the problem (Anderson, 1982). Because they recognize and effectively utilize these affordances, they have more

success in problem resolution. Seventh, although experts spend more time analyzing a problem qualitatively, they are faster at solving the problem because of extended practice in their domain and have more automatized problem solving routines (Glaser & Chi, 1988; Klein, 1993). Eight, experts are opportunistic. They make use of all sources of information and available resources to solve a problem (Gilhooly et al., 1997) and are more successful than novices at choosing the correct problem solving strategies. Lastly, experts have more accurate self-monitoring skills which help them detect errors more precisely and self-monitor the status of their comprehension during problem resolution (Chi, Glaser & Rees, 1982; Chi, 1978).

Expertise in the health professions.

Attributes of professional expertise were gleaned from studies conducted in the health professions. The following points summarize findings from the literature on expertise in nursing (Benner, 1982, 1984; Daley, 1999; Dreyfus & Dreyfus, 1980; Hamers, van den Hout, Halfens, Abu-Saad & Heijltjes, 1997; Welsh & Lyons, 2001), medicine (Allen, Arocha & Patel, 1998; Feltovitch & Barrows, 1984; Patel & Groen, 1986, 1991; Patel & Kaufman, 1995; Schmidt & Boshuizen, 1993; Schmidt, Norman & Boshuizen, 1990, 1992), psychology (O'Byrne & Goodyear, 1997), and medical imaging (Yielder, 2004): (a) Professionals grow from the experiences they encounter moving through five steps of development: novice, advanced beginner, competent, proficient and expert. This move reflects a change from reliance on abstract principles to reliance on more concrete past experiences. (b) Experts use a combination of

intuition, tacit knowledge and formal knowledge when exposed to complex client problems. (c) Professional expertise has an impact on decision making regarding treatments and on how fast clinical decisions are made. (d) Experts see situations as a whole; they readily recognize relevant aspects of a problem and gather clinical information with minimal attention to superficial aspects of a case. They also rapidly recognize patterns in clinical situations and similarities between cases. When making diagnoses, expert physicians rely on a set of cognitive schemas that store information from previous patient experiences, referred to as "illness scripts" (Custers, Boshuizen & Schmidt, 1996; Feltovich & Barrows, 1984; Schmidt, Boshuizen, & Norman, 1992; Schmidt, Norman & Boshuizen, 1990). Physicians reorganize their knowledge of pathophysiology, clinical signs of disease, changes in signs and symptoms and constraints under which some diseases may occur into scripts that are tied together by temporal links and causal relationships. Scripts typically have three features: enabling conditions such as predisposing factors, faults which refer to the insult to a tissue by an organism and consequences which take the form of complaints, and signs and symptoms. Experts operate upon these "illness scripts" that appear to accumulate from recurring exposure to a variety of clients and from extended practice. Expert physicians will search for appropriate scripts to help them identify features of the problem already stored in memory that can be used to support the solution of a new, albeit conceptually similar clinical problem. (e) Professional experts (mostly in medicine) tend to use forward thinking (data driven) strategies which require a great deal of background knowledge whereas novices tend to use a hypothesis-

driven approach, (backward reasoning) which makes heavier demands on working memory and is more likely to be used when domain knowledge is limited. (f) Experts have highly developed self-monitoring-skills that they use during client encounters and problem solving situations. (g) Professional expertise is manifested through and builds upon interpersonal relationships with clients and other professionals. It is not simply a function of how much knowledge one has, but how and when that knowledge is used. (h) Deliberate practice is necessary for achieving professional expertise.

Although expertise in the health professions builds upon attributes of general expertise, there are notable differences between expertise in professions such as medicine and OT and expertise in domains such as music, chess and sports. Expertise in the health professions appears to be manifested through interpersonal relationships with others (clients and colleagues). Experts in domains such as medicine and OT demonstrate mastery of a diverse body of knowledge (biomedical, clinical) and a range of motor (surgical, manual muscle testing), cognitive (problem solving, clinical reasoning) and interpersonal skills. This is clearly, unlike many other domains (Norman et al., 2006). Also unlike other domains, professional expertise involves coordination of formal versus experiential knowledge. For instance, physicians must keep up with the volume of new knowledge on diagnostic tools and medical treatments (Choudhry et al., 2005) in addition to engaging in extensive periods of training in order to attain success in their practice.

Notwithstanding these differences, there is one major common feature of expertise across different domains. There is little support for skill or talent as the defining characteristic of expertise across domains. “General skills are as inadequate an explanation for surgical expertise as they are for violin expertise” (Norman, Eva, Brooks & Hamstra, 2006, p. 350). Rather, it is the individual’s knowledge and cognitive processes as well as the deliberate practice with feedback that are believed to be the key to expertise in most domains.

Development of expertise.

Contemporary expertise research programs have been focusing on the development of models of what learners need to know in order to demonstrate complex performance across domains (Alexander, 2003; Chi et al., 1988; Glaser et al., 1987; Lajoie, 2003; Lajoie & Azevedo, 2006; Mislevy et al., 1999). While the emphasis on developmental trajectories towards expertise is prevalent in contemporary studies of expertise (Ackerman, 1996, 2000, 2003a; Alexander, 2003; Lajoie, 2003), researchers in the professions have yet to identify such trajectories. Yielder (2004) argued that one reason for this shortcoming is that traditional expertise research focused primarily on experiential and cognitive factors as contributors to expertise, ignoring the need to integrate these into a coherent model of professional practice (Rolfe, 1998). Instead of examining expertise from the strictly traditional cognitive point of view, Alexander (2003b) has proposed that the focus be shifted to the development of expertise in academic domains. Her model of domain learning (MDL) considers domain knowledge, strategic processing and interest as interacting elements in the development of

expertise (Alexander, 1992; 1997). The MDL conceptualizes expertise as having a domain-specific nature and recognizes that learning must be conceptualized as encompassing both cognitive and non-cognitive factors such as motivation and affect. The MDL targets improvement in student learning and development in academic domains as its primary purpose. With the MDL, the journey towards achieving expertise becomes more important than the differences between experts and novices. Understanding the impact of these factors on the development of expertise is crucial for uncovering why some learners are more successful on their journey towards expertise than others (Bereiter & Scardamelia, 1993).

Alexander's work has resulted in a description of the stages of expertise development from acclimation, to competence and proficiency. Within this framework, students are not expected to reach the proficiency level while in the academic setting, because proficiency requires a broad knowledge base, advanced problem solving skills and interest, which can only be acquired following extended exposure and practice in a domain (Alexander, 1992). The implication of the MDL for EBP competency development is as follows: if successful application of evidence in clinical practice is a function of expertise (Davidoff, 1999; Haynes, 2002; Rappolt, 2003; Rolfe, 1999) and if we conceptualize EBP as a domain, then it may be unrealistic to expect university students to reach expert performance levels in EBP by the end of their educational experience. Instructional environments may have to redirect their objectives and move to meet interim targets on the trajectory of learning and progressive acquisition of EBP expertise. The academic training may be designed to help students with individual

features of expertise and among these, self-monitoring which is a key element as it propels progress along the trajectory (Collins, Brown & Newman, 1989; Lajoie, 2003). Although Alexander's model requires further study in relation to how it can support the development of EBP expertise in OT students, it offers a promising reference for examining trajectories of development and particular subset of skills that might reasonably be achieved at various stages. In the interim, to help students develop EBP competencies and move along the trajectory of developing expertise, instructors must design effective teaching environments and use valid instruments and assessment methods to assess both the individual student's competence and the programmatic impact of EBP curricula. Doing so requires a solid grasp of teaching and learning theories as well as analyses of the research evidence in this area. In this next section a synthesis of the literature on the teaching and assessment of interventions targeting EBP knowledge, skills and attitudes in professional programs and post graduate education is presented**.**

Effectiveness of Evidence-Based Practice Teaching and Assessment Interventions

Teaching Interventions

Teaching activities described in the health sciences literature are designed to address one or more of the required skills for successful implementation of EBP and are typically aligned with the five EBP steps. However, few teaching approaches address all five (5) EBP steps and, fewer have demonstrable success in teaching all of the skills needed to adequately and consistently integrate EBP into clinical practice. Five systematic reviews, conducted between 1998 and 2007, looked at the effectiveness of teaching interventions on knowledge of critical

appraisal, attitudes, skills and EBP behavior. Flores-Mateo and Argimon (2007) studied the effect sizes for different instructional interventions aimed at improving EBP knowledge, attitudes, skills and behaviors in postgraduate health care education. They found small improvements for all four outcomes when these were measured alone but rather large improvements (effect size > 0.79) in knowledge and skill in EBP when these were measured together in a total score. These findings notwithstanding, the authors were critical of many of the studies in the review because of poor study quality and lack of validated outcome measures. Norman and Shannon (1998) showed that instruction in critical appraisal resulted in positive gains on medical students' knowledge of critical appraisal, without providing evidence of gains sustained over time or translated into practice. Coomarasamy, Taylor and Khan's (2003) systematic review of the teaching of critical appraisal revealed improvements in knowledge of critical appraisal but not in EBP attitudes, skills or behaviors. The same authors (2004) reviewed the effect of standalone vs. integrated courses (teaching of EBP integrated within clinical practica) on critical appraisal knowledge, skills, attitudes and behaviors. They found that the former improved knowledge only, whereas the integrated approach showed improvement in all four outcomes (knowledge of critical appraisal, skills, attitudes and behaviors) supporting the use of authentic teaching situations and the situated aspect of learning (Lave & Wenger, 1991). Hyde, Deeks and Milne's (2006) review examined the teaching of critical appraisal and the impact of this teaching on client care, client outcomes and knowledge of critical appraisal. The review, which included only one RCT, indicated that teaching improved

knowledge of critical appraisal by 25%, however, there were no data reported on client outcomes.

Several conclusions are drawn from these reviews. Teaching interventions have a greater impact on knowledge and skill than they do on sustainable EBP behaviors. Hence, there is no evidence as to whether teaching interventions ultimately have an impact on clinical practice. Improvements in EBP knowledge seem to vary according to the level of the learner, whether undergraduate or postgraduate. It is not clear what works for which group because studies were conducted on learners at different levels in their training (students, post graduates). Many of the studies lack theoretical grounding as the investigators have not used theoretical frameworks to support the studies. Lastly, it appears that EBP instruction has a greater impact on acquisition of EBP related knowledge, skills and attitudes when integrated into real life contexts using authentic situations as those afforded by fieldwork and clerkships, which support the value of situated learning and the use of authentic teaching situations (Lave & Wenger, 1991). A note of caution: a number of methodological flaws in most of the studies reviewed considerably limit the validity and generalizability of findings. Hatala and Guyatt (2002) and Gruppen (2007) have highlighted these shortcomings as: infrequent use of randomization in experimental designs, a heavy reliance on quantitative methods for measuring and explaining the complex forms of EBP competencies, the short duration of interventions in university environments where there is a rapid student turnover and limited time for longitudinal studies

and repeated use of self-reports of knowledge and skill instead of objective measures of performance and behaviour.

Assessment of EBP Competencies

Until about 1998, published assessment instruments focused mostly on the evaluation of critical appraisal, essentially ignoring the other EBP steps. Furthermore, the majority of instruments measured EBP knowledge and skills but did not objectively assess behaviors in actual practice. Most importantly, few had established validity and reliability (Shaneyfelt et al., 2006). In the last decade, several instruments have been developed to address the shortage of measures with strong psychometric properties that incorporate all steps of EBP. Green (1999) conducted a systematic review of evaluation instruments in graduate medical education training in the areas of clinical epidemiology, critical appraisal, and evidence-based medicine. The main objective of the studies included in Green's review was to improve critical appraisal skills (other EBP steps were excluded) in resident-directed, small-group seminar teaching using scores on multiple-choice examination as the outcome measure. Only four of the eighteen studies met minimum methodological standards for controlled trials and of the seven studies that evaluated the effectiveness of the teaching of critical appraisal skills, the effect sizes ranged from no effect to a 23% net absolute increase in test scores. Green, however, reported problems with the studies including incomplete description of curriculum development, absence of behavioral objectives and clearly defined educational strategies and, inadequate evaluations of the curricula which introduced limitations to the systematic review process. A 2006 systematic

review by Shaneyfelt et al. identified 115 articles on assessment of EBP, representing 104 unique instruments administered primarily to medical students and postgraduate trainees. Although the majority of available valid instruments were self-report measures of skills in searching for and appraising the literature, the authors highlighted two instruments with strong psychometric properties that evaluated most of the EBP steps: 1) the Fresno Test (Ramos, Schafer & Tracz 2003) which uses two clinical vignettes and asks students to formulate a clinical question, acquire the evidence, appraise it and then apply the evidence for the client depicted in the vignette, and 2) the Berlin Questionnaire (Fritsche, Greehalgh, Falck-Ytter, et al., 2002) which measures EBP knowledge and skills using a 15-item multiple choice test. Although the latter is easier to score than the Fresno, it does not evaluate all the EBP steps (Agrawal, Szatmari & Hanson, 2008). Other instruments included in the Shaneyfelt et al. (2006) review targeted fewer EBP steps and were specific to certain types of EBP curricula. In their 2007 review, Flores-Mateo and Argimon compiled 22 distinct assessment methods for EBP skills, knowledge, behaviors and attitudes of post-graduate healthcare workers. However, the authors described several problems with the studies included in their review such as poorly reported feasibility of implementation, underreporting of time needed to administer and score the instruments and lack of instrument validation; only 45% (N=10) of the instruments were validated with at least two or more types of evidence of validity or reliability. In addition, most instruments had limited applicability to different teaching modalities or to different curricula in the health professions. The literature reviewed so far has

highlighted a number of strategies used to promote EBP knowledge, skills, and attitudes in undergraduate students and post graduate trainees. Whether because of methodological flaws, absence of theoretical grounding or challenges in teaching and assessing the 5-step process in a pedagogically sound manner, this literature suggests that there is still no consensus on the ideal methods for teaching and evaluating EBP. This clearly points to a gap that needs to be addressed in light of OT curriculum objectives. In this final section, suggestions are offered for teaching EBP, drawing on educational theories and their relevance to teaching in higher education. For the evaluation of EBP, rather than proposing specific assessment instruments, general concepts of assessment that need to be taken into account are discussed and suggestions are offered for the design of EBP assessment.

A Framework for Teaching and Evaluating EBP

Theoretical Guidelines for Teaching

Proceeding through the five steps of EBP requires a balance of skills in each step (Dawes et al., 2005). Curricula designed to promote knowledge, skills and attitudes of EBP grounded in the 5-step process can help students see the EBP process as a continuum. Specific teaching methods that help students acquire and integrate cognitive and self-monitoring strategies and discover, use and manage knowledge (Collins et al., 1989) can support the move along the trajectory of developing expertise in EBP (Lajoie, 2003). Constructivist theories have guided the design of effective learning environments where individuals learn by doing and where learning takes place in context (Lajoie & Avezedo, 2006). The

recommendation here is that instructional design that targets EBP competencies be based on five salient constructivist characteristics about learners and the learning context. That is, instructors should 1) consider the learner's existing knowledge, beliefs and attitudes regarding EBP; 2) understand the salient role of social negotiation and collaboration with peers in incorporating evidence in clinical decision making; 3) acknowledge that the learning situations, content and learning activities are meant to foster self-analysis, problem-solving, higher-order thinking and deep understanding. As such, they must be relevant, authentic and represent the natural complexities of the world; 4) support collaborative learning because it exposes students to alternative viewpoints and affords them the opportunity for apprenticeship learning; 5) scaffold learners so that they can move from what is presently known to what is to be known, thereby facilitating the learner's ability to perform just beyond the limits of current ability (Ernest, 1995; Honebein, 1996; Jonassen, 1991, 1994; von Glasersfeld, 1995; Vygotsky, 1978; Wilson & Cole, 1991). Moreover, EBP should be taught in a socially constructed environment in the classroom and in authentic learning contexts such as those afforded by fieldwork. Students should be encouraged to engage in discussion, debate, reflection and problem solving with peers and experts and ultimately solve problems that reflect the broad scope of scenarios they are likely to encounter in the future. The content and context of learning should be structured and guided by the teacher in collaboration with the learner. The teacher should model the EBP process and its underlying skills, scaffold students through practice and progressively fade the support allowing students to engage in EBP autonomously.

The use of collaborative learning methods, case-based methods and cognitive apprenticeship offers much promise for promoting the development of EBP competencies. The specifics of these approaches are described below.

Collaborative learning.

In collaborative learning environments, students work in small groups with their peers. In the process of cooperatively solving problems, students generate self-explanations and construct inferences about a specific problem. This process ultimately helps them integrate and solidify new understanding and solve problems (Slavin, 1991). Engaging in discussions, problem solving and questioning (Johnson & Johnson, 1993) also allows students to test each other's understands and build knowledge. The types of constructive activities involved in collaborative learning trigger metacognitive activities. In attempting to solve problems, students monitor their understanding and become aware of errors and misunderstandings. Group problem solving improves awareness of misunderstandings which in turn triggers help-seeking behaviors and explanations and ensures better understanding and problem resolution (Johnson & Johnson, 1993). Collaborative learning contexts afford many opportunities for working on EBP cases where students can discuss client scenarios and integrate the EBP steps collaboratively.

Case-based method.

Cases are frequently used in traditional and problem-based learning (PBL) health sciences curricula (Evenson & Hmelo, 2000; Hmelo-Silver, 2004). The objective of case-based instruction is "learning through problem solving" (Hmelo-

Silver, 2004, p. 239). While working with cases, students learn content, strategies, and self-directed learning by solving problems (Hmelo-Silver, Duncan & Chinn, 2007) and actively construct knowledge in a collaborative manner with peers. The instructor's role is to guide the process through open-ended questioning that facilitates problem solving, reasoning, and the application of existing and prior knowledge. In PBL environments, the case (or problem) is typically an ill-structured but realistic problem used to facilitate learning and reasoning (Barrows, 2000; Evenson & Hmelo, 2000). In OT education, clinical cases are designed to promote knowledge acquisition, problem solving and working through the OT process. Cases range from simple scenarios targeting surface-type issues (identification of the client's occupational performance issues) to more complex vignettes designed to promote analysis, synthesis and application of knowledge for OT assessment and treatment. Cases contain explicit detail and appropriate cues allowing the clinical image to emerge. By selecting the important information among the less pertinent information in a case (McKeachie, 1986), either with support from peers or instructors, student can begin to identify the more relevant assessments and treatments. Focusing on the significant aspects of the case facilitates understanding of the nature of the problem (Rogers & Holm, 1991). Neistadt et al., (1997) found that the use of cases in OT led to improved quality of student intervention plans and understanding of clinical reasoning concepts mainly because instructors explicitly model their expert problem solving and clinical reasoning before having students attempt to solve a similar case. Using case studies, Reed (1996) developed and evaluated a 12-week course

designed to help foster problem solving skills in OT students. Results indicated that students in the program were not only more confident in their selection of assessment and treatment interventions, but they could apply effective problem solving skills to determine solutions to complex pediatric patient problems. Case based methods can have great potential for evoking both the knowledge and skills required for evidence-based decision-making.

Cognitive apprenticeship.

The cognitive apprenticeship framework as a social-constructivist approach to OT education in general and to the teaching of EBP in particular offers much promise. It can promote the required OT skills and competencies by exposing students to authentic practices through activity and social interaction. Cognitive apprenticeship embeds learning in activities that make deliberate use of the social context. Social interaction and collaboration with peers and with the teacher promotes conceptual understanding and the development of problem solving skills (Collins, Brown & Newman, 1989). In cognitive apprenticeship, students are given ill-defined tasks and real-world problems representing authentic situations. The tasks start by being slightly more difficult than students can manage independently, requiring the support of peers and instructors to succeed.

The techniques in cognitive apprenticeship include modeling, scaffolding, coaching, articulation, reflection and observation. Modeling, scaffolding and coaching are designed to assist students in integrating a set of cognitive and metacognitive skills through processes of observation and guided practice.

Modeling provides students with a concrete reference to expert performance. It provides a glimpse "into" the expert's internal cognitive processes and helps students understand the thinking involved in solving problems. The process requires that the expert's (in this case the instructor's) knowledge be made explicit if it is to contribute to the developing knowledge and practice of novices (in this case the students) (Bereiter & Scardamelia, 1993; Ethell & McMeniman, 2000; Mayer, 1987). In *coaching,* instructors observe learners while they carry out a task. During the observations, the instructor offer hints, cues, feedback, and reminders as needed and suggests new tasks that will help bring the learner's performance closer to expert performance. Learners begin to assume greater role in the activity by carrying out and integrating skills through highly interactive feedback and suggestions. *Articulation* involves learners talking out loud about their knowledge, reasoning, or problem-solving processes. This helps students consolidate their knowledge but it also helps them compare and contrast their understanding with peers and the expert (instructor). Ultimately, the instructor has a basis for refining and expanding the student's understanding. In *scaffolding* the teacher provides support to help learners carry out a task. This is done by carrying out parts of the overall task the learner cannot yet manage, by providing physical supports, or by providing suggestions and help along the way and as needed. The *fading* stage occurs when the student is capable of independent exploration of learning (Collins et al., 1989). Exploration pushes students to try out hypotheses, methods, and strategies similar to those that experts use to solve problems (Collins, 1991), it encourages learner autonomy in defining and solving problems

and enhances discovery of new knowledge and acquisition of general problem-solving skills (Shunk, 2000).

The relevance of the apprenticeship framework to OT education in general and to the teaching of EBP in particular in the classroom and in clinical milieu is evident. Clinical cases, collaborative learning groups and clinical experiences can be woven though the OT curriculum. These instructional activities provide authentic learning opportunities for students that involve cognitive apprenticeship with practicing clinicians and instructors. The didactic portion of the curriculum also offers opportunities for cognitive apprenticeship whereby instructors model their thought processes and verbalize their problem solving processes while working on cases (Graham, 1996; Maudsley & Strivens, 2000). In fieldwork, preceptors can demonstrate and model the EBP skills and behaviors that students are expected to learn. Gradually, preceptors can reduce their direct assistance and shift from modeling to guiding or facilitating learning with the objective of engaging the student in the EBP process independently (Sullivan & Bossers, 1998).

Considerations for Assessment

Progress in what is known about learning and acquisition of complex cognitive skills has led to major changes in both the purpose and types of assessments used (Bass & Glaser, 2004; Boston, 2003; Collins, 1990; Cranton, 1989; Frederiksen & Collins, 1989; Glaser, 2001; Marshall, 1993; Pellegrino, Baxter & Glaser, 1999; Pellegrino, Chudowsky & Glaser, 2001; Royer, Cisero & Carlo, 1993; Shepard, 2000; Snow & Lohman, 1993). To be compatible with and

support a constructivist model of teaching and learning, assessment should be targeting both the process and the product of learning. Table 3 summarizes the general assumptions and features of assessment and provides examples of applications in assessment of EBP.

Table 3

Assumptions and Features of Assessment Design and Examples of Application in Assessment of EBP

Assumptions	Features of assessment design	Examples in EBP
Planning and authenticity	Assessment should be valid, reliable and authentic. Assessment takes place in authentic environments. Assessment tasks resemble the challenges learners will encounter in the course of ordinary living.	Teacher ask questions such as: "*How should students demonstrate knowledge and competence in EBP"?* *"At what level should students be able to resolve problems at the end of an instructional episode?"* *"What important aspects of a student's performance do we want to draw inferences from when measuring student achievement in EBP"?* *What situations and tasks should we observe to make the appropriate inferences"* Assessments using simulated clients, real clients during fieldwork and cases histories.
Dynamic assessment	Evaluates progress in knowledge and performance during the problem solving process. Evaluates learners throughout a term of instruction to capture the degree of	Assessment of EBP competencies throughout a term of instruction and in each of the academic years. Integration of EBP concepts across assignments.

	development in learning. Offers immediate feedback to both the learners and the teacher who use this information to scaffold the next steps of instruction, modify content and process of instruction and make recommendations to learners for areas of improvement. Makes it possible to use assessment as a learning vehicle, in a formative rather than in a summative way.	Regular feedback on EBP knowledge, skill and behaviors.
Alignment of assessment with learning outcomes	Assessment methods converge with specific expectations stated in the learning outcomes.	If novice learners are expected to know the definition and purpose of EBP, assessment should target surface type knowledge. If desired outcome is synthesis of research findings and integration of findings in clinical decision-making making, assessment should target these higher levels skills in addition to surface knowledge regarding critical appraisal.
Transparency	Present learners with explicit evaluation criteria. Satisfies a basic fairness criterion. Helps learners develop their understanding of standards in a domain.	Assessment of critical appraisal skills: provide a detailed checklist with explicit criteria for the different areas of critical appraisal.
Using a range of formative and summative	Is one way of meeting the diversity of learners' needs? Helps to gain a holistic understanding of	Using different assessment methods that target the different skills involved in the five EBP steps for various clinical

assessments	what knowledge and skill has been acquired. Enhances validity and fairness of inferences by giving learners various ways of showing competence. Formative assessment removes high stake element of assessment and informs learning.	scenarios (essay questions, oral presentations and client simulations). Feedback on assignment that are not graded (eg. searching for literature with librarian, practice of critical appraisal using different checklists, etc).
Group performance	Assessment that target group performance and contributions of individuals to that performance. Reflects many real life situations involving interactions with others and contributions from many people.	Assessment of the contribution of various group members in working on a case depicting an EBP scenario.
Focus on thinking and cognitive processes	Assessment that targets the thinking and the cognitive processes involved in a domain, as opposed to emphasizing acquisition of content knowledge only.	May involve problems solving and decision-making in the face of varying or conflicting scientific evidence regarding a treatment.

Assessment of learning and competence in EBP requires careful planning. Instructors can design valid, reliable and authentic assessments that take place in authentic environments similar to those in which the learner is expected to apply the newly acquired knowledge (Boston, 2003). The tasks used to assess learners should resemble in significant ways the challenges that learners will encounter in the course of ordinary living. In designing EBP assessments, instructors can ask questions such as "How should students demonstrate knowledge and competence in EBP"? "At what level should students be able to resolve problems at the end of an instructional episode"? "What important aspects of a student's performance do we want to draw inferences from when measuring student achievement in EBP"? What situations and tasks should we observe to make the appropriate inferences"? (Boston, 2003).

Dynamic assessment can be used to evaluate students' progress in knowledge and performance while they are in the process of solving a problem rather than after they have completed a task (Lajoie & Avezedo, 2006). With dynamic assessment, instructors evaluate students throughout a term of instruction. This offers immediate feedback to both the student and the instructors (Brown, Campione, Webber & McGilly, 1992) who can use this information to scaffold the next steps of instruction (Vygotsky, 1978), to modify the content and process of instruction, and make recommendations to students for areas of improvement (Palinscar, 1998). Dynamic assessment makes it possible to use assessment as a learning vehicle and in a formative way rather than in a summative way. Assessing EBP competencies throughout a term of instruction

and in each of the academic years allows instructors to capture the degree of development in EBP learning and performance in the context of an academic program.

Assessment must clearly capture and be aligned with the learning objectives (Fenwick & Parsons, 2000; Frederiksen & Collins, 1989; Kelson, 2000). Both the assessment methods and the manner in which they are used must converge with the specific expectations as pre-stated in the learning outcomes. If novice learners are expected to know the definition and purpose of EBP, assessment should be targeting surface type knowledge. If, on the other hand, the expectation is that students be able to synthesize research findings and integrate these in clinical decision-making making, then the assessment should be targeting these higher levels skills in addition to surface knowledge regarding critical appraisal.

Assessments that are "transparent" (Pellegrino et al., 2001; Shepard, 2000; Wolf & Reardon, 1996) present students with the explicit criteria to be used during evaluation of learning (Bass & Glaser, 2004; Frederiksen & Collins, 1989; Frederiksen & White, 1997). Because the EBP process contains various steps and associated skills, the notion of "transparency" allows learners to know exactly what aspects are being evaluated and how (Bass & Glaser, 2004; Frederiksen & Collins, 1990; Frederiksen & White, 1997; Pellegrino et al., 2001; Shepard, 2000, 2001; Wolf & Reardon, 1996). Access to evaluation criteria satisfies a basic fairness criterion but it also helps students to develop their understanding of standards in a domain (Shepard, 2001). In assessing critical appraisal skills, for

example, instructors should provide a detailed list of the different areas of critical appraisal so that students know exactly what is expected of them. No one single test score can capture the complexity of EBP and its five related steps or be considered a true measure of a student's competence in EBP. Therefore, when possible, instructors should use a broad range of formative and summative assessments (Pellegrino et al., 2001). Formative assessment gives students the opportunity to receive feedback on their knowledge of EBP and their ability to proceed through the EBP steps without the high stakes of summative assessment. Using a wide range of assessments is also one way of meeting the diversity of learner needs and developing a holistic understanding of what knowledge and skill has been acquired (Fenwick & Parsons, 2000). Furthermore, a variety of assessment methods enhances validity and fairness of inferences by giving students various ways of showing competence. In the case of EBP, instructors could use different assessment methods (such as essay questions, oral presentations and client simulations) that target the different skills involved in the five steps of the process for various clinical scenarios.

Assessment of EBP can be designed to target group performance and the contributions of individuals to that performance, because many real life situations involve interactions with others and contributions to group efforts and group performance. Instructors can assess the contribution of various group members in working on a case depicting an EBP scenario.

Assessment should focus on the thinking and the cognitive processes involved in EBP (e.g. synthesis of scientific evidence, problem-solving, decision-

making) as opposed to emphasizing acquisition of content knowledge (e.g., knowledge of evidence, knowledge of different study designs) only (Pellegrino et al., 2001; Royer, Cisero & Carlo, 1993; Shepard, 2000). In EBP, this may involve problem-solving and decision-making in the face of varying or conflicting scientific evidence regarding a treatment.

Lastly, authentic and performance-based assessments represent the complex thinking and problem solving skills that are necessary for success in today's world. They are useful for assessing the process and product of learning (Branford & Schwartz, 1999; Lajoie, 2003; Lajoie & Avezedo, 2006; Linn, Baker & Dunbar, 1991; Pellegrino et al., 2001) and can be developed to reflect the kinds of competencies needed in most occupations and professions (Graue, 1993; Schuwirth & van der Vleuten, 2006; Shepard, 1989). Authentic and performance-based assessments represent an alternative to standardized, norm-referenced, multiple-choice testing (Maclellan, 2004). These are more meaningful to students because they invoke authentic applications (Marshall, 1995; Fenwick & Parsons, 2000). Authentic assessments have the following features: (a) students help with the development of assessment criteria, (b) they target higher order level of thinking and problem solving, (c) they measure metacognitive, collaborative and intrapersonal skills, (d) they contextualize assessment in real world applications, (e) they use specific criteria that are known in advance, and (f) they define standards of good performance (Linn et al., 1991; Wiggins, 1989). Examples of assessments that can be used to evaluate EBP competencies include essays, open-ended tasks such as explaining answers, working on research papers, group

projects, oral examinations, a portfolio of work accumulated over a term of instruction and the 360 degrees feedback assessment where the learner asks peers and instructors to complete a questionnaire on their performance rating technical skills, interpersonal skills, team skills and research skills.

In summary, it is proposed that the design of EBP assessment methods be grounded in the 5-step process where competence is evaluated using different assessment tools that target the different skills involved in each step. Instructors should design assessments grounded in empirically tested models of expertise, implement assessment methods that clearly capture the learning objectives, provide students with explicit criteria of what is expected from them and utilize a combination of authentic and performance-based assessment methods in order to evaluate the different learning goals and ensure fairness of the inferences made about student learning.

Conclusion

Consumers of health services expect the best possible care from competent, up to date professionals who base their clinical decisions on a combination of expert judgment and sound research evidence. EBP attempts to meet these expectations. Despite the continuing debate about the nature of evidence and the generalizability of large scale clinical trials, EBP remains an attractive and highly researched paradigm of health care practice. Successful EBP is a function of experience in a domain, the use of sound evidence and the integration of client choices. If the development of clinical expertise is in part dependent upon extended experience and practice in a domain, exposure to a

variety of cases and sufficient domain knowledge, then EBP competency development ought to be conceptualized as a progression along a path of developing expertise with clearly delineated landmarks. Acquisition of EBP competencies must begin during an individual's professional training. To this end, OT academic programs are expected to design curricula that target these competencies. The specifics concerning what is the most effective way to teach and evaluate EBP in professional OT programs remain illusive to curriculum designers. This paper highlighted how the breadth and depth of EBP knowledge can be addressed by teaching and modeling the expert competencies needed for practice. For instructors to successfully teach EBP, they must ensure that students possess the essential domain knowledge and that learning is embedded within a socially constructed environment and that they use authentic problems which students solve with peers first and then independently. Whether in the classroom or in fieldwork, learning environments should promote self-monitoring skills that will allow students to monitor their work, regulate their learning and actively engage in the learning tasks.

Finally, this paper has provided an outline of educational theories that can inform both teaching and assessment of EBP. There is considerable knowledge about how people acquire, synthesize and use information to solve real-life problems and this knowledge ought to inform the design of professional curricula. This kind of development needs to go hand in hand with research to determine effectiveness and whether desired EBP competencies are achieved. There is a wide territory ripe for exploration.

Bridging Manuscript

Development of an Occupational Therapy Evidence-Based Practice Reference Model

The second manuscript in the dissertation is intended to address the first study objective: to identify the evidence-based practice (EBP) behaviors of expert occupational therapy (OT) clinicians in one area of practice, 'prevention of falls in the geriatric population' and use the identified behaviors to create an EBP reference model.

The growing popularity of EBP for its potential to promote best practice and improve clinical outcomes has resulted in efforts by policy-makers and researchers to better understand EBP and find ways to encourage practitioners to embrace and successfully adopt this practice paradigm. The rising recognition of EBP has also lead to mounting pressures on OT academic programs to raise student awareness of evidence sources, to ensure a widespread change in their attitudes to evidence use (Turner, 2001) and to produce evidence-based scientific practitioners (Rothstein, 1998).

Despite the overwhelming call for OT clinicians to integrate research findings in clinical practice, there is strong evidence that scientific findings are not routinely used to inform decisions about client care. In fact, the growth of scientific evidence in OT has not resulted in an equally growing trend towards EBP. As a result, researchers are now shifting their focus towards identifying and applying effective strategies to help clinicians embrace and adopt EBP. Likewise,

in the higher education context, efforts to design optimal EBP curricula have resulted in numerous studies including a number of systematic reviews on the effectiveness of EBP teaching in the health sciences. While studies have shown some methods to be effective in improving learners' EBP knowledge and attitudes towards evidence use, effective strategies leading to long term behavior change and impact on clinical outcomes have yet to be identified. EBP requires that a health care professional demonstrate judicious use of scientific evidence when making a clinical decision (Rosenberg & Donald, 1995; Sackett, et al., 1996; Taylor, 1997). Successful application of research findings in clinical practice is believed to be a function of the individual's experience and expertise in their domain (Davidoff, 1999; Haynes, 2002; Rappolt, 2003; Rolfe, 1999). Traditional expertise research (Bransford, Brown & Cocking, 2000; Chi, Feltovich & Glaser, 1981; Ericsson, 1996; Ericsson & Smith, 1991; Lesgold et al., 1988) has served as the foundation for what is currently known about what it means to be an expert in the professions. Contemporary expertise research has been focusing on the developing nature of expertise in order to plot potential trajectories that can be used to guide novices to progressively move towards expertise in a domain (Ackerman, 1996, 2000, 2003a; Alexander, 2003b; Lajoie, 2003). These trajectories can eventually be used to develop models of what students need to know in order to demonstrate complex performance across domains (Alexander, 2003b; Chi, Glaser, & Farr, 1988; Glaser, Lesgold, & Lajoie, 1987; Lajoie, 2003).

There are currently no existing models of expert thinking and problem solving in complex areas of OT practice such as EBP. To support clinicians in

successfully adopting EBP as well as facilitate the design of EBP curricula in OT professional programs, a clearer understanding of what characterizes optimal performance in this decision-making approach is needed. Attributes of expert performance gleaned from observations of clinicians who apply EBP in their daily practice could provide useful insights into what expert clinicians' evidence-based practice looks like in a particular clinical area. These attributes can then be used to design models of EBP that present clinicians with a framework for best practice. These models can also be useful for educators as they design and implement curricula that help students acquire EBP competencies (Alexander, 2003; Lajoie, 2003). To date, there is no empirical evidence on the behaviors and decisions of expert OT clinicians who apply the EBP process.

The research reported in this paper describes the practice behaviors of experienced clinicians in one area of OT, 'falls prevention in the elderly population'. The paper also describes the process of generating an EBP reference model from the identified practice behaviors and the resulting tree structured reference model in this clinical area.

Chapter III: Manuscript 2

Development of an Occupational Therapy Evidence-Based Practice Reference Model

From: Thomas, A., Saroyan, A., & Lajoie, P. S. Development of an Occupational Therapy Evidence-Based Practice Reference Model. Manuscript submitted to the journal "Disability and Rehabilitation", January 6th, 2011.

Abstract

The growing recognition of evidence based practice (EBP) for its potential to improve patient outcomes has resulted in substantial efforts by managers and researchers to find ways to encourage clinicians to integrate research findings in practice. To support clinicians in successfully adopting EBP as well as facilitating the design of EBP curricula in occupational therapy (OT) professional programs, a clearer understanding of what characterizes optimal performance in this decision-making approach is needed. Attributes of expert performance gleaned from observations of clinicians who apply EBP in their daily practice could provide useful insights into what expert EBP might look like in a particular clinical area. To date, there is no empirical evidence on the behaviors and decisions of expert OT clinicians who apply the EBP process in the area of falls prevention. The objective of this study was to capture the EBP behaviors of expert OT clinicians for a written simulated clinical vignette and use these behaviors to develop an EBP reference model in the area of falls prevention. The study was

conducted in three phases. In the first phase, nine expert OTs participated in the creation of a clinical vignette through focus group discussions. In the second phase, using the vignette as the stimulus case, the clinicians answered five questions that reflected the five EBP steps for the client in the vignette (step 1: posing a clinical question, step 2: searching the literature, step 3: appraising the literature, step 4: decision-making, step 5: re-evaluation of the EBP process and outcomes). In the last phase, the same clinicians participated in a second focus group to validate their original responses and ensure synthesis of the data. This second consensus building focus group resulted in the elaboration of a tree structured decision model. Results indicate that being an expert clinician is not synonymous with being an expert evidence-based practitioner. Experts' clinical decisions were seldom based on all three components of EBP (research, client choice and clinician experience) and only rarely involved research evidence. When scaffolded to answer questions corresponding to the five EBP steps, experts were compelled to think about the use of scientific evidence and were thus able to proceed through the EBP process. However, some challenges were experienced in steps 1, 2 and 3 which are most likely dependent upon knowledge and skills obtained through formal instruction. Expert clinicians' EBP behaviors in steps 4 and 5 included concepts which reflected the clinicians' highly organized and structured experiential knowledge. Overall, the reference model represents expert OTs' clinical decisions in each of the EBP steps and illustrates what aspects of the decision-making process are in line with a combination of the three EBP components (research evidence, client choice and clinical experience) versus

aspects that are driven primarily by experience. There are two potential key contributions arising from this study. First, clinicians working in prevention of falls in geriatric rehabilitation can use the reference model as a practice framework to guide them through clinical decision making using some aspects of EBP. Second, the model can guide educators as they design and implement curricula that help students acquire expert-like behaviors including those associated with EBP.

Introduction

With advances in rehabilitation interventions and rising expectations from consumers to receive best possible care, occupational therapists (OTs) are expected to work within an evidence-based practice (EBP) context (Bennett & Bennett, 2000; Evidence-Based Medicine Working Group, 1992; Lloyd-Smith, 1997). There is strong evidence that findings from scientific research are not routinely used to inform decisions about client care (Cameron et al., 2005; Korner-Bitensky et al., 2006; Philibert, Snyder, Judd, & Windsor, 2003; Salls, Dolhi, Silverman, & Hansen, 2009). In fact, although there has been a rise in available scientific evidence in areas of occupational therapy (OT) such as stroke and cerebral palsy, many clinicians continue to use practices that are not supported by this research. As a result, researchers are now shifting their focus towards identifying and applying effective strategies to help clinicians embrace and adopt EBP. To support clinicians in this endeavor, a clearer understanding of what characterizes optimal performance in an evidence-based decision-making approach is needed. Attributes of expert performance gleaned from observations

of clinicians who apply EBP in their daily practice can provide useful insights into what expert EBP looks like in a particular clinical area. These attributes can then be used to design models of EBP that present clinicians with a framework for best practice. Expert models can also be useful for educators in the design of curricula that help students acquire EBP competencies (Alexander, 2003b; Lajoie, 2003). To date, there is no empirical evidence on the behaviors and decisions of expert OT clinicians who apply the EBP process. This paper describes the process of generating an OT reference model of EBP behaviors in the area of prevention of falls in the elderly population and the resulting tree structured decision model.

Background

Evidence-based practice (EBP) has been defined as the integration of current best evidence with clinical expertise and client choice (Sackett et al., 2000). EBP involves a five-step process (Corcoran, 2006; Strauss et al., 2005; Tickle-Degnen, 2000a): 1) formulating a clear and answerable question derived from the client's problem or need, that captures four components: (P) the target population, (I) the intervention, (C) the comparison to another group or another intervention, and (O) the desired outcome of the intervention; 2) searching the literature, for the best available research to help answer the clinical (PICO) question; 3) conducting a critical appraisal of the literature to assess its trustworthiness and its value and relevance for a particular client and context; 4) combining clinical expertise, the client's perspective, and the available scientific evidence in making a clinical decision for the client, and 5) assessing the effectiveness of the intervention and one's proficiency with the EBP process.

Mounting interest in EBP for its potential to improve client outcomes and efforts to help clinicians adopt EBP have led to a burgeoning of research on various aspects of this process. These include monitoring of gaps between actual practice and EBP, identification of EBP barriers and the role of experience and expertise in the application of research evidence in clinical practice.

Gaps Between Actual Practice and EBP

While the EBP process has been clearly delineated and OT clinicians are frequently reminded of the importance of basing their clinical decisions on scientific evidence, several studies have found that OTs are not incorporating research findings in their clinical practice (Cameron et al., 2005; Korner-Bitensky et al., 2006; Philibert et al., 2003; Salls et al., 2009). Cameron et al., (2005) and Philibert et al., (2003) surveyed OTs in the USA to examine the use of evidence in practice. Both studies found that although the majority of therapists had favorable attitudes towards EBP and felt that EBP should be an essential part of clinical practice, only a few reported using research findings in their own daily practice. In fact in Philibert et al.'s (2003) study, only 38 % of surveyed clinicians reported using research findings in their practice. Likewise, Salls et al.'s (2009) survey of 930 US therapists showed that while most (97%) had positive attitudes about EBP, and close to 80% were confident in their ability to find and critically review the literature, only one in four therapists actually used the literature to inform their clinical decision-making. In a cross Canada study on stroke rehabilitation, Korner-Bitensky et al., (2006) found that clinicians were not routinely using best practices even though there are over 900 randomized

controlled trials on assessment and treatment interventions in stroke management and many readily available and highly recognized best practice guidelines (Duncan et al., 2005; Lindsay, et al., 2008). Also in the area of stroke, a 2006 multi-center study found that only 13% of patients with unilateral spatial neglect were actually assessed with a standardized assessment; an intervention that is consistent with EBP (Menon-Nair, Korner-Bitensky, Wood-Dauphinee & Robertson, 2006). Results from these studies clearly highlight the substantial gap that exists between the norms of EBP and current OT practice.

Barriers to EBP

Poor uptake of research findings in OT practice has been found to be in large part due to a number of barriers including a lack of administrative support (limited access to research materials, computers, and library resources) (Humphris, et al., 2000), a lack of dedicated time to search for and incorporate research results in practice (Bennet et al., 2003; Cameron et al., 2005; Dysart & Tomlin, 2002; Korner-Bitensky et al., 2006), negative attitudes towards research (Craik & Rappolt, 2003), and a lack of confidence and skill in interpreting, synthesizing and applying research findings (Bennett et al., 2003; Dubouloz, Egan, Vallerand, & Von Zweck, 1999; Salbach et al., 2007; Teasell et al., 2008; Tse, Lloyd, Penman, King, & Hazel, 2004; Welch & Dawson, 2006). A recent study on factors that influence clinicians in adopting best practice suggests that personal habits may also block clinicians from adopting sound practices (Rochette, Korner-Bitensky & Thomas, 2009).

For EBP to be successfully employed and to improve client outcomes,

practitioners must be able to synthesize clinical expertise with the best available evidence from research as well as with the values and preferences of the client they are interacting with. It appears that the extent to which research findings can actually inform clinical practice is related to not only the factors listed above but to both clinical expertise and experience (Davidoff, 1999; Haynes, 2002; Rappolt, 2003; Rolfe, 1999; Sackett, et al., 1996). Research evidence, is only one element of EBP. It is not a substitute for clinical judgment nor does it contribute to EBP in isolation (Bennett & Bennett, 2000; Haynes, Deveraux & Guyatt, 2002; Rappolt, 2003; Sackett et al., 1997).

The Role of Experience and Expertise in EBP

Although the literature on EBP expertise is primarily anecdotal, there is extensive research on expertise in general and expertise in the professions in particular, that offer a solid foundation for identifying and understanding expertise in EBP. This literature can be useful in informing the development of OT expert reference models and outlining what individual OTs need to know along a trajectory of development, to demonstrate complex performance in a given domain such as EBP (Alexander, 2003; Chi, Glaser & Farr, 1988; Glaser, Lesgold & Lajoie, 1987; Lajoie, 2003).

Traditional expertise research has shown that experts reach superior performance levels in their domain not only because of years of experience but because of deliberate practice. This form of practice involves self-monitoring as well as feedback on well-defined tasks that help the individuals improve certain aspects of their performance (Ericsson, Krampe & Tesch-Romer, 1993; Ericsson

1998, 2001, 2004). In the context of solving problems, experts are better than novices at retrieving and using large amounts of well-organized and structured domain-specific knowledge (Bransford, Brown & Cocking, 2000; Ericsson & Smith, 1991; Lesgold et al., 1988) and do so with minimal cognitive effort (Alexander, 2003). They execute skills with greater automaticity, exert greater cognitive control of their performance (Ericsson, 2006), and readily use all sources of information and available resources in order to solve a problem (Gilhooly et al., 1997). Experts are attuned to a problem's affordances and utilize them to solve problems more effectively (Anderson, 1982). They focus on conceptual features of a problem and see patterns, cues and underlying principles (Chi, Feltovich & Glaser, 1981; Lesgold et al., 1988), can select better problem solving strategies and deal with both well and ill-defined problems more successfully than novices (Bransford et al., 2000; Chi, Feltovich & Glaser, 1981; Ericsson, 1996; Ericsson & Smith, 1991; Lesgold et al., 1988). Although initially experts spend more time analyzing an unfamiliar problem qualitatively, they are faster at solving the problem because of extended practice in the domain, highly developed pattern recognition, and more efficient problem solving skills (Glaser & Chi, 1988; Klein, 1993). Moreover, experts have better self-monitoring abilities which help them detect errors and remain informed about the status of their comprehension as they solve a problem (Chi, 1978; Chi, Glaser & Rees, 1982)

Expertise in the health professions.

Findings from expertise studies in medicine (Feltovitch & Barrows, 1984; Patel & Groen, 1986, 1991; Patel & Kaufman, 1995; Schmidt & Boshuizen, 1993,

Schmidt, Norman & Boshuizen, 1990, 1992); nursing (Benner, 1982, 1984; Daley, 1999; Dreyfus & Dreyfus, 1980; Hamers et al., 1997; Welsch & Lyons, 2001), and psychology (O'Byrne & Goodyear, 1997) have formed the foundation for our current understanding of expertise in the health professions and its distinguishing attributes from expertise in other domains such as music, chess and sports. Expertise in medicine and OT is unlike expertise in many other domains (Norman et al., 2006) in that these experts demonstrate mastery of a diverse body of knowledge (biomedical, clinical) and a range of motor (surgical skills, manual muscle testing skills), cognitive (problem solving, clinical reasoning) and interpersonal skills. Also unlike some other domains, expertise in the health professions involves coordination of formal versus experiential knowledge. For instance, physicians must keep up with the volume of new knowledge on diagnostic tools and medical treatments (Choudhry et al., 2005) in addition to engaging in extensive periods of professional development and deliberate practice in order to attain success in their domain.

The major common features of expertise that cut across different domains and makes it different from more generic skills or talents, be it in medicine, sport or chess, is the breadth and depth of individuals' knowledge, highly developed cognitive processes, and engagement in extensive and deliberate practice with feedback (Norman et al., 2006).

Who qualifies as an expert?

Identifying someone as an expert in their domain has always been a contentious issue in studies of expertise (Ericsson et al., 1993; Ericsson &

Kintsch, 1995; Ericsson & Lehmann, 1996; Ericsson & Smith, 1991; Vincente & Wang, 1998). Criteria used to identify someone as an expert in a domain include social reputation (peer nomination), formal education, accumulated accessible knowledge and length of experience in a domain, which is typically over 10 years (Chi, Glaser & Farr, 1988; Hoffman, 1992). Critics have been particularly vocal about using social reputation and length of experience as criteria. In fact, in the case of peer nomination of experts in computer programming (Doane, Pellegrino & Klatzky, 1990) and physics (Reif & Allen, 1992), actual performance of the nominated experts using this criterion was found to be not exceptional at all. The performance of both computer programmers and physics professors were not consistently superior to that of computer science students or physics students' performance on introductory physics problems. With regards to using the level of training and experience as a criterion for identifying experts, Ericsson (2006, p. 68) suggests that often, this attribute has only a "weak link to objective measures of performance". Studies in psychology (Dawes, 1994), software design (Sonnentag, 1998), finance (Camerer & Johnson, 1991) and medicine (Ericsson, 2004) have shown that length of experience and training are not consistently associated with success in patient care, superior financial advice on investments and more accurate diagnoses of heart sounds. As a result, rather than use the above-mentioned criteria, researchers have proposed that the focus be shifted to identifying individuals who consistently perform in a superior manner in a specific area, whether they are socially recognized as experts or not (Ericsson, 2004). To establish the quality of performance, typically laboratory tasks (think

aloud, recall and summarization, explanation, and knowledge elicitation) have been used both in general studies of expertise and expertise in biomedical domains (Chi, 2006, p. 167-184; Patel, Yoskowitz, Arocha & Shortliffe, 2009).

While there is a need for OTs to offer evidence-based services, research findings suggest that available scientific evidence is not routinely used to inform clinical decisions. Features of expertise in OT have yet to be studied in relation to the behaviors and skills reflected in EBP. In other words, it is not clear if and how expert OT clinicians manifest EBP. Supporting clinicians in successfully integrating evidence in practice requires a thorough understanding of how attributes and behaviors of expert OT clinicians in a given context correspond with the EBP process. This study aimed to identify the practice behaviors of expert OT clinicians in prevention of falls in the geriatric population, determine the extent to which these are congruent with EBP and use the identified behaviors to create an EBP reference model for OT practitioners.

Methods

Ethics approval was obtained from the Institutional Review Board of the Faculty of Medicine of a research intensive University, in Montreal, Quebec, Canada (Appendix A).

Study Participants

Recruitment.

Study participants were OTs from five University affiliated clinical sites in Montreal, Quebec, Canada. Taking into account common practice and the corresponding criticisms regarding the criteria for identifying experts, for the

purposes of this study, participants had to meet the following criteria in order to be considered expert: 1) be nominated by the OT department manager who had to consider the person an expert in geriatrics and vouch for their ongoing participation in falls prevention programs, 2) have 10 or more years of OT clinical experience in geriatrics, and 3) have participated in a minimum of one falls prevention activity per year. Also, to be eligible to participate in the study the clinicians had to be a licensed OT with the provincial regulatory body, and be willing to provide informed consent. To recruit participants, the principal investigator (AT) contacted the OT manager at five clinical sites in the metropolitan area of the study, described the study and asked for names of clinicians who met the inclusion criteria. Ten clinicians met the study criteria. Subsequently, a letter including the description of the study and the invitation to participate along with a consent form were sent to these individuals. The invitation resulted in nine respondents who comprised the expert OT sample and agreed to take part in study.

Participant characteristics.

Table 1 shows participants' professional employment and clinical experience profile. One participant worked in a long term care facility, four were employed in geriatric rehabilitation centers, three worked in an adult rehabilitation center where the majority of clients are over the age of 65, and one clinician worked in the community where the majority of her interventions took place in clients' homes.

Table 1

Characteristics of the Nine (9) Participating Expert Occupational Therapists

Practice area	Long term care: (n=1) Geriatric rehabilitation: (n=4) Adult rehabilitation: (n=3) Community: (n=1)
Years of experience in OT	18 (range: 10-30)
Years of experience in geriatrics	16 (range: 9-20)
Years of experience in falls prevention	16 (range: 9-20)
Previous degrees	Yes =2 Diploma in organizational micromanagement Diploma in management (in progress)
Participation in development of fall prevention initiatives	Yes n=6 Nature of fall prevention initiatives 1) Development of policies and procedures regarding falls prevention in OT and PT and alternatives to restrains 2) Development of measures for preventing falls including risk for falls scale 3) Group education sessions for clients and families 4) Education in the community about falls and falls prevention 5) Development of an education module for clients in hospital 6) Development of a one hour fall prevention session for clients in hospital
Frequency of participation in falls prevention programs	Minimally at present time (n=2) Daily (n=1) Weekly (n=1) Bi-monthly (n=2) Monthly (n=1) As needed (n=2)

Study Procedure

There were three phases in the creation of the EBP reference model. Phase 1 involved designing a clinical vignette to be used as the stimulus case for capturing the EBP process of study participants**.** Vignettes have been used for

eliciting clinicians' attitudes and beliefs, evaluating recall, applying clinical knowledge to solving clinical problems (Jones, Gerrity & Earp, 1990; Rutten, Harting, Rutten, Bekkering & Kremers, 2006), and elucidating the OT decision-making process (Moskowitz, 1988). The practice area, prevention of falls in the geriatric population, was selected because there is considerable research available that can be used to inform clinical practice and facilitate EBP. Appendix B illustrates the results of a comprehensive search of the literature on evidence regarding fall prevention programs that was conducted by an expert librarian for this study.

Study participants attended a two-hour focus group to discuss the content of a vignette depicting an elderly client with a history of falls who is admitted to a hospital that is specializing in geriatric rehabilitation for OT assessment and treatment. The focus group used a dual moderator format (Morgan, 1996). The moderator (AT) asked open-ended questions and used probes to guide participants through the discussion. The co-moderator and experienced OT professor, was familiar with the area of study but was not part of the research team. She ensured that the session progressed smoothly. The discussion was framed with 12 questions (Table 2). Two research assistants took detailed notes during the focus group. The moderator (PI) transcribed and summarized the notes into a coherent clinical vignette. The vignette was then sent to the nine clinicians for member checking (Creswell & Miller, 2000). No revisions or additions were proposed. The outcome of this phase was a clinical vignette depicting an elderly woman with a history of falls (Appendix C).

Table 2

First Focus Group Questions

1. What kind of client would you commonly see in a clinical setting who has been admitted due to a fall (age, gender, reason for admission)?
2. What would be a realistic past medical history?
3. What kind of social history would you expect this client to have?
4. What would be the circumstances surrounding the fall?
5. What would be the clinical profile upon admission?
6. What medical treatment/ interventions would be done in acute care immediately following the fall?
7. What would be the documented reason for referral to OT?
8. What would be the assessment process in OT?
9. What results would you anticipate from the OT assessment?
10. What would the OT treatment plan be?
11. What recommendations would be made regarding and prior to discharge?
12. What would you anticipate the client's overall status to be at discharge?

Phase 2 involved applying the EBP process as the expert clinicians dealt with the client presented in the vignette. Table 3 shows the five questions corresponding to the EBP steps that participants were asked to answer. The final vignette and the five EBP questions were mailed to the participants. To ensure that participants had sufficient time to complete the questions given their busy schedules, they were given eight weeks to respond individually. They were instructed to use any information or resources at their disposal, other than peers or superiors. No specific instructions were provided on the nature of the information to be included. There was no reference to the EBP process and neither was there a glossary to provide definitions for various terms. Participants requested an extension to complete the task and were granted four additional weeks. At the end of the 12 week-period, one participant did not complete the task and another

withdrew from the study. This resulted in a sample of seven experts completing the study.

Table 3

Data Collection Questions Regarding EBP Process

EBP Step	Question
Step 1 Clinical question	Given the scenario in the vignette and the family's question regarding the fall prevention program, what is your PICO question for this client?
Step 2 Searching the literature	Conduct a search to find literature that could help you answer your PICO question. As part of your search strategy list which databases, search engines and key words you would use? Once you identify the sources, which of the following factors do you use to determine the value of the source: peer-reviewed sources, type of publication and research design, type of scholarly databases, disciplinary source and impact factor. Rate each factor as 'must drive my search', 'can drive my search', 'does not drive my search' or 'do not know'.
Step 3 Appraising the literature	Appraise the literature you found in relation to the client in the vignette. Then list and rank, in order of importance, the sections of an article you consider most useful? (Example: abstract, methods, discussion, results, etc.)
Step 4 Decision-making	What will you recommend for this client? Describe your plan/ recommendations and state which of the EBP components (research evidence, clinical experience, client wishes) informed each of your recommendations.
Step 5 Re-evaluation	The client has been home three months after having completed your recommended fall prevention program and has fallen twice since the treatment ended. The client's daughter has contacted you to let you know about the recent falls. Answer the following 3 questions: 1) List the possible reasons why the client (Mrs. P.) fell again? 2) What will you recommend in this situation? What is your

	new plan of action? 3) Which of the EBP components (research evidence, clinical experience, client wishes) informed your recommendations. [1]

1. This hypothetical scenario was provided because participants could not observe the actual outcome of the intervention or objectively evaluate the reasons for the recurrence of falls.

In Phase 3, following a preliminary analysis (described in detailed in the next section) of the data generated by clinicians' original responses to the questions listed in Table 3, the seven participating clinicians were invited to a second focus group. This consensus building exercise allowed for the verification of data, analytic categories and interpretations with participants from whom the data were originally obtained (Creswell, 2007; Lincoln & Guba, 1985) and allowed for greater synthesis of the responses generated in phase 2. This member checking focus group also enhanced the validity of interpretations made by the PI during all phases of the analysis. Five of the seven original clinicians participated in this focus group, and as a group, they added, deleted or modified responses and selected the ideal answer for each question. Mediated group discussions led to synthetic categories of concepts and sequence of actions for each EBP step. The PI used the final categories and concepts to create a tree structure reference model that highlights the expert clinicians' decisions and the sequence in which these would be made for the elderly client with a history of falls depicted in the simulated scenario.

Data Sources, Analysis and Synthesis

Participants' written responses to the five EBP questions comprised the data source for this study. Analysis occurred in three levels. First, individual responses were recorded and compiled. Second, the PI used open coding to generate low inference categories from the original responses (Creswell, 2007). This facilitated the identification of similarities in participants' responses when they were describing the same concept or making reference to a similar concept. Third, using the low inference categories generated in the second level of analysis, all the possible permutations of categories of what appeared to be similar actions, behaviors or decisions were identified. These analyses accommodated for taking into account both individual and group responses.

Participants were shown the three levels of analysis during the member checking activity. Specifically, the PI showed the original responses, along with levels 2 and 3 of the analysis. The PI explained how the analysis took place and asked participants: 1) whether their responses were included in level 1, 2) whether their original responses were reflected in level 2, 3) whether they agreed with the categories and concepts generated from the coding process, and 4) whether they wished to add or remove any of the categories and concepts. Group discussions ensued for each EBP question. Consensus was achieved on the three levels of analysis for each EBP step. This three-step process of analysis is elaborated below using the first PICO question (Population, Intervention, Comparison, Outcome) as an example.

EBP Step 1: PICO Question (Tables 4-7).

For the first question (EBP Step 1), participants presented their PICO

questions. The PI identified the four PICO components for each participant. Analysis level 1: Table 4 illustrates the analysis of the population (P) component of the PICO which involved a list and frequency of responses. Responses included: "*community older person", "community dwelling senior", "client with a history of falls"," senior over 65" and "78 year old female with a history of fall"*.

Analysis level 2: Open coding was used to identify categories and their associated concepts. The coding resulted in three categories for the "P": a) person/age/gender, b) location of residence and c) condition/client characteristic. Nested within each category were a number of concepts. "*Older person, senior, client, senior over 65 and 78 year old female" were* concepts nested within the first category (person/age/gender). The concepts *"community" and "community dwelling"* were nested within the second category (location of residence) and the concept "*history of falls"* was nested within the third category (condition/client characteristic).

Analysis level 3: The final step in data reduction involved combining the low inference categories into all the possible variations of actions, behaviors or decisions. Table 3 illustrates the 20 possible variations for the 'P'. These were increasingly detailed ranging from a simple *"For an older client"* to a more detailed description such as *"for a senior over 65 with a history of falls living in the community"*.

During the member checking activity, participants were presented with the three levels of analysis and asked to agree upon which categories and specific

words described each PICO component. Tables 5, 6 and 7 show the analysis for the remaining three components of the PICO question. The same analysis was carried out for steps 2, 3, 4, and 5 of the EBP process.

Table 4

Analysis of 'P' Component of PICO

Level 1: responses of individual participants

- community older person (n=1)
- community dwelling seniors (n=1)
- client with a history of falls (n=3)
- seniors (65 plus) (n=1)
- 78 year old female with history of fall (n=1)

Level 2: response of experts, combined and grounded
Responses regarding population make reference to:

- person/age/gender: older person, senior, client, senior over 65, 78 year old female
- to location of residence: community, community dwelling
- condition or client characteristic/history: history of falls

Level 3: synthesis: possible combinations of concepts and words to be used in the "P" of the PICO

- for an older client, for a senior, for a client, for a senior over 65, for older women
- for an older person living in the community, for a senior living in the community, for a client living in the community, for a senior over 65 living in the community, for older women living in the community
- for a community dwelling older person, for a community dwelling senior, for a community dwelling client, for a community dwelling senior over 65, for community dwelling older women
- for an older person living in the community with a history of falls, for a senior living in the community with a history of falls, for a client living in the community with a history of falls, for a senior over 65 with a history of falls living in the community, for elderly women with a history of falls living in the community

Table 5

Analysis of 'I' Component of PICO

Level 1: responses of individual participants

- participation in a rehabilitation, usual rehabilitation care and multifactoral fall prevention program (n=1)
- the evidence for the value of fall prevention programs (n=1)
- participation in a fall prevention program in the community (n=3)
- a fall prevention session (n=1)
- no intervention (n=1)

Level 2: response of experts, combined responses grounded (with range of responses)
Responses regarding the intervention make reference to:

- program only: fall prevention programs
- a session not full program: session
- location of the program (where the program would take place): fall prevention program in the community
- program type in combination with rehabilitation (traditional rehabilitation): a rehabilitation usual rehabilitation care and multifactoral fall prevention program

Level 3 synthesis: possible permutations

- fall prevention session
- fall prevention program
- fall prevention program in the community
- multifactoral fall prevention session
- multifactoral fall prevention session in the community
- multifactoral fall prevention in the community
- multifactoral fall prevention program and usual rehabilitation

Table 6

Analysis of 'C' Component of PICO

Level 1: response of individual participants

- usual rehabilitation care with no participation to fall prevention program (n=1)
- compared to only having exposure to OT and PT on the ward during hospitalization (n=3)
- in comparison to seniors who do not have access to this kind of session (n=1)
- no comparison (n=1)

Level 2: response of experts, combined responses grounded (with range of responses)
Responses regarding comparison make reference to:

- comparing the intervention with traditional rehabilitation only (usual rehabilitation, exposure to PT and OT only)
- comparing the intervention with no intervention (do not have access to this kind of session)
- location of the program, where the program would take place (while in hospital, in client)

Level 3 synthesis: possible permutations

- compared to traditional PT and OT only
- compared to usual rehabilitation only
- compared to those who do not have access to this session
- compared to usual in-client (in-patient) rehabilitation only

Table 7

Analysis of 'O' Component of PICO

Level 1: response of individual participant

- reduce the incidence of falls (n=1)
- in minimizing falls and their effects (n=1)
- decrease the number of future falls (n=3)
- decrease the number of falls or the severity of injury (n=1)
- no outcome (n=1)

Level 2: response of experts, combined responses grounded (with range of responses)
Responses regarding outcome make reference to:

- reduction in incidence/ number of falls (# of falls)
- reduction in incidence/ number and effects of falls (# of falls + effects)
- reduction in incidence/ number or severity of injury (# of falls +/or effects)
- subsequent falls (falls in the future)

Level 3 synthesis: possible permutations

- reduce the number of falls
- reduce the number of falls and their effects
- reduce the number of falls or the severity of falls
- reduce the number of falls in the future
- reduce the number of future falls and their effects
- reduce the number of future falls or the severity of their effects

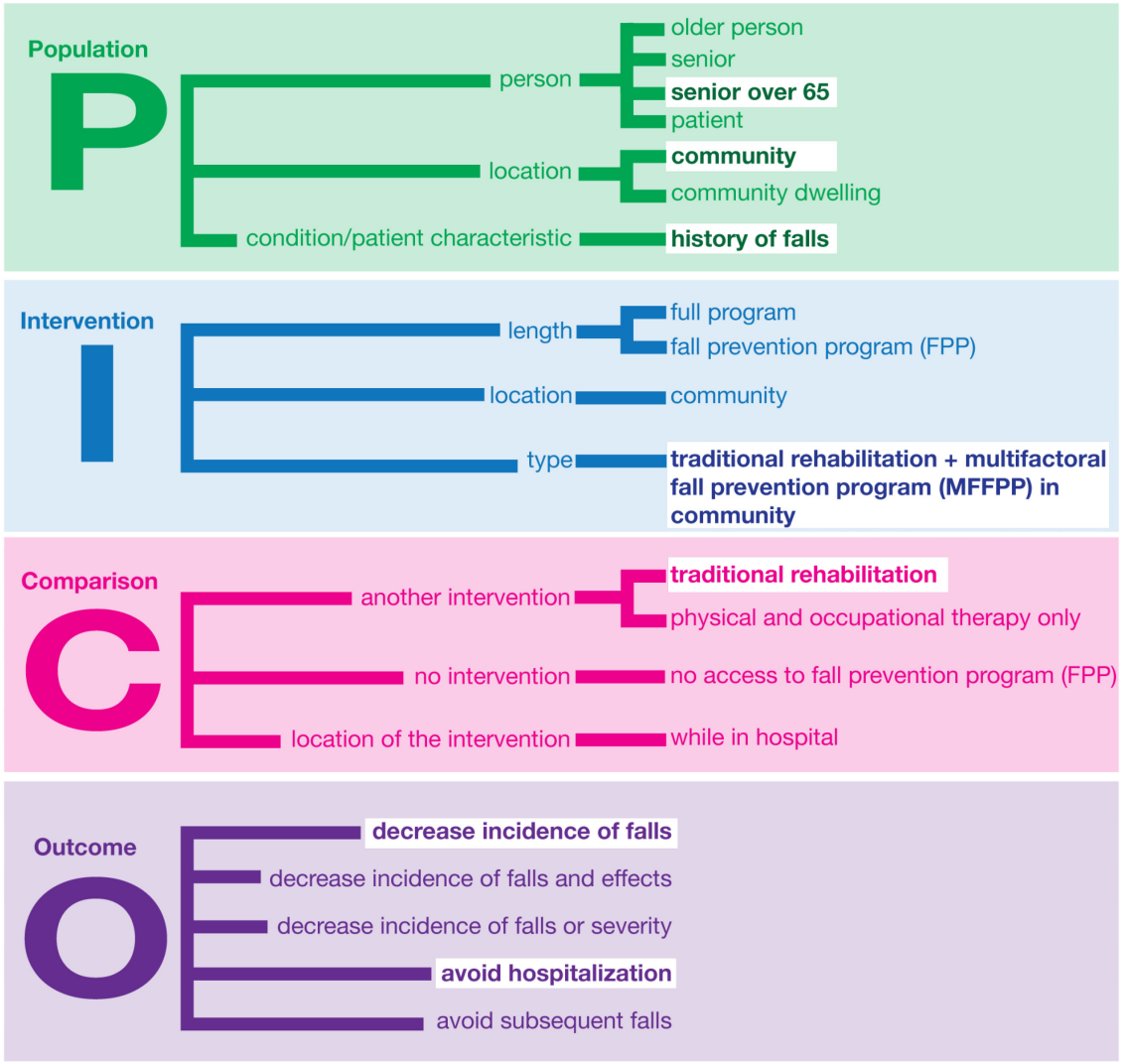
Results

EBP Model Step 1: PICO Question

Figure 1 illustrates the results generated from Step 1 in a schematic format. Fourteen categories representing the four PICO components were identified. For example the 'population' component of the PICO includes three categories (person, location of residence and condition/client characteristic). Nested within each category are a number of concepts. Concepts represent either a synonym or an alternative for a PICO concept. For example in the category *'person'* the concepts *'older person', 'senior', 'patient', 'senior over 65'* are synonyms used to describe the elderly client in the vignette. In the category 'another intervention' the concepts '*traditional rehabilitation'* and *'PT and OT only'* represent two different intervention alternatives or possibilities.

The highlighted terms (in white) in Figure 1 represent the final concepts that make up the PICO question for the client in the vignette as per participant consensus: *(P) For a senior over the age of 65 with a history of falls and living in the community, (I) does participation in a multifactoral fall prevention program in addition to traditional rehabilitation, (O) reduce the number of future falls and the need for hospitalization, (C) compared to traditional in client rehabilitation only?*

Figure 1: Clinical (PICO) question



EBP Model Step 2: Searching the Literature

Results of literature search.

Participants identified 33 articles from 20 different sources (Appendix D). Eighty percent (n=16) of the sources were peer reviewed journals, 75 % (n=12) of which had an impact factor. Eighty percent (n=16) of the sources were from health care disciplines other than occupational therapy or physical therapy and two of these (10%) were from peer reviewed rehabilitation journals. Thirsty six percent (12/33) of the articles reported results of randomized controlled trials, four were systematic reviews (12%) and two (6%) were meta-analyses. Since the reference model in this study primarily represents processes, these results were not included in the graphic representation.

Search process.

The tree structure for searching the literature is illustrated in Figure 2. It includes participants' ratings of the five 'driving factors' (peer-review, research design, scholarly databases, disciplinary sources and journal impact factor) and the five categories of key words used in searching the literature. 'Peer-reviewed source' is the only factor rated as 'must drive the search'. The categories of key words include '*person', 'prevention', 'benefits', 'intervention' and ' location'*. Nested within the categories, are the specific keywords used for search. For the category 'person', participants identified six keywords (concepts): "*elderly", "over 65 years of age with history of falls", " older", "senior", "falls in the elderly" and "over 65"*. Rankings of the keywords are illustrated with the numbers, 1, 2, and 3. No ranking indicates that the keywords can be used

interchangeably if the original search (using the first three keywords) fails to produce relevant literature.

Figure 2: Searching for literature

Factors that drive the search

Peer-reviewed source	Design/type of publication	Scholarly databases	Disciplinary source	Impact factor
must drive	can drive	can drive	does not drive	do not know

Key concepts & words used in search

	1 First key word used	2 Second key word used	3 Third key word used	4 No specific order
Person	elderly	over 65 with history of falls	older senior falls in the elderly over 65 history of falls	
Prevention	fall prevention for the elderly	MFFPP	fall prevention FPP senior fall prevention home hazard assessment	
Benefits	benefits	best practice	benefits of FPP efficacy	
Intervention				intervention community programs fall intervention home hazard modification
Location	inpatient program	in-hospital program	FP in the community community community program	

Sources used in search

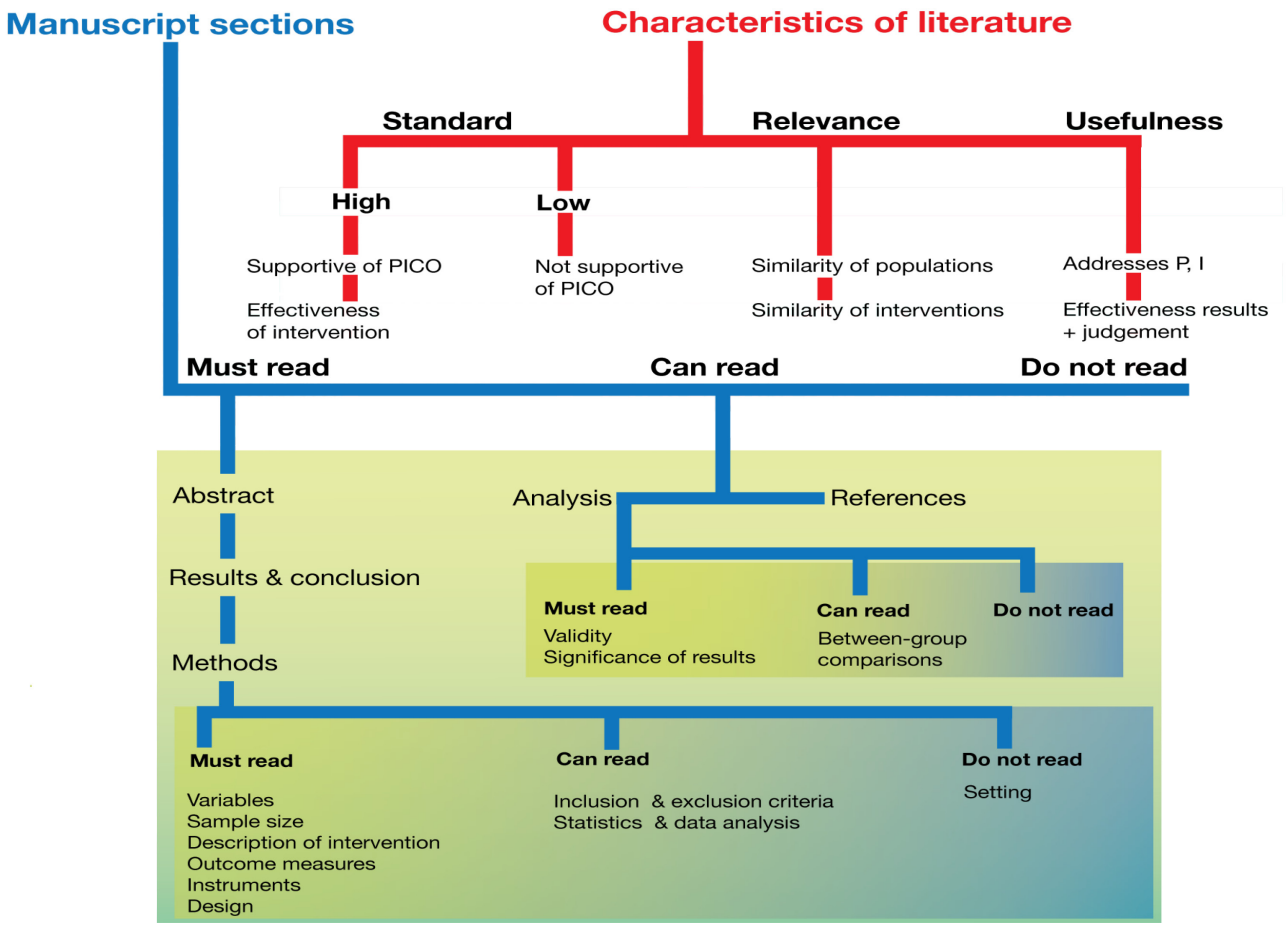
Databases	Search engines	Journals	Browsers	Websites
EBM Reviews	Google	American Journal of Gerontology	Internet Explorer	NBCOT.org
CINAHL	Google-Scholar	Canadian Journal of Gerontology	Netscape	
Medline				
OT Seeker				
PubMed				

EBP Model Step 3: Critical Appraisal

The information gleaned from this step was limited because only two of the seven participants answered the question. There was no evidence of formal critical appraisal although one of the two participants who answered this question used recognized critical appraisal criteria such as "*supportive of PICO", "similarity of study populations", "sample size", "quality of results regarding the effectiveness of the intervention" and "the use of randomized controlled trial as a rigorous research design"*. The initial responses obtained from the two clinicians were shown during the second focus. Figure 3 shows the three main critical appraisal categories and accompanying concepts that were derived from the discussion during the consensus building focus group: *"standard of the research"* (of high standard, of low standard), "*relevance of the research"* and *"usefulness of the research"*. For example, a study was deemed to be of a "high standard" (category) if it "*supported the PICO question"* (concept) and if the study findings showed the *"intervention to be effective"* (concept). Figure 3 also illustrates which of the manuscript sections and subsections were considered to be important when reading and appraising the literature and the corresponding rating for each. In the '*methods*' category for example, participants reported that they '*must read'* about *"study variables"*, "*sample size", "description of the intervention", "outcomes measures", "research instruments"* and *"research design*". They do not read about the "*setting*" in which the study was conducted. Depending on the circumstances, they 'can read' about "*inclusion and exclusion criteria"* as well as "*statistics*" and *"data analysis"*". Participants disregarded this

information in clinical decision making because of a self-reported lack of knowledge in these areas.

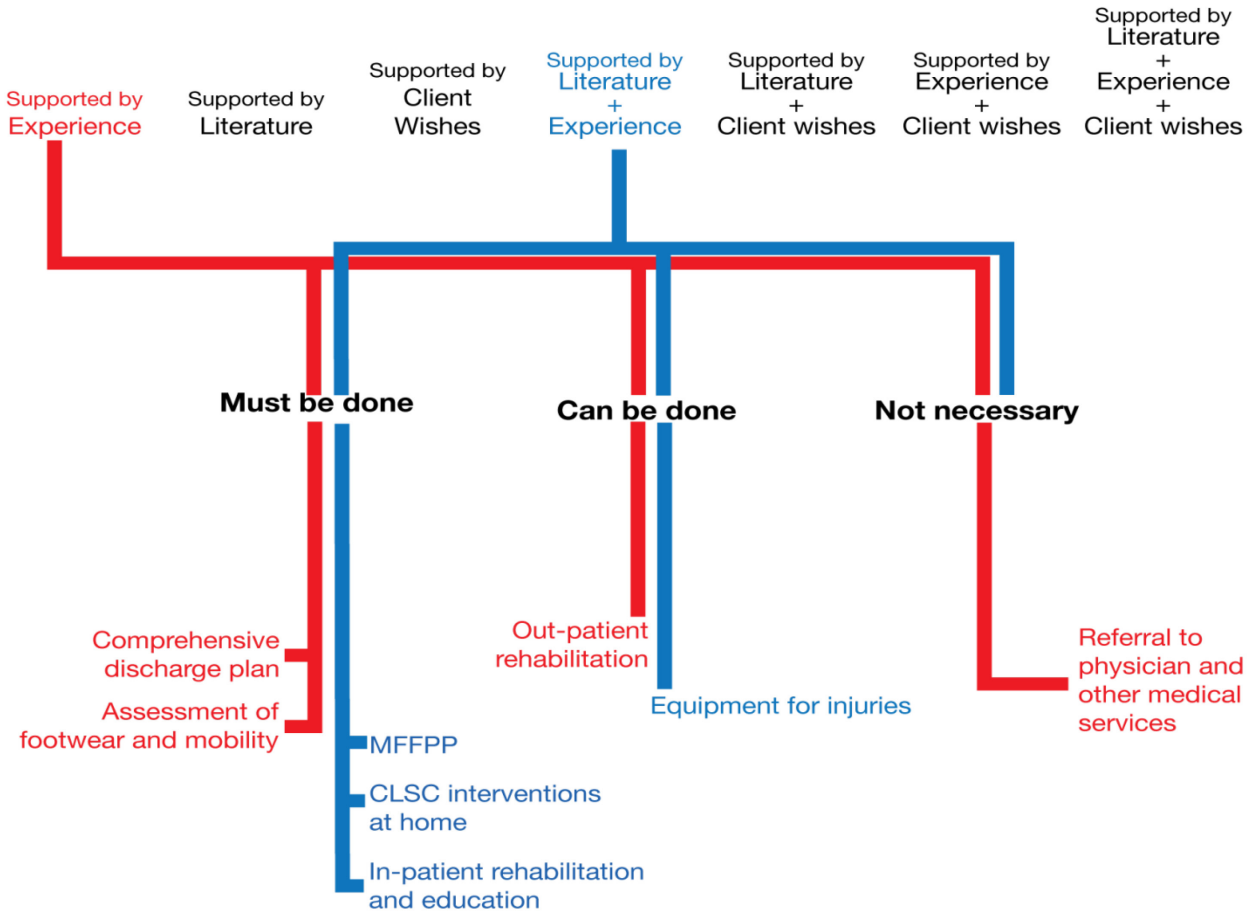
Figure 3: Appraisal of literature



EBP Model Step 4: Treatment Planning and Recommendations

Figure 4 illustrates the eight categories of treatment recommendations and the rating ('must be done', 'can be done', 'doesn't need to be done') reflecting the relative importance of each recommendation derived from the consensus building focus group. Participants reported that although all the listed interventions may be appropriate when deciding on a treatment plan for a client with a history of falls, seven of the eight final categories of interventions targeted the specific needs of the client depicted in the vignette. Overall, when asked to list which EBP components (clinical experience, client choice, research evidence) were used to support these decisions, participants agreed that two of the five necessary recommendations (*comprehensive discharge plan and assessment of footwear*) were based on clinical experience (one of the three EBP components) and three recommendations (*multifactoral fall prevention program, CLSC interventions at home and in-client rehabilitation and education*) were based on a combination of the evidence from the literature participants had read in combination with their clinical experience (two of the three EBP components).

Figure 4: Decision-making / client recommendations



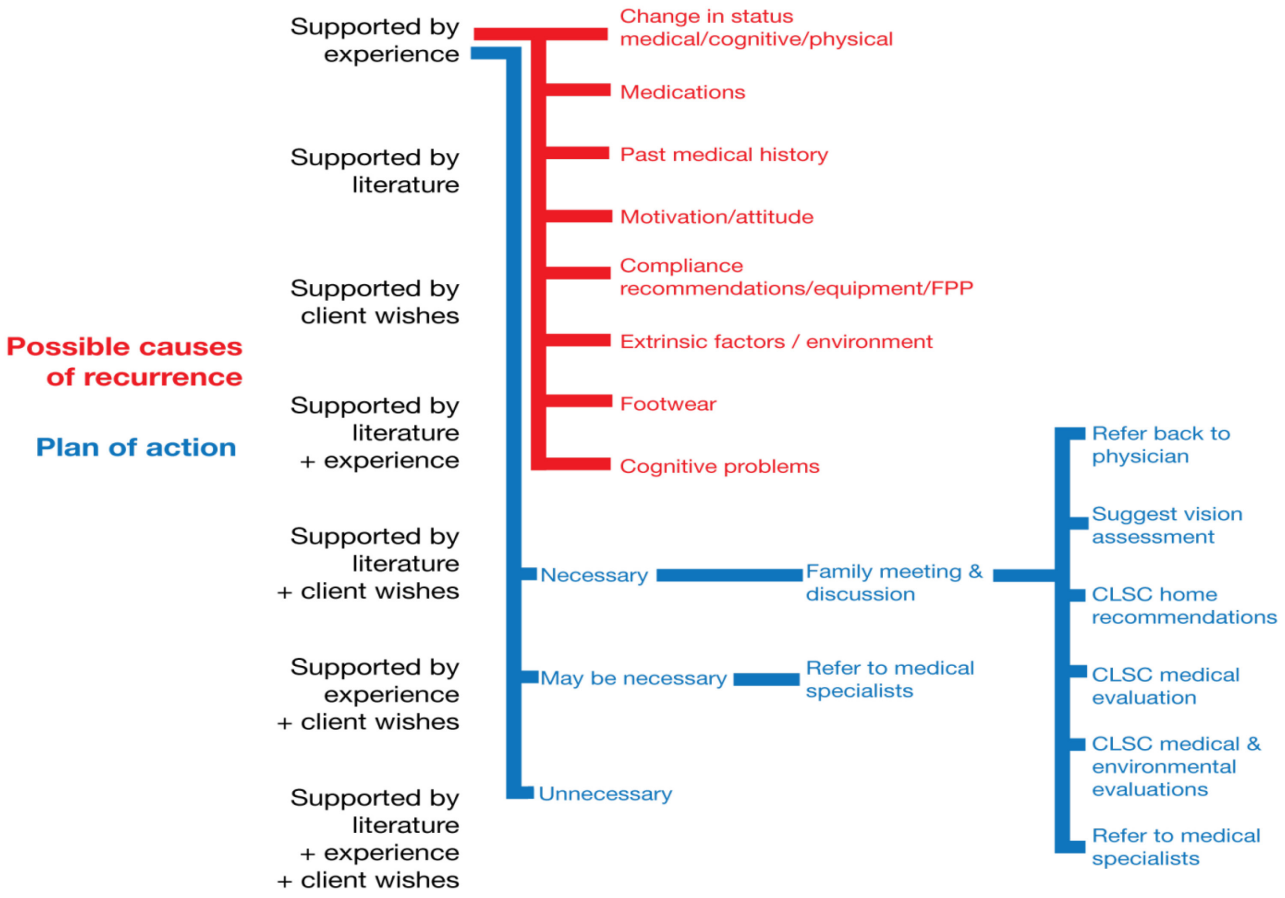
EBP Model Step 5: Evaluation of Intervention Outcomes

Eight categories of possible causes for the recurrence of falls emerged from the analysis. There was no mention of compliance with fall prevention recommendations or effectiveness of the fall prevention program as potential causes. During the second focus group, participants reported that recurrence of falls is a complex phenomenon caused by a combination of client and contextual factors. The client-specific causes (all except for extrinsic factors/ environmental, Figure 5) are more likely to contribute to the recurrence of falls, than failure of one or more components of the multifactoral fall prevention program. Participants unanimously reported that their extensive clinical experience facilitated the identification of a wide repertoire of causes that were considered for the simulated client. Participants reported that neither the literature nor the client's input guided this process.

Figure 5 shows the eight categories of new actions (following the recurrence of falls) and the order in which they would be offered for the client in the vignette. Participants identified one necessary intervention: a family meeting to discuss the circumstances of the fall and coordinate additional resources as needed. The remaining seven categories derived from clinician consensus, represent possible actions in the event that the main intervention (family meeting) fails. None of the participants mentioned the need for or the importance of re-examining any of the previous EBP steps nor was there any mention of reassessing personal proficiency in searching, appraising and implementing the research evidence which are normally done in the last EBP step. The revised plan

of action was also exclusively derived from clinical experience (one of the three components of EBP).

Figure 5: Evaluation of outcome



Reference Model Representing Expert Clinicians' Evidence Based Practice Behaviors

Figures 1 to 5 represent the EBP reference model created from the decisions of experienced clinicians in the area of fall prevention in the elderly. Each step in the reference model includes the categories and concepts that delineate the actions and decisions that are made for a client with a history of falls. The model also includes rankings that illustrate the importance attributed to certain decisions as well as which actions are supported by clinical experience, scientific evidence and client choice.

Discussion

The objective of this study was to develop an OT reference model in the area of fall prevention in the elderly and identify the extent to which participants adhered to the principles of EBP as part of their clinical decision-making for a written simulated case. There was variability and breadth in participants' original (prior to consensus building focus group) responses in steps 2, 4 and 5 of the EBP process. For step 2, individual searches for literature (Step 2) did not yield any common articles. Interestingly, more than half of the articles reported results of randomized controlled trials, systematic reviews and meta-analyses. Considering the volume of published research on this topic (Appendix B) and the position of these research designs on the evidence hierarchy (Sackett et al., 2000), this finding is encouraging. Although the present study did not examine participants' knowledge of research, their selection of published articles with rigorous research methodologies suggests that clinicians can discriminate between studies with high

vs. low levels of evidence. The number of categories and key words for searching the literature suggests that clinicians rely on a broad list of synonyms which they use interchangeably or in sequence depending on the success of their search. Thus, while overall, they may end up using the same set of keywords and databases, it may be that because of the sequence of the entry in their searches, their yield is not identical. It is also possible that when they originally conducted the literature searches (on their own time and individually) they may have used different terms. Only through the process of group discussion and consensus with the other participants, they arrived at a particular set of key words included in the reference model.

With respect to the observed variability and breadth of responses in steps 4 and 5, the extensive lists of recommendations (step 4) and causes of recurrence and new action plan (step 5) suggest two things. First, that optimal management of a complex clinical scenario likely hinges on a combination of treatment interventions. Second, that clinicians' experience with numerous clients through the years has contributed to a rich and well organized body of knowledge from which participants are drawing in order to effectively identify causes of falls and select appropriate interventions (Bransford et al., 2000; Ericsson & Smith, 1991; Lesgold et al., 1988). Consistent with expertise research findings in other domains (Ericsson & Smith, 1991; Lesgold et al., 1988), extended experience in falls prevention has likely resulted in participants having developed a set of patterns and cues regarding clients with a history of fall. Clinicians are able to successfully recognize similar patterns and draw from cues presented in previous

clients in order to effectively solve a new problem (find the possible causes of recurrence and consider subsequent interventions for the current client). In the final step of the EBP process where participants listed their new plan of action, neither a review of the EBP process nor an assessment of their individual proficiency with the process were considered to be possible new actions. Although the EBP process is supposed to culminate in a review of the outcome of the intervention for which scientific evidence is sought and that individual reflection and reassessment are believed to be crucial in improving one's aptitude in EBP (Hammell, 2001; Strauss et al., 2005) these actions may not be congruent with clinicians' demanding caseloads or their knowledge of the EBP process (Dysart & Tomlin, 2002; Korner-Bitensky et al., 2006).

Variability in the depth and breadth of responses may also be due to individual differences in clinical expertise and the extent of participants' experience in the area of falls prevention. While this study did not examine any of the individual attributes of expertise mentioned earlier, evidence from the expertise literature in professional domains indicates that such differences do exist (Feltovich, Johnson, Moller & Swanson, 1984; Patel & Groen, 1986; Yielder, 2004; King et al., 2007, 2008). Looking at participants' experiences, it is evident that these vary both quantitatively and qualitatively (i.e., the type of involvement). With respect to the former, the number of years of clinical practice in geriatrics ranges from 9 to 20 as does the frequency with which participants engage in fall prevention activities (from "none at the moment" to "daily"). As to the latter, it can be noted that some participants took part in specialized activities within

prevention of falls such as developing new programs or creating written documents for patient education whereas others participated in only basic client education. These qualitatively different experiences may be linked to the mandates of the various clinical sites which offer OT services according to the clients' stage in the recovery process (rehabilitation vs. community setting). Rehabilitation centers offer services targeting remedial treatments for fractures, education on preventing falls and preparation for discharge, whereas community settings normally follow clients in their home for maintenance with minimal if any form of remediation. Where there is a mandate to offer intensive treatment for prevention of falls, clinicians will necessarily be forced to use targeted interventions that can eventually translate into greater exposure and experience in this domain.

There was little variability in responses to steps 1 and 3. Without additional data on clinicians' knowledge of PICO and EBP prior to this study, it is not possible to explain why participants' PICO questions (step 1) were so similar. The variability in step 3 (appraising the literature) and the low number of responses to this question (only 2/7 participants answered the question) suggests limited familiarity and skill in critical appraisal which is consistent with the findings from the literature presented earlier in this paper (Bennett et al., 2003; Dubouloz et al., 1999; Salbach et al., 2007; Teasell et al., 2008; Tse et al., 2004; Welch & Dawson, 2006).

The data do not allow for drawing any resolute conclusions regarding the role of deliberate practice in explaining individual differences in EBP behaviors.

In most areas of OT, clinicians do not select and deliberately introduce interventions in order to improve their proficiency in those interventions. Rather, the 'practice' of falls prevention interventions is a function of the therapists' caseload, their knowledge of the clinical area, their ease with different interventions and the availability of resources (equipment, physical space). Deliberate practice may be a mediating mechanism for the development of expertise in this area but only under certain conditions. The precise conditions (circumstances and facilitators) under which a clinician is compelled to engage in purposeful practice in order to attain superior levels of competence in this area require further study. Deliberate practice may have a role in the development of expertise in OT professional contexts such as falls prevention, but this is probably unlike deliberate practice in domains such as music or sports where an individual practices purposefully for a number of hours daily, with feedback and supervision in order to improve performance (Ericsson 1998, 2001, 2004). Opportunities for an OT to engage in this kind of deliberate practice are seriously limited if the clinical context does not afford regular and appropriate client cases and peers or mentors who could provide timely feedback.

The study findings have shown that being an expert clinician is not synonymous with being an expert evidence-based practitioner. The expert clinicians' did not integrate all EBP components (scientific evidence, clinical experience and client choice) in their clinical decisions for the client depicted in the vignette. One third of their recommendations were informed by research evidence and the majority of decisions were based primarily on past experiences

with clients with similar problems (Figure 5). This finding is consistent with the notion of the "evidential knowledge base" which Miles et al., (2004, p.133) claim is necessary in clinical practice. Scientific evidence alone, without knowledge and experience in a domain, does not speak for itself. Thus, clinicians must rely on their clinical experiences to judge if and how they will use the scientific evidence. Although additional data regarding clinicians' motives for relying primarily on clinical experience would be needed to explain this finding, there are a number of possible explanations. First, participants may not have practiced using all aspects of EBP because their professional training did not include formal instruction in EBP. In fact, all seven participants were trained during a period where EBP was not part of OT professional education. As it has been suggested, novice clinicians are more likely to utilize evidence in practice than more seasoned practitioners most probably because of the recency of exposure to EBP in their university training (Korner-Bitensky, Desrosiers & Rochette, 2008; Menon-Nair, Korner-Bitensky & Ogourtsova, 2007). Second, time since graduation seems to influence the extent to which a clinician stays abreast of and uses current best evidence. The average number of years since graduation in our sample was 18 years. Although, EBP was not a foreign concept for any of the participants, they did not seem to be familiar with the details of the EBP approach and/or the five-step process nor did they seem to be aware that it is regarded as an approach to decision-making. Both the process and purpose of EBP became clearer with the structure provided through the five questions to which they were asked to respond (Menon, 2009) and the scaffolding provided during the second focus group. Third, participants

may have experienced a number of the EBP barriers earlier in their practice, and these may have deterred them from adopting this approach in the context of the simulated case. Although potential inhibiting reasons were not explored in the context of this study, several participants in informal discussions following both focus groups, reported that a number of issues in the "real world" of clinical practice were discouraging them from using an EBP approach. Participants mentioned busy case loads and increasingly demanding clients with complex co-morbidities, all factors identified by other researchers (Bennet et al., 2003; Cameron et al., 2005; Dysart & Tomlin, 2002; Korner-Bitensky et al., 2006), as well as administrative structures that do not accommodate for dedicated time to conduct literature searches (Humphris, et al., 2000). Even though our participants may have had favorable attitudes towards EBP, a finding that is consistent with studies reported earlier (Cameron et al., 2005; Philibert et al., 2003; Salls et al., 2009), they perceived the aforementioned barriers as insurmountable. Ongoing and future research in continuing professional development and knowledge translation will need to shed light on the types of strategies that can support clinicians in adopting and adhering to EBP (Cusik & McCluskey, 2000; Davis, 2006; Law, Missiuna & Pollock, 2008; Lencucha, Kothari & Rouse, 2007; Mezler & Metz, 2010). Fourth, clinicians may have been either unaware that there is current evidence in falls prevention or they may not have recently attended any continuing education initiatives on best practice in this domain. Interestingly, a recent systematic review of strategies for rehabilitation professionals (occupational therapists and physical therapists) to move evidence-based

knowledge into practice (Menon et al., 2009) showed that multi-component knowledge translation interventions (interactive educational sessions, opinion leaders, outreach visits, and printed materials) were shown to be effective for enhancing knowledge and practice behaviors of physical therapists. However, these strategies were unsuccessful in producing any changes in OTs' clinical practices. Though this review included very few studies specifically of OTs, findings suggest that even if our sample of clinicians had participated in such knowledge translation strategies, we most likely would not have observed differences in EBP behaviors in the present study. Fifth, reliance on experience more so than on research or client input is consistent with studies by Bennett et al. (2003), Dubouloz et al. (2003) and Humphris et al. (2000). These studies demonstrated that clinicians depended primarily on clinical experiences, peers, and informal continuing education rather than on research evidence to guide their practice. Indeed, therapists may perceive clinical experience as paramount even in the presence of research evidence. Thus, perceptions may influence if and under what circumstances scientific evidence is considered and ultimately incorporated in practice. Green, Gorenflo and Wyszewianski (2002) have suggested that there may be underlying factors that influence if and how a clinician responds to new information. Specifically, a clinician's practice style may be influenced by what is considered as credible sources of evidence, the value attributed to evidence vs. experience, the importance attributed to practical issues such as managing workload vs. client satisfaction and the readiness to diverge from group norms (issues of non-conformity). A study on the prevalence of practice style traits of

physical and occupational therapists working in stroke rehabilitation lends credibility to this assertion (Korner-Bitensky, Menon-Nair, Thomas, Boutin & Arafah, 2007). The results of that study showed that the majority of therapists were rated as 'pragmatists' according to the practice style questionnaire (Green, Gorenflo, & Wyszewianski, 2002). Pragmatists focus on the day to day demands of clinical practice. They may be willing to "diverge from local norms" (p. 939) but only if this is not disruptive to their practice as they are primarily concerned about efficiency. This finding underscores their (pragmatists') perception of the importance of the practical over the scientific element. In contrast, very few clinicians were 'seekers' whose clinical practice was driven by scientific evidence. It is therefore possible that in the present study, participants' reports that experience was the main driving force behind most clinical decisions, is in part due to an underlying practice style trait.

Findings from the present study suggest that arriving at one common end-point regarding EBP in falls prevention is not straightforward. In complex client scenarios such as the one depicted in the vignette used in this study, there appears to be a broad range of actions within the EBP process particularly in steps 4 and 5. Hence, it may be a challenge to successfully integrate all components of the EBP process when trying to make a clinical decision about a fall prevention intervention. Given the extensive list of responses in those two steps and clinicians' reports that there is no "one size fits all" approach to managing clients with falls, it may be that actual expert practice in prevention of falls is a function of the individual and unique needs of each client. If accurate, this explanation

would be consistent with the client-centered philosophy of OT. This explanation may even appease critics who argue that client-centered OT practice is inconsistent with EBP and that unless the client is included in every step of the process, clinicians risk sacrificing the profession's espoused philosophy of client-centeredness. Results from the study reported herein, however, do not present any evidence that the proposed interventions involved client input. This was an unexpected and surprising finding not only because of the recognized role of client input in EBP but precisely because of the OT profession's client-centered philosophy.

Expert practice in prevention of falls appears to manifest itself in a broad repertoire of possible explanations for the etiology of falls and in a range of treatment interventions that are largely based on extensive clinical experience in the domain. Expert OTs can proceed through the EBP process with explicit cueing. In the absence of a structure that scaffolds clinicians through the EBP process, the same experts rely primarily on their experience and their extensive knowledge of their clients to make a clinical decision. Even when the EBP process is clearly outlined and clinicians are asked to respond to each step, they fall short in clearly articulating a clinical question, and searching for and appraising the literature. This is most likely due to their limited knowledge and skill in steps 1 through 3 which most OT academic programs have just recently begun to teach explicitly as part of the EBP curriculum. Decisions in steps 4 and 5 of the process include fewer and more precise concepts which may reflect clinicians' highly organized and structured experiential knowledge.

A final discussion point is if and how the EBP approach in the context of falls prevention, adds value to clinical practice. For the most part, the study sample of therapists based their clinical decisions on previous clinical experiences with the majority of fall prevention recommendations still in use primarily because of their supposed success over the years. While this may not automatically result in ineffective or hazardous decisions given that OTs view experience as a legitimate source of evidence, the practice of selecting treatments mainly because they have always worked may be leading OTs down a slippery slope. Clinical experience alone does not replace EBP. Clinical decisions must be based on a weighted use of expert judgment, client-centered practice, clinical experience and scientific evidence. These necessary components of the evidence-based OT process work together, albeit at varying degrees and for different situations, to address the unique occupational needs of individuals living with disabilities. The question of whether under specific conditions clinical experience in falls prevention is sufficient, and whether it can, to some extent, compensate for limited research knowledge and uptake, is an issue which requires further study.

The reference model of expert OT practice in falls prevention for an elderly population with a history of falls generated in this study is a useful reference model for what expert clinicians likely do, what aspects of the process are in line with EBP and what aspects of EBP are missing. The model identifies which actions are influenced by experience, research evidence, and client input.

Implications for Practice

The research reported in this paper is the first to attempt to capture the EBP behaviors of expert clinicians in one area of OT practice and create a reference model that illustrates the behaviors that are consistent with all three components of EBP and those that are primarily driven by clinical experience. Study results have the potential to contribute to guiding ways to improve EBP practice and education. The findings broaden the existing knowledge base regarding experts' practice behaviors in the area of falls prevention in every day practice terms. Results support existing evidence that most clinicians rely primarily on their clinical experience to guide clinical decision-making. Clinicians can make deliberate efforts to think about and incorporate EBP principles when scaffolded through the EBP process despite limited knowledge of concepts such as PICO question, and limited skills in searching and appraising the literature. Also from a practice point of view, a possible contribution of this study is the potential for the resulting model to be used in OT as a practice framework. Clinicians working in prevention of falls in geriatric rehabilitation can use the reference model to guide them through the steps of the decision-making process regarding interventions for falls prevention. With further elaboration and validation, the model generated in this study has the potential to be used as a framework for teaching and assessment in OT education. In order to help students acquire expert practice competencies in falls prevention, educators can use the reference model to: 1) demonstrate the expert actions taken to arrive at a clinical decision regarding falls prevention including the aspects of the decision-making

process that are and are not congruent with EBP, 2) develop teaching activities that help students move along the decision-making process, and 3) assess students' competence in decision-making by comparing their responses to the responses of expert OT clinicians depicted in the model. Finally, the methodology from this study can be used for developing models of expert practice in other domains of OT where there is available scientific evidence such as stroke and cerebral palsy.

Study Limitations

The extent to which a simulated case can capture a complex and multistep process such as EBP introduces a limitation to this study. Although clinical vignettes are generally useful for eliciting some practice behaviors, they are only second best alternatives to authentic contexts. A second limitation is related to the data collection process. Clinicians completed the task on their own time over a 12-week period. Even though they were given direction as to what resources they could use, they may have used other resources or their responses to the questions may have been influenced by interruptions caused by clinical duties or their help seeking from others. A third limitation is that this research was conducted in one area of OT practice. Although there is ample scientific evidence to draw from when making a clinical decision about fall prevention programs, the results are specific to this area of OT practice and may therefore have limited generalizability. Lastly, the inclusion criteria (being identified as an expert clinician by supervisors, 10 years of clinical OT experience or more, extensive experience in geriatrics and regular participation in prevention of falls programs)

are only robust criteria insofar as the insights we have from the current literature on expertise. Only future research findings will be able to shed light on the conclusiveness of the inclusion criteria for the sample included in this study**.**

Directions for Future Research

This study is the first to systematically identify features of expert OT clinical decision-making in one area of OT practice. As such, it has uncovered important insights into experienced OTs' practice in this area and pointed to interesting directions for further research. Given the apparent shortcomings in the application of EBP, it would be worthwhile to generate a model created by a group comprised of clinicians, researchers and academics with recognized expertise in EBP. The knowledge and behaviors gleaned from these experts could be used to create more comprehensive representations of expert EBP in specific domains of OT practice. Given that there are researchers who study EBP and that most academics in OT programs are involved in teaching EBP, identifying these experts should not be a challenge. Identifying clinician experts in EBP however, may prove to be a far greater challenge in light of recent studies which have shown that most OT clinicians are not readily using research evidence to support their practice. With ongoing efforts to move knowledge into practice, as evidenced by the sharp rise in knowledge translation studies, we may witness a move towards increased use of interventions that are based on the best available scientific evidence. If knowledge translation strategies prove to be successful in changing clinicians' behaviors, there may be a larger pool of experienced clinicians with recognized skills and expertise in EBP to draw from when

attempting to create expert models of EBP. Future research on the development of expert EBP models will likely need to go hand in hand with knowledge translation studies.

Another avenue for research on the development of expert models includes replicating the methodology used in this study in other areas of OT practice where there is existing scientific evidence to validate the approach. Emerging scientific evidence for rehabilitation interventions in areas such as stroke and cerebral palsy provides fertile ground for additional testing of this methodology.

This study captured the decisions of experienced OT clinicians in one area of practice. Although not all of the behaviors were consistent with all of the EBP principles, the reference model does illustrate expert OT decision-making in falls prevention. It would be worthwhile to examine the differences in clinical decision-making for falls prevention, amongst clinical experts with no recognized expertise in EBP and expert evidence-based OT practitioners. This comparison could yield important data regarding the differences in the nature of the client-centered clinical decisions and the specific conditions under which scientific evidence is integrated in practice.

Another possible avenue for research that extends from this study would involve examining clinicians' EBP behaviors in real time and in authentic contexts. There are two major advantages in using real clients in investigations of EBP. The first is that OT clinicians will have the opportunity to assess the impact of their evidence-based interventions, assess their own proficiency with the EBP

approach and make plans for improvement. Ultimately, these actions can help clinicians to further hone both their clinical skills and their EBP skills. The second advantage, relates to researchers observing the actual outcomes that result from clinical decisions supported by research findings. Results from studies conducted in authentic contexts could begin to answer a question raised by some skeptics of the EBP movement: Does EBP lead to superior care and improved clinical outcomes? To gain greater insights into the reasons for clinicians' EBP decisions, and examine what underlying cognitive processes may be supporting the decisions made in EBP, future studies using qualitative methodologies and cognitive task analyses could be used. This kind of research could be conducted with clinicians in different practice areas and with varying levels of experience.

Regardless of which of the above mentioned research avenues are pursued, future studies of expert models in OT will have to take into account developments in expertise research that are grounded in cognitive psychology as well as current developments in knowledge translation and knowledge exchange.

Appendix A: Ethics Approval Certificate

McGill

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September 17, 2008

Ms. Aliki Thomas
Department of Educational and Counseling Psychology
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Dear Ms. Thomas,

Thank you for submitting your request for IRB approval of the study proposal entitled "Comparison of evidence based practice behaviors on a simulated case among occupational therapy students and expert clinicians"

As this study involves no more than minimal risk, and in accordance with Article 1.6 of the Canadian Tri-Council Policy Statement of Ethical Conduct for Research Involving Humans and U.S. Title 45 CFR 46, Section 110 (b), paragraph (1), we are pleased to inform you that approval for the study and study instruments (September 2008) and focus group, students and clinicians consent forms (September 2008) was provided via an expedited review by the Chair on September 17, 2008 valid until **September 2009.** The study proposal will be presented for corroborative approval at the next meeting of the Committee and a certification document will be issued to you at that time.

A review of all research involving human subjects is required on an annual basis in accord with the date of initial approval. The annual review should be submitted at least one month before **September 2009**. Should any modification to the study occur over the next twelve months, please advise IRB appropriately.

Yours sincerely,

Serge Gauthier, M.D.
Chair
Institutional Review Board

cc: A09-E35-08B

Appendix B: Results from Expert Literature Search on Falls Prevention Programs

Search criteria:

Effectiveness of fall prevention programs in community dwelling elderly; 1996 to 2009

CINAHL and Ovid MEDLINE; Accidental Falls/prevention and control [MeSH] OR fall prevention (as keyword) AND Program Evaluation [MeSH]; Limit to 65 and Older

Results:

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Appendix C: Stimulus Vignette

Mrs P. is a 78 year old woman widowed for 5 years. Her past medical history includes, hypertension, diabetes, bilateral cataracts, osteoarthritis in her knees and spine and vertigo. She also has a history of urinary track infections and pneumonia. She lives alone in a 2-storey single family house which she has owned for 35 years. Her bedroom is on the second floor which she accesses with 17 steps and a railing (13 steps, a landing and 4 more steps). There are no steps outside the home. The main bathroom with the bath and shower are on the second floor. There is a powder room with a toilet and sink on the main floor. Mrs P. has a son who lives in Toronto and a daughter who lives 20 minutes away but is burdened with a busy job and who helps to care for her frail, live-in father-in law. The daughter also occasionally baby sits her 6-month old grandson. Mrs P. has a neighbor that she has known for many years but with whom she does not have any significant contact. She does not have any other friends or social network. Her income is limited with a modest old age pension and small savings which are running out. Mrs P. worked as a clerical assistant for a window manufacturer for 13 years but stopped working to raise her children and never returned to work. When her children left home she began volunteering in a nearby community center. She volunteered there for 25 years. She enjoys sewing, playing cards, reading, knitting and watching television. She went to church every Sunday morning until about 3 years ago. In the last 3 years she has become less active: she stopped going to church and has been more homebound. When asked why she does not go out as much she says: I'm just not up to it".

Mrs P. fell getting out of bed one night to go the bathroom. She could not move much and remained on the floor for almost 24 hours. Eventually she crawled to the phone and called her daughter who in turn called the ambulance. When asked what happened she told the ambulance technician: "I don't know, I suddenly found myself on the floor". She was taken to the emergency where an X-Ray revealed a right hip fracture (intertrochanteric neck of the femur). Four days after her fall she had a hemiarthroplasty (partial right hip replacement). The surgery was successful and 5 days later she was transferred to a rehabilitation hospital with the following restrictions: 90 degrees right hip flexion, no hip internal rotation and no hip adduction. She is permitted to weight bear fully. The first day at the rehabilitation hospital she was seen by an OT for a wheelchair assessment and PT for evaluation of transfers and for the loan of a walking aid. On the second day, she was seen by OT for an initial interview and complete ADL assessment using the FIM (Functional Independence Measure). The results of the initial interview and ADL assessment are:

- This is her first documented fall but she has admitted to several " near falls" without injury
- There are mild cognitive problems (temporal orientation and short term memory) which are observed from talking with her and observing her during dressing and transfers,

- She requires close supervision for chair and toilet transfers and assistance for shower and bed transfers,
- She requires moderate assistance with lower body dressing, use of a walker and close supervision for ambulation for short distances, and requires moderate assistance to wash her lower body in the shower in a sitting position
- She requires frequent reminders to respect her restrictions; She follows instructions inconsistently,
- She has skin redness on the buttocks and swelling in the right leg,
- She complains of pain in the right hip upon movement (7/10 on the Visual Analog Scale)
- She is unable to maintain adequate positioning in bed or to change positions in bed,
- She has good static balance but precarious unsupported standing balance when she stands to pull up her undergarments and trousers.
- She has poor endurance (fatigues after walking 5 to 7 meters).

The treatment plan in OT included: 1) a formal screening of her mental status (Mini Mental Status Examination: 24/30 - borderline score), 2) providing technical aids for dressing and education on their use, 3) teaching and practice of safe transfers and bed mobility, 4) meeting with daughter to discuss patient's pre-fall situation, 5) practice of functional mobility with walker, 6) endurance exercises, 7) self-medication program, 8) evaluation of Instrumental Activities of Daily Living (IADL) 9) referral to social work. Mrs P has now been in rehabilitation for 4 weeks. The team is discussing her discharge which is scheduled to be in 2 weeks. Mrs P's clinical profile at discharge is as follows:

- She can dress and undress using a long-handled reacher, shoehorn, sock aid and elastic laces,
- She can sponge bathe at the sink in sitting and needs help to get in the bathtub using grab bars to sit on bath chair.
- She transfers out of bed independently; can transfer to the car independently and can transfer to the toilet independently using a raised toilet seat. She needs a commode (at her bed side) for night time.
- She can prepare breakfast and reheat meals but needs assistance for meal preparation.
- She walks with a walker independently indoors and requires supervision for mobility outdoors.
- She can go up and down the stairs with a cane, 1 rail and close supervision.
- She can manage her meds with a dossette box (pill box)
- Mini Mental score: 27/30 considered within normal limits

Mrs P. will be discharged home with the following recommendations: 1) temporarily move her bed to the main floor for easier access to the powder room and kitchen, 2) referral to CLSC for bathing and home safety evaluation, 3) referral to Meal on Wheels, 4) information on lifeline service, 5) referral to adapted transport, 6) purchase of adaptive equipment for bathroom (grab bars,

bath seat and raised toilet seat) for her home (these have been ordered). She has already purchased a long shoe horn, a sock aid, elastic laces and a tray for her walker. 7) Her daughter will assist with groceries and laundry and she will have help for housecleaning once very 2 weeks. There are 2 weeks left prior to her discharge and the team is considering the recommendation that Mrs P. take part in the hospital's fall prevention program. **Mrs P. and her daughter have been informed that you are thinking of having her take part in the Fall Prevention Program. They ask you to explain how this program will be of additional benefit for her, given her exposure to Occupational and Physical Therapies on the ward. How would you respond and how would you justify your response?**

Appendix D: Results from Participants' Literature Searches

Journal/ Source	**Study design (n)**	***Total n* of articles from source**	**Peer-reviewed source**	**Impact factor**	**Disciplinary source: PT/OT Other health disciplines (OHD), Other (O)**
Journal of Science and Medicine in Sport	review	1	Yes	Yes : 1.212	OHD
Age and Ageing	letter to the editor (1) MA (1)	2	Yes	Yes: 1.910	OHD
Gerontology	review (1)	1	Yes	Yes: 1.358	OHD
Journal of American Geriatrics Society	review (1) RCT (6)	7	Yes	Yes: 3.539	OHD
Worldviews on Evidence Based Nursing	SR (1)	1	Yes	Yes: 1.167	OHD
Cochrane Library 2009	SR (1)	1	N/A	N/A	OHD
British Medical Journal	RCT (1) SR (1)	2	Yes	Yes: 9.723	OHD
Australian Occupational Therapy Journal	SR (1)	1	Yes	No	PT/OT
Canadian Seating and mobility conference Proceedings	conference proceedings	1	No	N/A	O
Journal of Gerontological Nursing	pilot study	1	Yes	No	OHD
Report Public Health agency of Canada	technical report	1	No	No	Other
Nursing and Health Sciences.	clinical trail	1	Yes	No	OHD

	non-randomized (1)				
Clinical Calcium	?	1	?	No	OHD
Physical Therapy.	longitudinal cohort study (1) Cross sectional survey (1) RCT (1)	3	Yes	No	PT/OT
New England Journal of Medicine	Review (1) Clinical trial (1) Prospective study (1)	3	Yes	Yes: 51	OHD
Journal of Epidemiology and community health	RCT (1)	1	Yes	Yes: 2.956	OHD
Gerontologist.	RCT (1)	1	Yes	Yes: 1.820	OHD
Medical Care	RCT (1)	1	Yes	Yes: 3.534	OHD
Journal of the American Medical Association	MA(1)	2	Yes	Yes: 23.17	OHD
American Journal of Medicine	RCT (1)	1	Yes	Yes: 4.907	OHD
Total n of sources : 20	RCT n=12 SR n= 4 MA n=2 Reviews n=4	n=33	Yes: n=16 No: n=2 N/A: n=1 TBA: n=1	Yes: n=12 No: n=6; N/A:n= 2	PT/OT journals n= 2 OHD: n=16 Other: n=2

SR: Systematic Review
MA: Meta-Analysis
RCT: Randomized Controlled Trial

Bridging Manuscript

Comparison of Evidence Based Practice Behaviors on a Simulated Case Among Occupational Therapy Students and Experienced Occupational Therapy Clinicians

Findings from the first phase of the study showed that clinical decisions of experienced occupational therapy (OT) clinicians in the area of falls prevention were based primarily on experiences with previous clients and rarely on scientific evidence. While clinicians engaged in the EBP process with cueing and peer-support, there was noticeable variability amongst clinicians' decisions for the client depicted in the simulated scenario. The breadth of decisions was particularly evident in the final two stages of the EBP process which appeared to be highly dependent on clinical experience and exposure to a large number of clients throughout clinical practice. The EBP reference model generated by expert clinicians illustrates the clinical decisions made for a client with a history of falls and highlights the key concepts and decisions included throughout the steps of the EBP process. In addition, the model shows which behaviors are consistent with all EBP components (scientific evidence, clinical experience and client choice) and identifies aspects of clinical decision-making that are based primarily on individual clinical experience.

The third manuscript in the dissertation describes the results of the second phase of the doctoral study, intended to address the following question: What are the differences in EBP behaviors between OT students and experienced

clinicians? Specifically, the objectives were to: 1) identify the degree to which OT students at three different academic levels (beginning, middle and end of program) in a professional Master's entry-level OT program and experienced clinicians adhered to EBP principles when presented with a simulated clinical case, and 2) compare these behaviors to the EBP reference model representing expert clinicians' practice behaviors created in the first phase of the study.

Given that successful integration of research evidence in clinical practice is highly dependent upon an individual's experience and expertise in a domain (Craik & Rappolt, 2006; Sackett, et al., 1996), it is unrealistic to expect OT students to be experts in EBP at the end of their formal education. A more reasonable expectation is that students move along a trajectory of learning, marking a progressive development toward EBP competencies. While current expertise research emphasizes developmental trajectories towards expertise (Alexander, Murphy & Kulikowich, 2009), at the present time, the literature on the nature of such trajectories in OT is scant. The existing literature on EBP in the professions and in OT in particular, has yet to conclusively identify interim targets throughout the learner's professional education. Identifying the trajectory of EBP competency development including the nature of the EBP competencies and the points in time across learners' professional training when these are acquired, and establishing the extent to which students' practice behaviors are compatible with those of expert clinicians, can be useful for OT education. This information can guide curriculum designers as they plan instructional activities

that will help learners to progressively move towards EBP competency and demonstrate expert-like behaviors.

This manuscript describes the results of a study using a cross-sectional design of OT students from a professional Master's program and experienced clinicians from university affiliated clinical centers. The clinical vignette that was developed for the first part of the doctoral study was used to elicit students' and clinicians' behaviors in the five stages of EBP. Using a combination of qualitative and quantitative methods, participants' EBP behaviors were compared across cohorts as well as compared to the decisions depicted in the reference model.

Chapter IV: Manuscript 3

Comparison of Evidence Based Practice Behaviors on a Simulated Case Among Occupational Therapy Students and Experienced Occupational Therapy Clinicians

From: Thomas, A., Saroyan, A., & Snider, L. M. Comparison of evidence-based practice behaviors on a simulated case among occupational therapy students and experienced occupational therapy clinicians. To be submitted to the *Canadian Journal of Occupational Therapy.*

Abstract

Graduates from Canadian occupational therapy (OT) programs are expected to demonstrate entry-level competencies in evidence-based practice (EBP). If new graduates are to successfully apply EBP principles, they will need to develop the knowledge, skills and attitudes for integrating scientific findings in practice during their university education. In order for OT curricula to target specific EBP competencies throughout the academic program, educators must identify how EBP develops and is mastered at the pre licensure level and provide an outline for the trajectory of development of EBP competencies during the course of the academic program and with increased clinical experience. A clearer grasp of this trajectory can facilitate the design of EBP instruction and help students achieve targeted competencies along the way. The objectives of this study were to identify the differences in EBP behaviors amongst OT students and experienced clinicians and identify the extent to which these behaviors

corresponded to the decisions represented in an EBP reference model created in an earlier study (Thomas, Saroyan & Lajoie, 2011). The research reported in the present paper used a cross-sectional design of a sample of students from a professional OT Master's program at a Canadian research intensive university and experienced clinicians from university affiliated clinical centers. Student and clinician participants were asked to respond to five questions that reflected the five steps of the EBP process (step1: posing a clinical question, step 2: searching the literature, step 3: appraising the literature, step 4: decision-making, step 5: re-evaluation of the EBP process and outcome) for a simulated client. Both qualitative and quantitative data analyses were conducted in order to obtain a comprehensive description of group differences. Results indicate that students have greater breadth of knowledge of the aspects of EBP which are formally taught in the OT program (posing a clinical question, searching the literature and appraising the literature) but that their knowledge is not as well organized as the knowledge represented in the reference model generated on the basis of information gleaned from expert clinicians. Experienced clinicians' practice behaviors are most consistent with the decisions illustrated in the model in the final two steps of the EBP process (decision-making and re-evaluation) which may be a result of their experience in falls prevention. Knowledge of EBP concepts appears to be dependent upon formal instruction for the first three steps of the process whereas expert-like behaviors in the final two steps seem to be a function of experience in a given domain, reinforcing that knowledge of falls prevention and knowledge of EBP are distinct**.** Findings from this study have

implications for OT educators who can use identified gaps in EBP knowledge and synthesis of EBP concepts to update the EBP content in the OT curriculum. The study is the first to investigate trajectories of developing expertise in OT and has paved the way for educational psychology researchers to explore the developing nature of expertise in the context of EBP.

Introduction

Occupational therapists (OTs) in all areas of clinical practice are urged to provide services that are based on the best available scientific evidence (Dubouloz, Egan, von Zweck & Vallerand, 1999; Law & Baum, 1998). In fact, in a 2009 position statement on evidence-based occupational therapy, the Canadian Association of Occupational Therapists (CAOT) stated that all practicing clinicians and new graduates must offer services that target "client-centered enablement of occupation based on client information and a critical review of relevant research, expert consensus and past experience" (CAOT Joint Position Statement on Evidence-Based Occupational Therapy, http://www.caot.ca). If clinicians are to embrace and effectively incorporate the principles of evidence-based practice (EBP), they will need to develop the knowledge, skills and attitudes for integrating scientific findings in practice early in their OT career and ideally, during their formal academic training. Indeed, the CAOT and its accrediting council have strongly recommended that OT programs design and implement curricula that will promote entry-level competencies in EBP (CAOT, 2008). To achieve this objective, all academic programs must ensure that curricula promote awareness of evidence sources and that they target specific EBP competencies along the continuum of professional training. These goals are more likely to be achieved if actions taken are informed by research that identifies: 1) the nature of EBP knowledge required at different levels of OT education, 2) the incremental mastery of EBP competencies, and 3) the trajectory of development throughout the course of formal education. A comprehensive

analysis of this cycle of development could ultimately guide the design of the EBP curriculum and help learners achieve targeted outcomes along the developmental trajectory of EBP competencies. This paper presents the results of a study that examined the differences in EBP behaviors on a written simulated clinical case among OT students at different levels of their academic training and those of experienced clinicians, and identified the extent to which these behaviors corresponded to the decisions represented in an EBP reference model created in an earlier study (Thomas, Saroyan & Lajoie, 2011).

Background

Evidence-Based Practice Process

The evidence-based OT approach is said to include five steps (Bennett & Bennett, 2000; Corcoran, 2006; Hammell, 2001; Tickle-Degnen, 2000a). First, a clinician poses a clinical question about a treatment being considered, or an outcome of interest arising from client-identified issues. Second, a literature search is conducted to identify the best research evidence grounded in the client's perspective, in order to address the question. Once relevant research evidence is retrieved, the third step is to evaluate the evidence for its relevance and usefulness in order to extract clinical information of value. The fourth step consists of using the evidence for making clinical decisions and deciding if and how the information gleaned from the literature can be applied to a particular client. This decision is made by considering the research evidence in conjunction with clinical expertise and client choice. The final step involves an evaluation of the EBP process as a means of identifying gaps both in the clinician's EBP competencies

as well as those pertaining to the available research. Ultimately in this final step of the process, the clinician evaluates the effectiveness of the interventions in relation to the initial client-identified needs. Throughout the EBP process, OTs must use their clinical reasoning skills and consider their client's preferences in order to determine whether the evidence 'fits' with each feature of the client's context (person, occupation and environment) and whether as a clinician, he/she has the clinical expertise, and resources available to integrate the particular treatment intervention.

The Developing Nature of Evidence-Based Practice Competencies

Several researchers have asserted that the successful application of research evidence in clinical practice is a function of experience and expertise, reinforced by encountering a range of client problems and being forced to make daily decisions (Craik & Rappolt, 2006; Davidoff, 1999; Haynes, 2002; Rappolt, 2003; Rolfe, 1999; Sackett, et al., 1996). Guided by the fundamental principles of client-centered practice (CAOT, 1999), the evidence-based OT practitioner, relies on experience with past clinical cases with features that may or may not be similar to those of the present problem, to judge whether the scientific evidence applies to the current client and supports the clinical decision to be rendered. In order to successfully apply scientific findings in clinical decision-making, OT clinicians are expected to develop EBP competencies before they assume professional responsibilities and in the context of their formal education. Requirements of the national professional association for entry-level EBP competencies at graduation and explicit instruction in EBP in OT curricula across Canada have only recently

been integrated into the profession's mission to advance practice. Students in all Canadian OT programs are now expected to develop EBP-related knowledge, skills and attitudes during their academic training and to reinforce these incrementally as they advance in their program. Given that attaining a level of expertise in EBP is highly dependent upon extensive experience and practice in a specific area of clinical practice, it is unrealistic to expect students to demonstrate expert-like competencies in EBP at the end of their educational experience. However, it is realistic to expect that academic programs, through gradual development, lay the foundation of EBP and during the course of the program, move students along a trajectory of learning and progressive development of EBP competencies.

Developmental trajectories towards superior performance in a domain.

Defined as the "hallmark of the third generation of expertise research" (Alexander, Murphy & Kulikowich, 2009, p. 493), the concept of a developmental trajectory comprises a new chapter in expertise research that supports a developmental pattern rather than the dichotomous expert/novice orientation of earlier research on expertise. In past expertise studies (first and second generation of expertise research) researchers studied 'exceptional people' (Chi, 2006, p. 21) to understand how they performed in their domain and how they differed from the general population. Using both well-defined and ill-structured tasks, contemporary studies of expertise have been oriented toward studying the developmental and multidimensional nature of expertise. The objective of these contemporary expertise studies is to identify developmental

markers that can be used to incrementally shift individuals from being a novice to becoming an expert (Ackerman, 1996, 2000, 2003a; Alexander, 2003b; Lajoie, 2003). In addition to the notion of a developmental trajectory, contemporary expertise research programs (Ackerman, 2003a, 2003b; Alexander, 1997, 2003a, 2003b; Lajoie et al., 1998; Lajoie et al., 2001; Sternberg, 2003) have been investigating expertise "in everyday, dynamic settings or with complex, less well structured tasks" (Alexander, 2009, p. 493). Earlier expertise research was essentially conducted in highly controlled experimental environments using subjects with either very much (knowledge-rich) or very little knowledge (knowledge-lean) in an area (Chase & Simon, 1973; Ericsson & Polson, 1988; Ericsson & Smith, 1991; Gentner, 1988). Today, school settings and subject matter areas such as mathematics and domains such as medicine and history are considered legitimate disciplines and settings for expertise research and have become central to several expertise research programs (Alexander, 2003b; Lajoie, 2003). These domains have the potential to help researchers gain some insight into generalizable attributes of the way in which experts regulate their thinking and reasoning strategies (Kulijowich & De Franco, 2003).

Notwithstanding the range of domains and the scope of current research on developmental trajectories towards expertise, there is at present no literature on the nature of such a trajectory in OT in general and in EBP competency development in particular. The notion of incremental development of expertise, as applied to EBP, suggests that once foundational knowledge is present,

development toward different levels of expertise must be scaffolded along the way (Collins, Brown & Newman, 1989).

Current Basis for the Design of Evidence-Based Practice Curricula in OT Professional Programs in Canada

In the absence of specific EBP competency targets along the educational continuum, to date, Canadian OT programs have been using the 'Profile of Occupational Therapy Practice in Canada' (2007) to guide the design of EBP curricula. The 'Profile' describes the scope of OT practice and delineates the expected entry-level competencies in EBP. This document identifies seven main roles of OTs, two of which, "expert in enabling occupation" and "scholarly practitioner", specifically call for the use of research evidence for clinical decision making. In other words, the concept of EBP is most relevant to these two roles. The 'Profile' also describes the key competencies and performance expectations for "competent" and "proficient" OT practice for each role (Appendix A). Graduates are expected to perform at a "competent" level in all roles upon graduation. The move towards "proficiency" is foreseen to occur with acquisition of experience throughout clinical practice (CAOT, 2007). While the 'Profile of Occupational Therapy Practice' outlines the minimum standards for competent evidence-based OT practice, it does not provide interim competency targets throughout the learner's professional training. Thus, the distinctive milestones throughout the developmental EBP trajectory in OT, which are expected to be achieved during formal education, have yet to be identified.

Basis for the Study

The national professional OT association and its accrediting council are strongly recommending that university programs design and effectively integrate EBP in their curricula. If faculty are to design courses that support students in achieving a 'competent' level of practice in EBP at graduation, they will need to identify both the nature of the EBP competencies that must be acquired and the points in time across the OT educational continuum when these will need to be achieved. There is little reference in the empirical literature that provides base-line data on the acquisition of EBP skills and competencies during the course of academic programs.

The purpose of this study was to capture this baseline by investigating the differences in EBP behaviors among three cohorts of OT students representing learners at three different stages of formal OT education and a group of experienced OT clinicians, and examine the extent to which participants' EBP behaviors approximate experienced clinicians' EBP behaviors as depicted in an EBP reference model created in an earlier study (Thomas et al., 2011).

Methods

Ethics approval was obtained from the Institutional Review Board of the Faculty of Medicine of a Canadian research intensive University (Appendix B).

Study Design and Stimulus Material

The study used a cross-sectional design of a purposive sample of OT students and practicing OT clinicians in order to examine group differences between the four groups (independent variables) on each EBP step (dependent

variables). In the Thomas et al. (2011) study, a focus group of nine expert OT clinicians (a different group of clinicians than the ones who participated in the present study) was used to create a clinical vignette depicting an elderly woman with a history of falls. The vignette was used in the present study to elicit students and OT clinician participants' EBP behaviors (Jones, Gerrity & Earp, 1990; Ramos, Schafer & Tracz, 2003). 'Falls in the elderly' and 'falls prevention programs' are two prevalent issues within geriatric heath care that have received a great deal of attention from researchers. The choice of this area was based on one important consideration. Contrary to many other areas of OT practice, there is considerable literature and scientific evidence available to practitioners and researchers on these topics.

Recruitment and Sample

Non-probabilistic purposive sampling was used in this study. The sampling frame consisted of four groups: three student groups from an OT program at a research intensive university and a group of experienced clinicians from that University's affiliated health care facilities. The OT program at this University was selected because it focuses strongly on EBP, with explicit instruction in research methods and EBP across the program. Experienced OTs from five teaching hospitals were recruited because the clinicians at these sites who provide teaching opportunities for students are expected to be familiar with EBP and recognize the importance of clinical practice that is supported by the best available research evidence.

Student participants.

The Master's entry-level professional OT program at this University consists of four and one half years of coursework and 1000 hours of fieldwork. The first three years of the OT program consist of courses leading to a Bachelor's of Science in Rehabilitation Sciences (non-practicing). Graduates from this degree are eligible to apply to the 26-month Master's portion of the program leading to a Master's of Science Applied in Occupational Therapy (M.Sc. (A) O.T.).

Data were collected during the 2008 fall term (November). Student participants were recruited from three different academic years during the same time frame in order to capture learners' EBP behaviors at the beginning, middle and end of OT formal education.

Student participants representing the beginning stage of OT education were first year students. Year 1 (U1) comprises basic science courses and two OT introductory courses (one per term). At the time of data collection, U1 students had not received any instruction in research methods or EBP other than a 30-minute class on the rationale for EBP in today's health care context. The total number of students in this class was 52.

Learners representing the middle stage of OT training are known as 'qualifying year' (QY) students. Students at this stage have a previous undergraduate degree in a discipline other than OT (anatomy, psychology, sociology, arts) and are admitted into the third year of the undergraduate portion of the OT program. QY students must successfully complete all third-year undergraduate courses to be eligible for admission into the professional Master's

degree program. At the time of data collection, the QY cohort had received introductory level instruction in EBP (foundations of EBP), had just begun applying EBP concepts with simulated client scenarios, and had recently (4 weeks prior to data collection) attended a 3-hour workshop with a librarian on searching databases for scientific evidence. The total number of students in this cohort was 29.

During the 2008-2009 academic year, the professional entry-level Bachelor's of Science in OT (B.Sc. OT) program was being phased out as the new professional Master's program was being introduced. That year, the program was graduating its last B.Sc. OT class. As there were no Master's students yet that could be recruited to represent learners at the end of their professional education, students in the final year (year 3/U3) of the B.Sc. OT were recruited to participate in the study. The U3 students had completed almost two and one half years in the program. They had exposure to most areas of OT practice (musculoskeletal conditions, neurological conditions, mental health conditions, community health care) through their coursework, had received explicit instruction in research methods and EBP, and had over 600 hours of completed fieldwork. The total number of students in this cohort was 56. Table 1 illustrates the demographic characteristics including age, gender and previous degrees for the student cohorts. Table 2 shows the nature of the EBP content included in the curriculum in each of the three student cohorts.

Table 1

Student Participant Demographics

Cohort (n)	Age group				Gender		Previous degree		
	18-20 n (%)	21-23 n (%)	24-25 n (%)	26 + n (%)	F n (%)	M n (%)	Yes n (%)	No n (%)	Degree title (n)
U1 (15)	12 (80)	3 (20)	0 (0)	0 (0)	14 (93)	1 (7)	0 (0)	15 (100)	
QY (20)	0 (0)	10 (50)	4 (20)	6 (30)	17 (85)	3 (15)	20 (100)	0 (0)	B.Sc.: Psychology (2); Kinesiology (7); Biology (1); Physiology (1); Microbiology; Immunology (1) B. A. (4) Bachelor of Community rehabilitation (1) M.Sc. Computer science (1); Biomedical Engineering (1) MD (1)
U3 (18)	1 (5.6)	14 (77.8)	1 (5.6)	2 (11.1)	14 (77.8)	4 (22.2)	2 (11.1)	16 (88.9)	Kinesiology (1) Certificate in arts and sciences (1)

Table 2

Nature of EBP Instruction per Student Cohort

Cohort	Term of instruction, course name and number of credits	Instruction on EBP
U1	First year (fall) *OT seminars (3)*	Basic concepts and rationale for EBP
QY	Qualifying year (fall) *Therapeutic strategies in OT (8)*	Foundations of EBP: EBP steps/process Library workshop on creating a PICO and searching the literature
U3	First year courses (fall) *Assessment in rehabilitation I (3)* *Communication and professionalism (2)* *Health care and professionalism (2)*	3 courses covering concepts of EBP and searching the literature
	First year courses (winter) *OT practice I (sections a ,b, c, d)(4)*	1 course covering concepts and process of EBP and integration of evidence
	Second year courses (fall) *Assessment of performance II (2)* *OT practice II (Part 1 section A) (2)* *OT practice II (Part 1 section B) (2)* *OT practice III (Part 2) (3)*	Courses presenting current evidence in rehabilitation assessment and treatment, application of EBP concepts in assignments
	Second year courses (fall) *OT practice II (Part 2) (4*) *Assessment of performance III (3)*	Courses presenting current evidence in rehabilitation assessment and treatment and using evidence in selection of assessments
	Third year courses (fall) *Research methods (3)*	EBP guidelines, asking and answering a clinical question, searching to find the answer to a PICO , critical appraisal, classifying evidence on the effectiveness of interventions according to specific guidelines, synthesizing research information for clinical applicability, research designs
	Splinting and orthotics (2) *OT practice IV (3)* *OT and community mental health (3)*	Application of evidence in the selection and analysis of treatment interventions, application of EBP concepts

All students in each cohort were invited to participate in the study. They were eligible to participate if they had successfully completed all courses in the program up to the point of recruitment and provided written informed consent (Appendix C). Special students (exchange students and international students) were excluded from the study. To avoid the perception of coercion of student participants, because the principal investigator (PI) (AT) was an instructor in the OT program, three research assistants (education graduate students) assisted with recruitment of student participants and data collection. Once permission to recruit students during class time was granted from the program director and using a script of the study information prepared by the PI, the research assistants arrived during the last 20 minutes of class and presented the study, invited students to participate, and provided the consent forms.

Occupational therapy clinician participants.

The sample comprising the experienced OT clinicians in geriatric rehabilitation was purposively recruited because the intent of the research was also to capture the EBP behaviors of individuals with knowledge and professional experience in the clinical area depicted in the stimulus clinical vignette. Fifteen clinicians working in geriatrics from eight clinical sites in Montreal and surrounding areas were invited to participate. They were contacted via telephone and given the details of the study. Eligibility criteria included: being members of the provincial OT regulatory body, having worked in geriatric rehabilitation for a minimum of 10 years, being involved in at least one falls prevention initiative (the focus of the stimulus clinical vignette) per year, and being willing to provide

informed consent to participate (Appendix C). Nine OTs agreed to participate in the study. Appendix D shows clinicians' demographic information, work characteristics, falls prevention experiences and the frequency of participation in continuing education activities. Participants had an average of 23 years of OT experience (range 8-36), 18 years of experience in geriatrics (range: 4-28) and were representative of the major areas of geriatric practice (community practice, long term care, acute care, rehabilitation and research). The total study sample consisted of 62 participants, comprising 15 U1 students, 20 QY students, 18 U3 students and nine clinicians. These represented 29%, 69% and 32% of U1, QY and U3 students, respectively.

Study procedure and data collection.

Data collection for all student groups took place in the course of 48 hours in order to reduce the possibility of participant contamination and minimize potential confounding that might occur if new EBP teaching materials were introduced during the data collection period. The PI was not present during these sessions, but was available by telephone in the event that the research assistants had any questions arising from student participants. Due to scheduling and workload issues, data from clinicians were collected over several weeks. This was not a concern as clinicians did not know one another nor did they have any contact with the student participants for the duration of the study.

Data for all four cohorts were collected using WebCT, a course management system that enables instructors to store, reuse, and share learning materials (assessments, lectures, tutorials, activities, simulations, multimedia) as

well as collect and securely store aggregated, course specific data from student activity (Retrieved from http://www.zandara.com/dixon_portfolio/gtc/univo/univo_enlinea/materials/Leveraging.pdf; June 22, 2010). For the purposes of this study, WebCT represented a straightforward and familiar online platform to students. WebCT facilitated posting the vignette and the tasks the participants were asked to complete, as well as recording participants' responses. Of the nine clinicians, only one participant was familiar with this tool. The others were given a brief introduction to WebCT and its functions at the beginning of the data collection session and instructed to ask for assistance if they encountered any problems. The PI was present throughout the session to support clinicians in using WebCT.

Participants logged into WebCT and read the posted vignette and instructions for the study (Appendices E and F). They were instructed to complete the tasks individually. In the first two steps of the study, there was no mention of EBP or the EBP process. Instead, participants were told that the investigators were interested in examining participants' OT decisions for a specific client. Both students and clinicians had a total of two hours to complete the same seven tasks using specific instructions (Appendices E and F). The tasks were as follows:

Task 1 involved answering a set of demographic questions.

Task 2 (un-cued EBP) was designed to capture spontaneous reports of EBP or EBP concepts for the client in the vignette. This task required that participants answer the following question without any cueing to use the EBP approach: *Mrs P. and her daughter have been informed that you are thinking of*

having her take part in the Fall Prevention Program. They ask you to explain how this program will be of additional benefit for her, given her exposure to Occupational and Physical Therapies on the ward. How would you respond and how would you justify your response? Once they completed this second task and could no longer return to their answers, they were explicitly asked to respond to five questions (Tasks 3-7) that reflected the EBP steps:

Task 3) "*What is your clinical (PICO) question for the client in the vignette?*

Task 4) "*List the key words and sources you would use when searching for literature to answer you clinical question*"

Task 5) "*List which article sections (abstract, methods, discussion, results, etc.)which you consider most useful when appraising an article?"*

Task 6*) "What will you recommend for this client? Describe your plan/ recommendations."*

Task 7) Given the simulated scenario, and since participants could not observe the actual outcome of the intervention, for this task, they were given this hypothetical situation. *"The client is now home 3 months after having completed her treatment and has fallen twice. The family contacts you to let you know that this has happened. What do you believe are the causes for the recurrence of falls? What will you do in this situation? What is your new plan of action?*

Data Sources and Analysis

Written responses to tasks 2 through 7 comprised the data sources for this study. Three types of analyses were conducted to answer the research question: "What are the differences in EBP behaviors between OT students at different levels of their academic training and experienced OT clinicians"? MAXQDA10, a qualitative data analysis software program was used for coding the transcripts and SPSS 14.0 was used to conduct the subsequent quantitative analyses.

In the first instance, task 2 responses were read and searched for terms reflecting EBP and corresponding steps, such as *EBP, research, literature, evidence and scientific articles*. Open coding was used to identify emerging categories from participants' responses. This process identified 1) the number of participants per cohort as well as the total number of study participants that referred to EBP concepts explicitly and 2) generated the specific aspects of the EBP process that were being referenced.

Second, data from Tasks 3-7 (5 EBP steps) were coded using the EBP reference model (Thomas et al., 2011) for deductive coding. The categories in the model illustrate experienced clinicians' decisions for the client depicted in the vignette for each of the five EBP steps. The comparisons between behaviors illustrated in the model and behaviors of study participants, provided evidence of the extent to which participants' behaviors were consistent with expert clinicians' practice decisions and whether these behaviors varied by academic level (i.e., student cohorts) and professional experience (i.e., clinician cohort). Transcripts were coded by three independent judges (the study PI, coder 1 and coder 2). The

coding system, coding process and ensuing quantitative analyses are described next.

Coding System

The coding instrument consisted of the expert reference model (Appendices G-K) developed in the study reported in Thomas et al. (2011). Appendix G illustrates the 14 categories representing the four components (population, intervention, comparison, and outcome) of a clinical (PICO) question related to falls prevention. Nested within each category are a number of concepts. Concepts represent either a synonym or options within the category as expressed by the expert clinicians. Appendix H represents the two categories within the second EBP stage 'searching the literature': *'key words used in search' and 'sources used in search'*. Nested within the categories, are keywords that are used to search the literature and a list of sources that can be used when searching. Appendix I shows the four main critical appraisal categories (*standard of the research, relevance of the research, usefulness of the research and manuscript sections*) and nested concepts. Participants in the present study were only asked to list the manuscript sections and subsections they considered important when reading the literature. Appendix J illustrates eight categories of treatment recommendations for the client depicted in the vignette. Appendix K shows the eight categories of possible causes for the recurrence of falls and the eight categories of new action plans. Appendices J and K include additional EBP-related concepts such as '*supported by experience', 'supported by the literature' and 'supported by client wishes'*. These were part of the reference model but were

not applicable to the participants in this study and thus were excluded from the analysis.

Coding Procedure and Reliability Process

Using the codes in the reference model, the principal investigator (AT) created a coding manual (Appendix L) that contained a general description of the phenomena of interest (behaviors in each of the five EBP steps), explicit procedures for coding the data, details regarding the codes, specific definitions of the content to be identified, as well as how the content was to be identified (categories and ratings). Coded units consisted of single words, sentences or paragraphs. For example, in step 2 of the EBP process where participants were asked to list the databases they would search to find research evidence, statements such as "*Medline", "the Cochrane Database"* and *"Pubmed" were* considered single word segments. In step 4 of the EBP process, where participants were asked to list treatment recommendations, segments often consisted of sentences or paragraphs. The PI coded all the data (315 transcripts). Coders 1 and 2 were subsequently trained to code the data in this study. The training involved one session where the PI explained the coding system and demonstrated the coding procedure using the coding manual (Robins, Fraley & Krueger, 2007). Coder 1 had prior experience using the qualitative analysis software and coding qualitative data but was not a content expert (did not have any knowledge of OT or EBP). Coder 2, a licensed physical therapist and graduate student in education, had knowledge of the clinical area depicted in the vignette, was familiar with EBP and had clinical experience in rehabilitation. Coder 1 practiced coding on a subset of

the data (62 transcripts, 20%) and discussed the codes with the PI to ensure consistent interpretation of the coding scheme. Following this discussion, the PI modified the coding manual to further clarify the coding procedure and explicate the code definitions. Coder 1 then coded an additional 81 transcripts (26 % of transcripts). Coder 2 had an opportunity to practice with a subset of the data (15 transcripts, 5%) and discuss the codes with the PI. No further changes were made to the coding manual at this stage. Coder 2 subsequently coded 80 transcripts representing 25% of the data. Percentage agreement (P %) between each coder and the PI was measured as: (agreements/ (agreements + disagreements) X 100 for each EBP step as well as for overall agreement across all five EBP steps (Araujo & Born, 1985). Table 3 lists the P % for each task. Coder 2 with clinical experience and knowledge of the domain (fall prevention) had higher agreement with the PI on all EBP steps. This was an anticipated outcome because of knowledge of discipline-specific terms and subsequent interpretation.

Table 3

Coding Inter-Rater Agreement

Task	P % PI and coder 1*	P% PI and coder 2**
Task 3-PICO	.80	.91
Task 4-searching	.77	.78
Task 5-appraisal	.69	.84
Task 6-decision-making	.47	.81
Task 7-re-evaluation	.75	.78
TOTAL	.73	.81

*Coder without content knowledge

** Coder with content knowledge

Quantitative Analysis

Analysis of coded data from tasks 3-7 consisted of comparing group responses to the expert decisions depicted in the model for each of the five dependent variables (EBP steps). Each participant received a total score on each dependent variable. This score represented the number of responses that corresponded with the model categories. For example, the dependent variable PICO contains 14 categories (Appendix G). An individual score of 8, indicated that the participant reported 8/14 categories identified in the reference model. Individual total scores on each dependent variable were converted into group means (per cohort). Descriptive statistics were generated to present a comprehensive list of means, standard deviations and frequencies. A multivariate analysis of variance (MANOVA) of group effects on the dependent variables EBP steps was originally planned. To ensure appropriate use of this parametric procedure, the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality and the Levene test for equality of variances were conducted. Two non-parametric tests were subsequently performed to deal with skewness in the data and violation of the homogeneity of variance assumption. The Kruskal–Wallis one-way analysis of variance by ranks was used to test equality of medians among the four cohorts and the Mann–Whitney U with a Bonferroni correction was used on all pair-wise comparisons as there were no a priori hypotheses on group differences.

In the third and final phase of data analysis and to avoid making erroneous inferences, segments that did not correspond to any of the existing model elements were assigned to a new coding category named “other”. For example, in

the first EBP step, each PICO component in the model contains a number of categories. Within the 'population' component, there are three categories, 'person', 'location of residence' and 'condition/patient characteristic'. Nested within each of the three categories, are a number of concepts. When a response did not match any of the concepts but matched the top level category (population), the segment was coded as 'other' within that category. Segments such as *"woman"* or *"widow"*" made reference to the 'person' (category) but did not correspond to any of the four concepts within that category as identified by the experts in the Thomas et al., (2011) study (*older person, senior, senior over 65, patient*). These segments were assigned the code, *population-person-other.* Descriptive statistics were used to examine the features of these data by cohort on each of the EBP step.

Results

Study results are presented in the following order: 1) themes emerging from the un-cued EBP process (task 2), 2) proportions and frequencies of responses per cohort on each of the five EBP steps (tasks 3-7), 3) frequencies and proportions of responses that did not correspond with the reference model, 4) quantitative analysis of group differences on the five dependent variables (EBP steps).

Task 2: Un-Cued EBP Process

Seven (11%) of the 62 participants (U1, N=1; QY, N=4; U3, N=1; OT, N=1) reported concepts related to EBP when asked an open-ended question regarding the usefulness of a fall prevention program for the client depicted in the

vignette. Three main themes emerged from the analysis*: 'Search for evidence on effectiveness (SEE)', 'Components and content of a fall prevention program' (CCFPP) and 'Statistics or incidence of falls and injuries' (SIFI).* Table 4 illustrates the themes derived from individual participant quotes. All but one participant (U3 student) addressed the evidence on the effectiveness of the fall prevention program. This third year student quoted results of a study on the consequences of falls in the elderly but did not mention the effectiveness of a fall prevention program for the client in the vignette.

Table 4

Themes from Un-Cued EBP Process

Cohort	Participants	Quotes including themes
U1	P1	"I would certainly search for numbers; proving the efficacy of the treatment (SEE) (for ex, the number of people falling reduced by x; after following the program). This would show the clients that the program can give positive results"
QY	P1	"To reduce the risk of falling, several aspects will be focused on. Important aspects of the program will include education and skill building to increase Mrs Ps knowledge about fall risk factors, exercise to improve strength and balance, and home modifications that would make moving around her home (Thacker, 2000) CCFPP. …. to enable her to walk up her two storey home, …moreover, it has been shown that fall prevention programs have been effective in reducing the fear of falling by improving self efficacy, concerns and balance confidence (Zijlstra et al. 2007 (SEE))"
	P2	"I would explain how will this program be of benefit to Mrs P., including the following reasons: If the program is proven to make a reduction in the incidence of falls then (SEE) both Mrs. P and her daughter can worry less about Mrs. P falling"
	P3	"I first find out all of the information about the prevention program. I would find out what it includes (how long, how often, its structure (group vs. individual), content (CCFPP), as well as if there has been any research on it's success (SEE) and based on what population."
	P4	"I would do some research on fall prevention program, the different physical, mental issues of Mrs. P. See what evidence exists to support this type of program (SEE); I would present the benefits of the fall prevention program and how the OT &; PT can minimize the risks of injury".

U3	P1	"Also I would let them know that falls have a major effect on health and level of independence…Seniors are more likely to be admitted to hospital… In fact over half of all admissions due to falls occurred in persons 65 or over. Seniors…greater risk of permanent institutionalization than those who do not. <u>According to one study, the odds of moving to a long term care facility following an injurious fall were nearly triple the odds for people who had not fallen (SIFI)</u>
OT	(P)1	<u>Also I can present some stats about falls in the elderly (SIFI) and some scientific evidence (ex Public health) on the importance of prevention (SEE)</u>

*Themes are underlined

Tasks 3-7: Group Performance on EBP Steps

Tables 5-9 illustrate the proportions of participant responses per cohort, on the main model categories. Group proportions were highest for the PICO dependent variable. For this first EBP step, more than two thirds of the QY and U3 students (range from 67%-100%) identified PICO concepts included in the model. Proportions for the second dependent variable (searching) were the lowest of the five EBP steps with 6/10 categories having no responses from at least one of the four cohorts. In six of the ten 'searching the literature' categories, the highest proportions of answers corresponding to the model where from the QY (n = 4 categories) and U3 (n=2 categories) groups. A similar pattern was observed for 'appraisal of the literature' where the same two groups had the highest proportions in 5/6 categories (QY 3/6, U3 2/6). For the final two dependent variables, Tables 8 and 9 indicate that the clinician group has the highest proportions of responses corresponding to the model, followed by the U3 student cohort. The lowest proportions in the decision-making dependent variable do not

point to any particular pattern. The group with the lowest proportion of responses corresponding to the model varied across the eight categories in this step. In the final EBP step, the lowest proportions were from the U1 cohort.

Table 5

Proportions and Frequencies per Cohort for EBP Step 1: PICO

PICO category	U1 (N=15) N (%)	QY (N=20) N (%)	U3 (N=18) N (%)	OT (N=9) N (%)
Population	8 (53.3)	20 (100)	18 (100)	5 (55.6)
Intervention	4 (26.7)	19 (95)	17 (94.4)	2 (22.2)
Comparison	4 (26.7)	19 (95)	15 (83.3)	2 (22.2)
Outcome	2 (13.3)	13 (65)	12 (66.7)	1 (11.1)

Table 6

Proportions and Frequencies per Cohort for EBP Step 2: Searching the Literature

		U1 (N=15) N (%)	QY (N=20) N (%)	U3 (N=18) N (%)	OT (N=9) N (%)
Key words used in search	Person	2 (13.3)	12 (60)	6 (33.3)	4 (44.4)
	Prevention	3 (20)	13 (65)	12 (66.7)	6 (66.7)
	Benefits	1(6.7)	(-)	2 (11.1)	1 (11.1)
	Intervention	(-)	(-)	1(5.6)	(-)
	Location	(-)	1 (5)	(-)	(-)
Sources used in search	Browsers	2 (13.3)	(-)	(-)	(-)
	Scholarly Databases	3 (20)	20 (100)	18 (100)	3 (33.3)
	Search Engines	4 (26.7)	7 (35)	3 (16.7)	5 (55.6)
	Journals	(-)	(-)	(-)	(-)
	Websites	(-)	(-)	(-)	(-)

(-) no responses

Table 7

Proportions and Frequencies per Cohort for EBP Step 3: Appraising the Literature

Manuscript sections	U1 (N=15) N (%)	QY (N=20) N (%)	U3 (N=18) N (%)	OT (N=9) N (%)
Abstract	2 (13.3)	4 (25)	(-)	2 (22.2)
Results and conclusion	14 (93.3)	15 (75)	16 (88.9)	7 (77.8)
Methods	9 (60)	15 (75)	11 (61.1)	4 (44.4)
Analysis	(-)	1 (5)	2 (11.1)	1 (11.1)
Methods subsections	2 (13.3)	7 (35)	11 (61.1)	4 (44.4)
Analysis subsections	1 (6.7)	(-)	7 (38.9)	2 (22.2)

(-) no responses

Table 8

Proportions and Frequencies per Cohort for EBP Step 4: Decision-Making

Decision-making/ recommendations	U1 (N=15) N (%)	QY (N=20) N (%)	U3 (N=18) N (%)	OT (N=9) N (%)
In-patient rehabilitation and education	6 (40)	11 (55)	6 (33.3)	6 (66.7)
Multifactoral fall prevention program	13 (86.7)	13 (65)	15 (83.3)	5 (55.6)
Comprehensive discharge plan	1 (6.7)	(-)	2 (11.1)	(-)
CLSC home interventions	1 (6.7)	1 (5)	3 (16.7)	2 (22.2)
Assessment footwear and mobility	(-)	1 (5)	(-)	(-)
Out-patient rehabilitation	(-)	(-)	(-)	2 (22.2)
Referral to physician and other medical services	2 (13.3)	6 (30)	1 (5.6)	2 (22.2)
Equipment for preventing injuries	2 (13.3)	1 (5)	2 (11.1)	4 (44.4)

(-) no responses
CLSC: Centre Local de Services Communautaires (local community services centre)

Table 9

Proportions and Frequencies per Cohort for EBP Step5: Re-evaluation

		U1 (N=15) N (%)	QY (N=20) N (%)	U3 (N=18) N (%)	OT (N=9) N (%)
Causes of recurrence	Change in status:	8 (53.3)	14 (70)	13 (72.2)	8 (88.9)
	Medications	1 (6.7)	5 (25)	6 (33.3)	4 (44.4)
	Motivation/attitude	3 (33.3)	1 (5)	2 (11.1)	1 (11.1)
	Past medical history	7 (46.7)	8 (40)	6 (33.3)	3 (33.3)
	Compliance with recommendations, equipment, FPP	8 (53.3)	10 (50)	11 (61.1)	4 (44.4)
	Extrinsic factors/ environment	7 (46.7)	11 (55)	6 (33.3)	4 (44.4)
	Footwear	1 (6.7)	(-)	1 (5.6)	2 (22.2)
	Cognitive problems	5 (33.3)	8 (40)	8 (44.4)	2 (22.2)
New plan of action	Family meeting and discussion	4 (26.7)	5 (25)	3 (16.7)	5 (55.6)
	Refer back to physician	1 (6.7)	4 (20)	7 (38.9)	3 (33.3)
	Suggest vision assessment	1 (13.)	2 (10)	1 (5.6)	1 (11.1)
	CLSC home Recommendations	(-)	(-)	1 (5.6)	1 (11.1)
	Medical evaluation	(-)	(-)	1 (5.6)	(-)
	CLSC medical and environmental Evaluations	(-)	1 (5)	1 (5.6)	2 (22.2)
	Refer to medical specialists	(-)	2 (10)	4 (22.2)	(-)

(-) no responses
FPP: Fall prevention program
CLSC: Centre Local de Services Communautaires (local community services centre)

Responses That Did Not Correspond with the Reference Model

Table 10 shows the reference model which served as the coding system, including the new categories identified as "other". In total, 23 'other' categories were created from 853 segments representing 46% of all the coded segments (n = 1868) in the study. The breakdown of the 23 categories including the number of segments in each of the steps is as follows: eight new "other" categories created within the PICO (from 186 segments), nine new categories for step 2 (from 243 segments), three new categories for step 3 (from 113 segments), one category for step 4 (from 87 segments) and two categories for step 5 (from 224 segments). Appendices M through Q show the number of segments by cohort that were coded as 'other' for each EBP step. More than half of the segments (n = 463; 55%) coded 'other' were in steps 2 (searching the literature) and 5 (re-evaluation). In almost all of the 'other' categories (19/23), the majority of segments (between 57% and 70%) that did not correspond to the model categories, were from the U3 and QY groups.

Table 10

Code System Including New Categories "Other" [n of segments]

Step 1 PICO question	Step 2 Searching literature	Step 3 Appraising literature	Step 4 Decision-making	Step 5 Re-evaluation
Population person person-other [73] location location-other [8] condition/patient characteristic condition/patient characteristic-other [56] Intervention intervention-other [10] length length-other [1] location location-other [1] Comparison another intervention another intervention-other [4] Outcome outcome-other[33]	key words/ concepts key word-other [34] person person-other [91] prevention prevention-other [7] benefits benefits-other [1] intervention intervention-other [40] sources used in search sources - other [19] databases databases-other [39] journals Journals-other [4] websites websites-other [8]	manuscript sections manuscript-sections-other [50] manuscript-methods-other [59] manuscript-analysis-other [4]	decision-making/ client recommendations other [87]	possible causes of recurrence of falls possible causes of recurrence of falls-other [64] new plan of action new plan of action-other[160]

Quantitative Analysis of Group Differences on the Five EBP Stages

Table 11 presents the means, standard deviations and standard errors on the dependent variables for the four cohorts. Results of statistical analyses are presented following this table.

Table 11

Descriptive Statistics for Each Dependent Variable by Cohort

Dependent variable	Cohorts	N	Mean	SD	SE
PICO	U1	15	1.73	1.83	.361
	QY	20	4.40	.75	.312
	U3	18	4.50	.71	.329
	OT	9	2.11	2.42	.466
	Total	62	3.45	1.86	
Searching	U1	15	1.13	.99	.340
	QY	20	4.60	1.57	.294
	U3	18	3.28	.89	.310
	OT	9	2.44	1.81	.438
	Total	62	3.06	1.85	
Appraisal	U1	15	1.87	.92	.336
	QY	20	2.45	1.10	.291
	U3	18	3.00	1.64	.307
	OT	9	2.78	1.48	.434
	Total	62	2.52	1.34	
Decision-making	U1	15	1.67	1.11	.265
	QY	20	1.65	1.04	.229
	U3	18	1.72	.83	.242
	OT	9	2.22	1.20	.342
	Total	62	1.76	1.02	
Re-evaluation	U1	15	3.13	1.51	.435
	QY	20	3.60	1.76	.377
	U3	18	4.00	1.57	.397
	OT	9	4.44	2.01	.562
	Total	62	3.73	1.70	

Tests of Normality and Homogeneity of Variance

The Levene's test was used to assess homogeneity of variance. Equality of variance was confirmed between the four cohorts on all dependent variables except for PICO (Levene's statistic=13.335, df =3, $p < 0.001$). Results for the tests of normality using the Kolmogorov-Smirnov and Shapiro-Wilk tests are presented in Table 12 and show that data on all dependent variables did not follow a normal distribution.

Table 12

Tests of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
Dependant variable	Levene's Statistic	df	Sig. *	Levene's Statistic	Df	Sig.*
PICO	.245	62	< 0.001	.833	62	< 0.001
Search	.129	62	.012	.947	62	.01
Appraisal	.263	62	< 0.001	.896	62	< 0.001
Decision-making	.225	62	< 0.001	.882	62	< 0.001
Re-evaluation	.210	62	< 0.001	.915	62	< 0.001

*P value < 0.05: reject the null hypothesis that samples are from a normally distributed population.

Table 13 shows the Kruskal-Wallis mean ranks for each cohort on the five dependent variables. The U1 cohort had the lowest mean rank on all dependent variables except for decision-making, indicating that decisions of learners with the least academic and clinical experience were the least compatible with those in the reference model. The U3 and QY students' decisions approximated the ones depicted in the model the most for the first three steps of EBP with mean ranks highest for U3 on 'PICO' and 'appraisal' and mean rank highest for QY on searching. In the final two steps of the EBP process (dependent variables

'decision-making' and 're-evaluation'), the OT cohort surpassed all student groups indicating that their decisions approximated the reference model the most. Overall, these ranks indicate that novice learners' (U1) EBP decisions were the least compatible with those illustrated in the model whereas the OT group with clinical experience, ranked the highest on the experiential aspects of the EBP reference model (decision-making and re-evaluation).

Table 13

Descriptive Statistics Kruskal–Wallis One-Way Analysis of Variance by Ranks

Dependent variable	Cohorts	N	Mean rank
PICO	OT	9	18.78
	QY	20	40.23
	U1	15	15.97
	U3	18	41.11
	Total	62	
Searching	OT	9	26.06
	QY	20	46.40
	U1	15	12.37
	U3	18	33.61
	Total	62	
Appraisal	OT	9	34.28
	QY	20	32.35
	U1	15	22.97
	U3	18	36.28
	Total	62	
Decision-making	OT	9	38.11
	QY	20	29.80
	U1	15	30.13
	U3	18	31.22
	Total	62	
Re-evaluation	OT	9	38.06
	QY	20	29.98
	U1	15	24.43
	U3	18	35.81
	Total	62	

Table 14 indicates that the Kruskal-Wallis test revealed statistically significant differences between the four cohorts on the dependent variable PICO, H=27.078, 3 d.f., P < 0.001 and the dependent variable searching, H=32.476, 3 d.f., P < 0.001.

Table 14

Kruskal-Wallis Test Statistic

	PICO	Searching	Appraisal	Decision-making	Re-evaluation
Chi-Square	27.078	32.476	5.381	1.641	4.903
df	3	3	3	3	3
Asymp. Sig.	< 0.001	< 0.001	.146	.650	.179

The results of the Mann-Whitney test conducted on all possible pairwise comparisons for the dependent variable 'PICO' and 'searching' are presented in Table 15. Using the Bonferroni method for controlling Type I error rates for multiple comparisons, each pairwise comparison was tested at the .008 level. Statistically significant differences were found between QY and U1 (*U*= 31.0, r = < 0.001) and QY and OT on the "PICO" variable. Also significant were the differences between U3 and both the OT and U1 groups on the "PICO" variable (U3-OT: *U*=24.0, r=0.002; U3-U1: *U*= 24.5, r= <0.001). For the dependent variable "searching", statistically significant differences were found between the QY and the three other groups (QY-U1: *U*=13.0, r=<0.001; QY-U3: *U*=74.5, r=0.001; QY-OT: U=34.5, r=0.001) and between U3 and U1, (U=17.5, r <0.001).

Table 15

Pairwise Comparisons Using Mann-Whitney Tests

Variable	Test	Mean rank	N	Mann-Whitney U	Sig. [2*(1-tailed Sig.)] $p < 0.008$
PICO	OT	12.89	24	64.000	0.86
	U1	12.27			
	OT	8.22	29	29.000	0.003 *
	QY	18.05			
	OT	7.67	27	24.000	0.002*
	U3	17.17			
	QY	23.95	35	31.000	<0.001*
	U1	10.07			
	QY	19.23	38	174.5	0.87
	U3	19.81			
	U3	23.14	33	24.500	<0.001*
	U1	9.63			
Searching	OT	16.11	24	35.000	0.06
	U1	10.33			
	OT	8.83	29	34.500	0.007*
	QY	17.17			
	OT	11.11	27	55.000	0.19
	U3	15.44			
	QY	24.85	35	13.000	<0.001*
	U1	8.87			
	QY	24.78	38	74.500	0.001*
	U3	13.64			
	U3	23.53	33	17.500	<0.001*
	U1	9.17			

*significant at the Bonferroni corrected alpha level of 0.008.

Discussion

This study aimed to compare EBP behaviours of OT students in three different academic levels in a professional Master's program and experienced clinicians as applied to a simulated written case in the area of falls prevention. In order to obtain a step by step representation of the differences between the four cohorts and establish the extent to which participants' decisions corresponded to the decisions depicted in the EBP reference model generated in an earlier study (Thomas et al., 2011), three systematic analyses were conducted: an analysis of responses to an open-ended question regarding the benefit of a fall prevention program for a client with a history of falls, an analysis of EBP behaviours that did not correspond to any of the reference model categories and a quantitative examination of group differences on the five EBP steps using descriptive and non-parametric statistical procedures.

Only a few participants (7/62) reported EBP-related concepts in response to the question regarding the added benefit of a fall prevention program for the client in the vignette. Given the explicit instruction on EBP within the OT program with repeated examples of clinical situations that call for best practice and application of EBP in assignments (Table 2), it was surprising that only five students (one U3 and four QY) mentioned EBP concepts. There was a similar pattern of responses in the OT clinician group. Only one of the nine OTs reported EBP concepts, even though clinicians' self-reported participation in fall prevention continuing education activities should have resulted in greater emphasis on practices that are based on current scientific evidence. This finding is

consistent with the literature on the limited use of best practices in rehabilitation professionals (Cameron et al., 2005; Salls et al., 2009; Korner-Bitensky et al., 2006; Philibert et al., 2003) as well as with the findings by Thomas et al. (2011) who found that experienced clinicians seldom based their recommendations on research evidence. Indeed, experienced OTs in the Thomas et al. (2011) study as well as in the present study, failed to spontaneously report and apply EBP concepts even when a clinical scenario called for consultation of the scientific literature. It appears that in the absence of a process that scaffolds (Collins, Brown & Newman, 1989; Collins, Brown & Holum, 1991) both students and clinicians through the EBP process, neither group spontaneously addresses aspects of EBP nor do they engage in the EBP process.

There was a large number of participant responses that did not correspond to the reference model categories (almost 50%) and of those, 84% were from student participants. Given that students have explicit instruction on EBP concepts throughout the program, it was not surprising that some of their responses would not be represented in the model; however this large number was unforeseen. Although no definite conclusions can be drawn from these data without additional research, there may be two possible explanations for this finding: 1) students, particularly in U3 and QY, appear to be demonstrating greater knowledge in formulating PICO questions and searching the literature probably as a result of formal instruction on these aspects of EBP. This knowledge could therefore be manifested in a greater number of concepts which would not have been identified by the expert clinicians who generated the

reference model (Thomas et al., 2011); 2) consistent with research on expert-novice differences (Bransford, Brown & Cocking, 2000; Chi, Feltovich & Glaser, 1981; Ericsson & Smith, 1991; Lesgold, et al., 1988), students' formal knowledge of EBP concepts may be poorly organized, which results in long and elaborate lists of elements with few conceptual connections. Students appear to be retrieving their knowledge of PICO and searching principles, but they fall short in articulating this knowledge in a synthesized and structured manner. In addition, with the exception of the U3 cohort, at their stage, students would have had few opportunities to interact with real clients in order to apply their decision-making skills. As a result, the extensive lists of clinical decisions (steps 4 and 5) may reflect limited exposure to authentic clinical cases and poorly synthesized theoretical and experiential knowledge.

Group comparisons of EBP behaviors across all five steps revealed significant differences only on 'PICO' and 'searching the literature'. On both these steps, U3 and QY students outperformed the U1 and OT cohorts. Of the four cohorts, the U3 and QY students are the only two groups to have received explicit instruction on formulating a PICO question and searching for scientific evidence. These aspects of EBP are covered in lectures and are reinforced further in several assignments and examinations (Table 2). The OT cohort's performance on 'PICO' and 'searching' is not surprising. Thomas et al. (2011) found that expert clinicians fell short in clearly articulating a clinical question, and searching for and appraising the literature. Furthermore, clinicians' actual and perceived competence in these aspects of EBP have been associated with a lack of formal

instruction (Bennett et al., 2003; Dubouloz et al., 1999; Salbach et al., 2007; Teasell et al., 2008; Tse et al., 2004) as well as with the recency of exposure to EBP during university training (Korner-Bitensky, Desrosiers & Rochette, 2008; Menon-Nair, Korner-Bitenski & Ogoutsova, 2007). The average number of years since graduation from OT in the clinician group was 23, which takes this sample back to a period where EBP was not part of OT professional education. Interestingly, however, the sample of OTs in this study included two clinicians with Master's degrees. Research master's degrees typically require that students learn about and apply searching skills in the context of a literature review for the thesis. It would be reasonable to expect that the process would have been integrated in their normal approach and would have in turn been manifested in performing this (searching) task. This, however, was not the case.

A closer look at the student data only revealed group differences in steps 1 (PICO) and 2 (searching) that are not entirely consistent with the current level of EBP instruction in the OT program at this university. U3 students had benefitted from two years of coursework with EBP concepts covered in most required courses. In addition, this group had received explicit instruction on PICO question formulation and literature searching with an expert librarian just a few weeks prior to data collection. This advanced group of students should have outperformed all other student groups on both these EBP steps. Although the U3 cohort performed significantly better than the U1 cohort on both steps, group differences between QY and U3 were unexpected. In fact, the difference between U3 and QY (in favor of U3) for PICO was not statistically significant and the

difference between these two cohorts for searching the literature was statistically significant in favor of the QY group. The data do not provide any evidence for why the QY group outperformed the advanced group of students on this step. Still, the question remains, whether QY students' prior academic backgrounds could have influenced their performance on 'searching for literature'. All QY students had a previous university degree compared to 4% (2/56) of the U3 cohort. Although effects of background knowledge on performance of EBP tasks were not tested in this study, it can only be speculated that previous university coursework could have promoted the development of a skill set that supports performance on EBP skills such as searching for scientific literature (Bransford, et al., 2000; Chi et al., 1981; Ericsson, 1996; Ericsson & Smith, 1991; Lesgold et al., 1988).

Group differences in steps 3, 4 and 5 were not statistically significant and as such, no definite conclusions can be drawn from this data set. The mean ranks on these three steps offer only a preliminary explanation of a possible trend that requires further exploration. U1 students had the lowest number of responses that were consistent with the reference model, which is not surprising given the lack of clinical experience and exposure to the EBP process so far in this group's education. In step 3, (appraising the literature), group performances (mean ranks: U3 > OT > QY) were inconsistent with OT instruction on critical appraisal (QY students should have outperformed clinicians), as well as with research which has shown that clinicians have limited knowledge and skill in critical appraisal (Bennett et al., 2003; Dubouloz et al., 1999; Salbach et al., 2007; Teasell et al.,

2008; Tse et al., 2004; Welch & Dawson, 2006). Although results from the Thomas et al. (2011) study showed variation in experts' knowledge of critical appraisal concepts, it is possible that the graduate level training of two of the nine participating OTs in the present study could have increased the group average scores relative to the model for this EBP step**.** As for the final two EBP steps (decision-making and re-evaluation), again, additional exploration of the observed groups performances (mean ranks: OT >U3 >U1>QY and OT>U3 >QY>U1) is necessary before any conclusions can be drawn. The results provide only initial support for clinical experience as a basis for expert decision-making. Experienced clinicians' decisions on these two aspects EBP, which may be a function of clinical experience in falls prevention, approximated the decisions depicted in the reference model the most.

Of the three student cohorts, U3 students' decisions resembled those in the model the most. The U3 cohort had the most exposure to OT theory and practice and was the only student group to have had OT clinical experience (600 hours of fieldwork). At the end of the required 1000 hours of fieldwork, students are expected to demonstrate entry-level clinical competencies, notably in the evaluation and treatment of selected populations of clients. Fieldwork placements seek to provide increasingly complex opportunities for authentic and situated learning (Lave & Wenger, 1990), which are consistent with the student's progressive acquisition of knowledge, problem solving and professional development. Fieldwork placements in the OT program are designed to reinforce application of knowledge and promote the development of analytical and

conceptual thinking, judgement, decision-making, problem solving and reasoning that is based on evidence (Miller, Bossers, Polatajko & Hartley, 2001). These skills are necessary for the 'scholarly practitioner' role (Profile of Occupational Therapy Practice in Canada, 2007). During their fieldwork placements, students are expected to make numerous clinical decisions. Given that fieldwork placements add to students' clinical experience in OT and that they promote clinical-decision making skills, one wonders whether the U3 students' fieldwork experiences could have contributed to a set of decision-making skills which were applied to address the problems of the client depicted in the vignette. The data from this study do not allow for any conclusions regarding the relationship between fieldwork and EBP competencies, however, given that fieldwork experiences represent a substantial component of OT education, their role in shaping EBP competencies must be pursued in future studies.

The results from this study point to a possible trajectory of EBP competency development. EBP competencies may begin to develop in the OT curriculum where there is systematic instruction on how to articulate a clinical (PICO) question and then search for and appraise the literature. Through various instructional activities that are incorporated at different points in time in the OT program, students are beginning to develop the knowledge and skill to proceed through these first three steps of the EBP process. The move towards competence in integrating the scientific evidence for decision-making and the evaluation of the EBP outcomes may be primarily a function of clinical experience and repeated exposure and practice with clients in a given OT clinical domain (Ericsson,

Krampe & Tesch-Romer, 1993; Ericsson, 1998, 2001, 2004). Fieldwork experiences may be contributing to the knowledge and skills needed in these final two steps of the EBP process however this relationship needs further exploration.

Summary of Contributions

This study is the first to systematically examine the differences in EBP behaviors of individuals along the continuum of OT education. The study contributes to knowledge in both OT and educational psychology research and has curricular applications as well as theoretical implications.

This study has provided initial support for OT students gaining EBP knowledge and skill in the first three EBP steps as they progress through the program but that competence in the final two steps of the process is likely a function of experience and sustained practice in a specific clinical area. Additional empirical research is required in order to clarify a possible trajectory. In the meantime, and in an effort to assist students in moving along a path of developing competence in EBP, the OT curriculum should be designed such that it facilitates incremental acquisition of knowledge and skills across the academic years. Specifically, the OT program can have an impact on promoting EBP competencies in the first three steps of the process which may be associated with direct instruction. There may be limits to the extent to which the OT classroom primarily lecture-based curriculum can affect EBP competency development across all steps of the process. Nevertheless, OT programs should not focus only on the first three steps of the EBP process thereby neglecting the decision-making and re-evaluation aspects of EBP. Instead, the OT curriculum should be designed

such that it exposes learners to the core competencies involved in these two final steps through effective and evidence-based teaching methodologies so that the 5-step process is continuous and seen as a whole. In successfully teaching all aspects of EBP, promoting the desired competencies as well as fostering positive attitudes towards EBP, OT programs can contribute to the development of a new generation of evidenced-based clinicians, who will provide future students with learning opportunities that are more consistent with EBP.

Findings from this study have potential implications for the admissions of QY students to the OT program at this university. QY students demonstrate knowledge and skill in some aspects of EBP despite limited OT instruction in this area. This suggests that they may be coming into the program with a skill set that facilitates acquisition of EBP knowledge, positively affects performance on some EBP tasks and even distinguishes this group from more advanced OT students. While further research on candidates applying into the QY stream is needed, the findings from this study provide initial support for this entry point into the OT program.

Results from this study have implications for educational psychology research. Findings support current research trends in expertise that attempt to identify trajectories of leaning and developing expertise in dynamic, every day authentic settings such as the one in this study. This body of research can improve the knowledge base of how expertise develops in specific domains and eventually support curriculum designers and instructors as they plan and implement instructional activities that can help learners move towards specific learning

targets. This study also adds to the body of expertise research literature by suggesting that ill-defined problems such as the clinical vignette and complex tasks such as the EBP questions, can offer useful insights into learners' knowledge and skill in complex domains. Finally, this study contributes to expertise research in general and in the professions in particular, by suggesting that clinical experience and sustained practice most likely with feedback from knowledgeable OT instructors in an area such as falls prevention, are likely necessary conditions for achieving superior levels of performance in this domain.

Study Limitations

There are five main limitations in this study. First, although sample sizes were adequate for the type of analyses that were conducted, they were nonetheless small to produce large effects and as such, could have increased the likelihood of a Type II error. However, obtaining larger samples would have necessitated recruitment of participants from other OT programs which would have introduced several confounding variables such as type and quantity of EBP instruction, differences in student cohorts and variations in practice environments due to geographical differences and client demographics. Second, the sampling frame introduced a limitation on two levels: 1) The QY group is not truly representative of learners in the middle of the OT educational process. While students in the third year of the four and one half years professional Master's program would have been a better representation of this level of learners, there were no students yet in that cohort when the data were collected. 2) The U3 students recruited to represent learners at the end of the OT program were from the B.Sc. OT, a

program with a slightly different curriculum that is no longer being offered. The addition of this cohort offers only a historical baseline reference without any real advantages to the current situation. Third, data sources (questions 3 through 7) were slightly modified to allow participants to complete the tasks within the allotted time. These tasks represented slight variations in the actual actions taken within each of these steps in authentic environments. Fourth, participants had only two hours to answer the questions. While this may represent a short period of time to go through the EBP process, it does reflect the time pressures within which many busy clinicians work. Fifth, using the reference model as the desired comparison point presents an important limitation. Even though the behaviours depicted in the model are gleaned from reportedly experienced and respected clinicians, most model decisions across the five steps were not consistent with all aspects of EBP. Hence, participants' behaviours in this study were compared to experts' decisions rather than experts' EBP decisions. Nonetheless, in the absence of individuals identified as expert evidence-based practitioners, this is the best proxy model.

Directions for Future Research

This study is the first to examine the developing trajectory of EBP competency development in OT and as such, has opened the door to several possibilities for future research. Two main research avenues can be pursued. The first builds on the study described in this paper. The second is broader in scale and scope. There are potentially seven promising directions for future research that extend from this study. First, given that additional empirical research is required to clarify a possible trajectory of EBP competency development, it would be worthwhile to replicate the study with all student cohorts from the current Master's program (U1, U2, U3, M1 and M2) at this university at specific times in each academic year. Second, longitudinal explorations of professional Master's entry-level graduates' EBP knowledge, skills, attitudes and behaviours could determine whether new generations of OTs' practices are more consistent with EBP. Third, an in-depth qualitative analysis of additional concepts that did not correspond to any of the reference model categories could be conducted. This analysis could determine what additional aspects of EBP are identified by the different cohorts and whether newly emerging categories are consistent with the level of EBP instruction in the OT program. Fourth, additional studies are needed before focusing on a validation of the revised reference model from additional categories of concepts generated by the participants in this study (as per previous area of future study) and with mixed groups of expert practitioners and academics with recognized expertise in EBP. Fifth, the methodology in this study could be used with other OT programs in order to investigate national trends in EBP

competency development from samples of students in other Canadian OT programs. Sixth, research on EBP competency development will need to also target the role of fieldwork education and fieldwork preceptors in shaping EBP knowledge and skills. Seventh, to bridge the research-practice gap and improve clinical outcomes, more research on the most effective strategies for supporting practicing clinicians in embracing and applying EBP principles is needed. This research should be conducted in collaboration with knowledge translation studies.

The second avenue for research will depend upon researchers working collectively to address two serious limitations that have plagued many EBP studies in the professions: studies of EBP competencies at single points in time and the use of artificial tasks for measuring EBP competencies. With respect to the former, EBP competency development should be systematically studied at key points throughout the OT curriculum in order to obtain a comprehensive description of learners' competencies along the educational continuum. As for the latter, it is imperative that future research take place within authentic settings where students and novice clinicians will be expected to proceed through the EBP process in real time, using clients with real clinical problems for which an EBP approach is needed.

Appendix A: Performance Expectations and Key Competencies for 'Scholarly Practitioner' and 'Expert in Enabling Occupation' Roles (Canadian Association of Occupational Therapists- 2007)

Role definition	Performance Expectations for "Competent" Occupational Therapy Practice- Key competencies	Performance Expectations for "Proficient" Occupational Therapy Practice-Key competencies
Scholarly practitioner Occupational therapists ***base their work on the best evidence from research***, best practices, and experiential knowledge. Practitioners evaluate the effectiveness, efficiency, and cost-effectiveness of client services and programs. Occupational therapists engage in a lifelong pursuit to continuously maintain and build personal expertise. There is commitment to facilitate learning and contribute to the creation, dissemination, application, and translation of knowledge.	1. Maintain and enhance personal competence through ongoing learning. ***2. Critically evaluate information to support client, service, and practice decisions.*** 3. Facilitate the learning of clients, the team, and others.	1. Maintain and enhance personal competence through ongoing learning in a thorough and systematic manner. 2. Design or implement systems to support practitioner competency and ongoing professional development/continuing education. ***3. Critically evaluate information to support client, service, and practice decisions with ease and efficiency.*** ***4. Support the use of best evidence, and the distribution and translation of new knowledge into occupational therapy practice.*** 5. Facilitate the learning of clients, including organizations and populations.
Expert in enabling occupation Occupational therapists ***use***	1. Function effectively as a client-centered expert in occupation, occupational	1. Function effectively as a client-centered expert in occupation, occupational performance, and

evidence-based processes that focus on a client's occupations— including self-care, productive pursuits, and leisure—as a medium for action and outcome. Clients include individuals, families, groups, communities, populations, or organizations.	performance, and occupational engagement. 2. Recognize the limits of personal expertise. 3. Perform a complete and appropriate assessment of occupational performance. 4. Apply core expertise and professional reasoning. 5. ***Synthesize assessment findings and reasoning to develop a targeted action plan***. 6. Demonstrate skilled and selective use of occupation and interventions to enable occupation.	occupational engagement, including in system and population-related situations. 2. Perform a complete and appropriate assessment of occupational performance, including in complex situations. 3. Demonstrate innovation and professional reasoning. ***4. Synthesize assessment findings and reasoning to develop a targeted action plan, including in complex situations.*** 5. Demonstrate skilled and selective use of occupation and interventions with organizations and populations. 6. Recognize the limits of personal and team member expertise.

Appendix B - Certificate of Ethical Approval

McGill

Faculty of Medicine
3655, Promenade Sir William Osler
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Faculté de médecine
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September 17, 2008

Ms. Aliki Thomas
Department of Educational and Counseling Psychology
Faculty of Education
and School of Physical and Occupational Therapy
McGill University
3654 Promenade Sir William Osler
Montreal, Quebec H3G 1Y5

Dear Ms. Thomas,

Thank you for submitting your request for IRB approval of the study proposal entitled "Comparison of evidence based practice behaviors on a simulated case among occupational therapy students and expert clinicians"

As this study involves no more than minimal risk, and in accordance with Article 1.6 of the Canadian Tri-Council Policy Statement of Ethical Conduct for Research Involving Humans and U.S. Title 45 CFR 46, Section 110 (b), paragraph (1), we are pleased to inform you that approval for the study and study instruments (September 2008) and focus group, students and clinicians consent forms (September 2008) was provided via an expedited review by the Chair on September 17, 2008 valid until **September 2009.** The study proposal will be presented for corroborative approval at the next meeting of the Committee and a certification document will be issued to you at that time.

A review of all research involving human subjects is required on an annual basis in accord with the date of initial approval. The annual review should be submitted at least one month before **September 2009**. Should any modification to the study occur over the next twelve months, please advise IRB appropriately.

Yours sincerely,

Serge Gauthier, M.D.
Chair
Institutional Review Board

cc: A09-E35-08B

Appendix C: Consent Forms

Student participant consent form

This study entitled "Differences between Occupational therapy students and expert clinicians in treatment planning" is conducted in the context of a doctoral degree. In this study we are looking at how students work through a clinical vignette in order to develop an Occupational Therapy (OT) plan that is suitable for a geriatric patient with a history of falls. The information obtained from this study can help us understand how students problem solve when they are faced with a clinical scenario and how they come to develop an intervention plan for this type of patient.

The purpose of the study is to examine how O.T. students from different academic levels perform on a clinical vignette and how this performance is similar or different to the performance of more experienced clinicians. If you decide to participate in this study this is what will happen:

- In mid-November you will be asked to come to a computer lab outside of class time where you will be working with WebCT. A research assistant will be there to greet you and provide the instructions you need to begin the task.
- You will be initially asked to provide some information about yourself such as year of study in the program and whether you have any previous degrees.
- Once you are comfortable with the instructions you will log on to WebCT where you will be presented with a clinical vignette of an elderly patient.
- You will be asked to provide information on what you would do with such a client and identify the process you would use to plan a treatment.
- Completing the task should take about 2 hours.
- Your responses will be recorded on WebCT.
- All the information provided on WebCT will be collected in order to analyze the results.
- You will be invited to the presentation of the final results of the research which, should be held at the school in the fall of 2009.

There are no risks to you associated with participating in this study. There are no direct benefits to you as a participant. There are potential benefits for the teaching of OT as this study can close the gap between what we know about teaching and clinical practice.

Participation in this study is voluntary. Your decision whether to participate or not will not affect your grades, fieldwork performance, academic standing or your relationship with any of your professors, other faculty or staff members in the program. You will be free to withdraw your consent and discontinue participation at any time without penalty and your data will not be used in the study. All the information obtained in connection with this study will remain confidential and will be disclosed in aggregate form and with your permission only. The data you provide will be coded using a number for identification and your identity will only be known to the principal investigator of the study. The data will only be locked in a filing cabinet in the principal

investigator's office.

In order to thank all participants for their contribution to the study an Ipod will be raffled off at the end of the study. All those having consented and participated in the study will be eligible to win.

By participating in this study, you are contributing to important research on the process involved when students and expert clinicians plan treatments for clients. This information may be useful for curriculum planners who wish to develop curricula that help students acquire the necessary knowledge and skills for clinical practice. If professors have a better understanding of how students think through and problem solve with clinical cases then they can improve teaching practices and better prepare students for clinical practice. Your signature indicates that you read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent and discontinue participation at any time without penalty and that once this form is signed a copy will be made and given to you.

If you have any questions please do not hesitate to e-mail Dr Alenoush Saroyan, advisor for this doctoral study at alenoush.saroyan@mcgill.ca.

The study has been explained to me and my questions have been answered to my satisfaction. I agree to participate in this study.

Name: _____

Signature: _____

Date: _____

Appendix C (a): Consent Forms
Clinician participant consent form

My name is Aliki Thomas and I am a faculty member from the School of Physical and Occupational Therapy at McGill University. I am also a doctoral candidate in Educational and Counselling Psychology at the faculty of Education. In the context of my doctoral program I am conducting a study entitled "Differences between Occupational therapy students and expert clinicians in treatment planning". In this study I am looking at how students work through a clinical vignette in order to develop an OT plan that is suitable for a geriatric patient with a history of falls. The information obtained from this study can help us understand how students problem solve when they are faced with a clinical scenario and how they come to develop an intervention plan for this type of patient. The purpose of the study is to examine how O.T. students from different academic levels proceed through a clinical vignette and how this performance is similar or different to the performance of more experienced clinicians. If you decide to participate in this study this is what will happen:

- In mid-November you will be asked to come to a McGill computer lab. A research assistant will be there to greet you and provide the instructions for the task at hand.
- You will be initially asked to provide some information about yourself such as year of graduation from OT, number of years of experience and whether you have other degrees.
- Once you are comfortable with the instructions you will log on to WebCT where you will be presented with a clinical vignette of an elderly patient.
- You will be asked to provide information on what you would do with such a client and identify the process you would use to plan a treatment.
- Completing the task should take about 3 hours.
- Your responses will be recorded on WebCT.
- All the information provided on WebCT will be collected in order to analyze the results.
- You will be invited to the presentation of the final results of the research which, should be held at the school of Physical and Occupational Therapy in the fall of 2009.

There are no risks to you associated with participating in this study. There are no direct benefits to you as a participant. There are potential benefits for the teaching of OT as this study can close the gap between what we know about teaching and clinical practice.

Participation in this study is voluntary. You will be free to withdraw your consent and discontinue participation at any time without penalty and your data will not be used in the study. The data you provide will be coded using a number for identification and your identity will only be known to the principal investigator of the study. All the information obtained in connection with this

study will remain confidential and will be disclosed in aggregate form. The data will be locked in a filing cabinet in the principal investigator's office and destroyed after five years.

By participating in this study, you are contributing to important research on the process involved when students and expert clinicians plan treatments for clients. This information may be useful for curriculum planners who wish to develop curricula that help students acquire the necessary knowledge and skills for clinical practice. If professors have a better understanding of how students think through and problem solve with clinical cases then they can improve teaching practices and better prepare students for clinical practice.

Your signature indicates that you have read and understood the information provided above, that you willingly agree to participate, that you may withdraw your consent and discontinue participation at any time without penalty and that once this form is signed a copy will be made and given to you.

If you have any questions please do not hesitate to contact me at 514-398-4496 or via e-mail at aliki.thomas@mcgill.ca.

The study has been explained to me and my questions have been answered to my satisfaction. I have been given a summary of the study and I agree to participate in this study.

Name: _____

Signature: _____

Date: _____

Appendix D: Clinician Demographics

Gender	Women		
Average years of experience in OT	23 (range 8-36)		
Average years of experience in geriatric OT	18 (range 4-28)		
Average years of experience in prevention of falls	17 (range 2-32)		
Previous degree	N= 4 (plus 2 in progress) • Master's in Education • Master's in Rehabilitation Sciences (OT) • Bachelor's of Arts (Psychology) • Bachelors in Urbanism and Master's in management and organizational development) (in progress) • Master's of Arts (in progress)		
Place of employment and work responsibilities	▪ Long term care	N= 2	• Clinical coordinator for 15 sites; recruitment, training and evaluation of new OTs; clinical preceptor • Clinician; training and teaching activities
	▪ Rehabilitation	N= 1	• Clinician and clinical preceptor
	▪ Community	N= 3	• Clinician, clinical preceptor, teaches fall prevention • Clinician, clinical preceptor, teaching to staff • Clinician, clinical coordinator
	▪ Acute care	N= 2	• Clinicians, clinical preceptor

	▪ Research N=1	• Clinical and Research Coordinator of Cancer Program , currently not involved in clinical OT
Work time status	Full time N= 5 Part-time N= 4	
Falls prevention experience	OT1 • Validation of "The integrated program of dynamic equilibrium" (IPDE) (program designed to prevent falls in the elderly living autonomously in the community) • Teaching IPDE program in home • Teaching IPDE volunteers OT2 • Teaching seminar on falls prevention • Participation in National program management of restraints OT3 • Teaching to elderly clients in the community • Falls risk assessment in the home OT4 • Group or individual intervention basis partly grounded in IPDE program OT5 • Involved in National falls prevention program • Implemented falls prevention program in workplace • Individual evaluation of seniors with history of falls in nursing home since 2007 OT6 • Daily intervention in long term care practice. • Development and implementation of restraint reduction and alternatives to restraints for 5 years • Education/discussion groups with day center clients OT7 • Home visit assessments and interventions regarding safety and prevention of falls OT8 • Assessment of need for restraints • Development of adaptations and alternatives to restraints Development of multidisciplinary strategies to prevent falls	

	OT9 • Routine screenings for fall risk in the geriatric clinic • Fall risk assessment in the home environment • Recommendations for safety (equipment, techniques, education on fall hazards, obstacles in the home). • Written information/handouts provided to patients/family	
Frequency of professional development activities	• 1-2 /year • 2-3/year • 3-4 /year • Several per year • Ongoing • Whenever opportunity presents itself	(n=3) (n=1) (n=1) (n=2) (n=1) (n=1)

Appendix E: Data Collection Instructions Student Participants

Dear students,
Thank you for being part of this project! I trust that you will enjoy the experience! Please complete the following information before beginning the task. Please log into WebCT under the following course number XYZ 123. Once you have entered the course, click on "course content" where you will find a clinical vignette. You have 7 tasks to complete:

Task 1: Demographics
Year of study: U1 _____ U2_____ Qualifying year _____U3 BSc OT program _ Age
between 18 and 20 years old _____
between 20 and 23 years old _____
between 23 and 25 years old _____
25 years old and older _____

Gender: Male _____ Female _____

Previous undergraduate degree

Yes _____ No _____ If yes, please provide degree title_____

Task 2: Read the vignette carefully. Mrs P. and her daughter have been informed that you are thinking of having her take part in the Fall Prevention Program. They ask you to explain how this program will be of additional benefit for her, given her exposure to Occupational and Physical Therapies on the ward. How would you respond and how would you justify your response? Then proceed by describing the process that you would usually go through when faced with such a patient.

Task 3: What is your PICO (Population, Intervention, Comparison and Outcome) question for the client depicted in the vignette?

Task 4: List the key word and sources you would use when searching for literature to answer you clinical question.

Task 5: List which article sections (abstract, methods, discussion, results, etc.) you consider most useful when appraising an article?"

Task 6: What will you recommend for this client? Describe your plan/ recommendations.

Task 7: The patient is now home 3 moths after having completed his treatment and has fallen twice since the treatment ended. The family contacts you to let you

that this has happened. What do you believe are the causes for the recurrence of falls? What will you do in this situation? What is your new plan of action?

Appendix F - Data Collection Instructions Clinician Participants

Dear clinicians,
Thank you for being part of this project! I trust that you will enjoy this experience! Please log into WebCT under the following course number XYZ 123. Once you have entered the course, click on "course content" where you will find a clinical vignette. You have 7 tasks to complete:

Task 1: Demographics
Year of graduation from OT _____
Years of experience in OT _____
Years of experience in geriatrics_____
Years of experience in falls prevention _____

Gender:
Male _____ Female _____

Have you received any degrees other than BSc. OT

Yes _____ No _____If yes, please provide degree title _____

Task 2: Read the vignette carefully. Mrs P. and her daughter have been informed that you are thinking of having her take part in the Fall Prevention Program. They ask you to explain how this program will be of additional benefit for her, given her exposure to Occupational and Physical Therapies on the ward. How would you respond and how would you justify your response? Then proceed by 1) describing the process that you would usually go through when faced with such a patient.

Task 3: What is your PICO (Population, Intervention, Comparison and Outcome) question for the client depicted in the vignette?

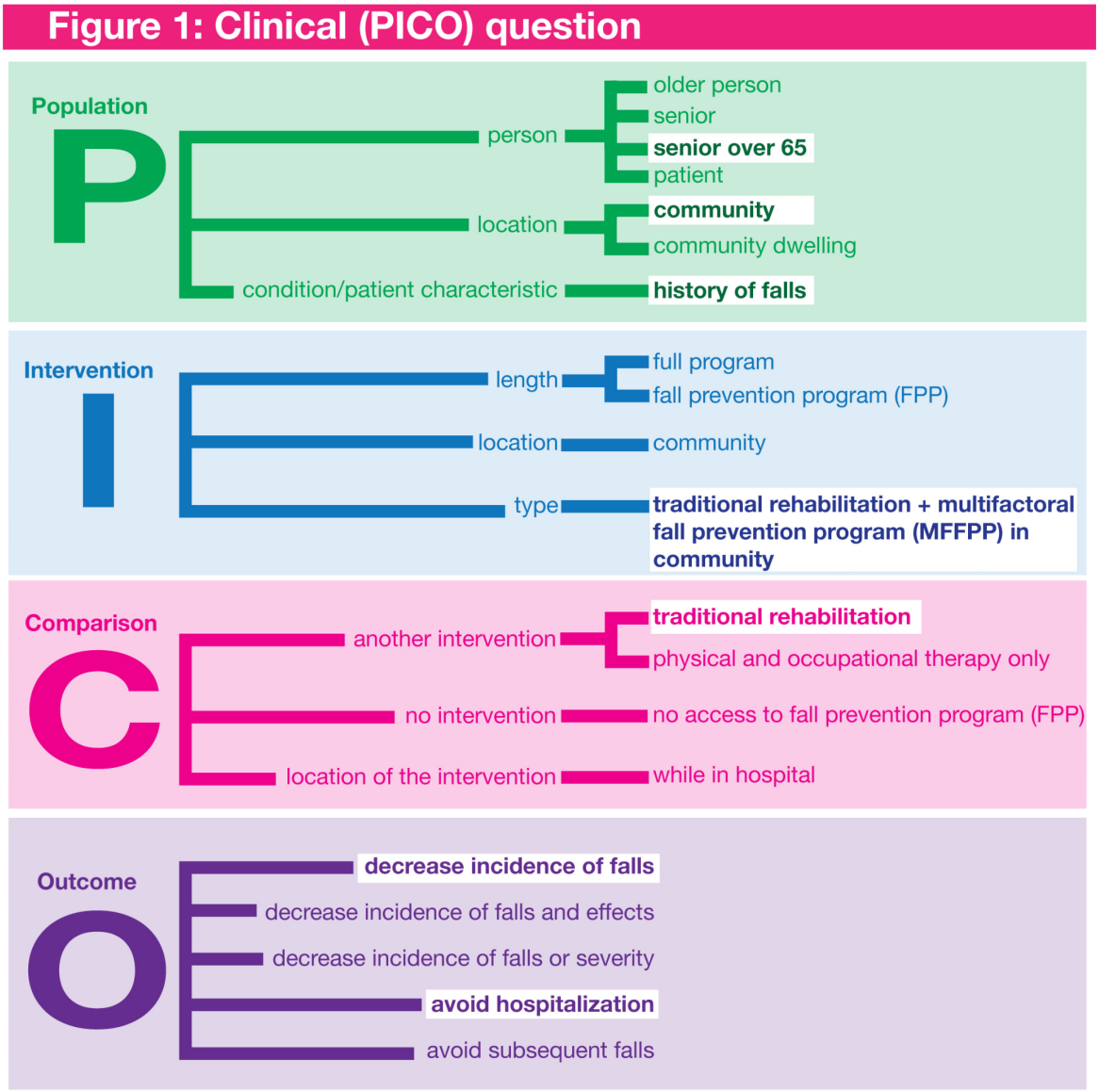
Task 4: List the key word and sources you would use when searching for literature to answer you clinical question

Task 5: List which article sections (abstract, methods, discussion, results, etc.) you consider most useful when appraising an article?"

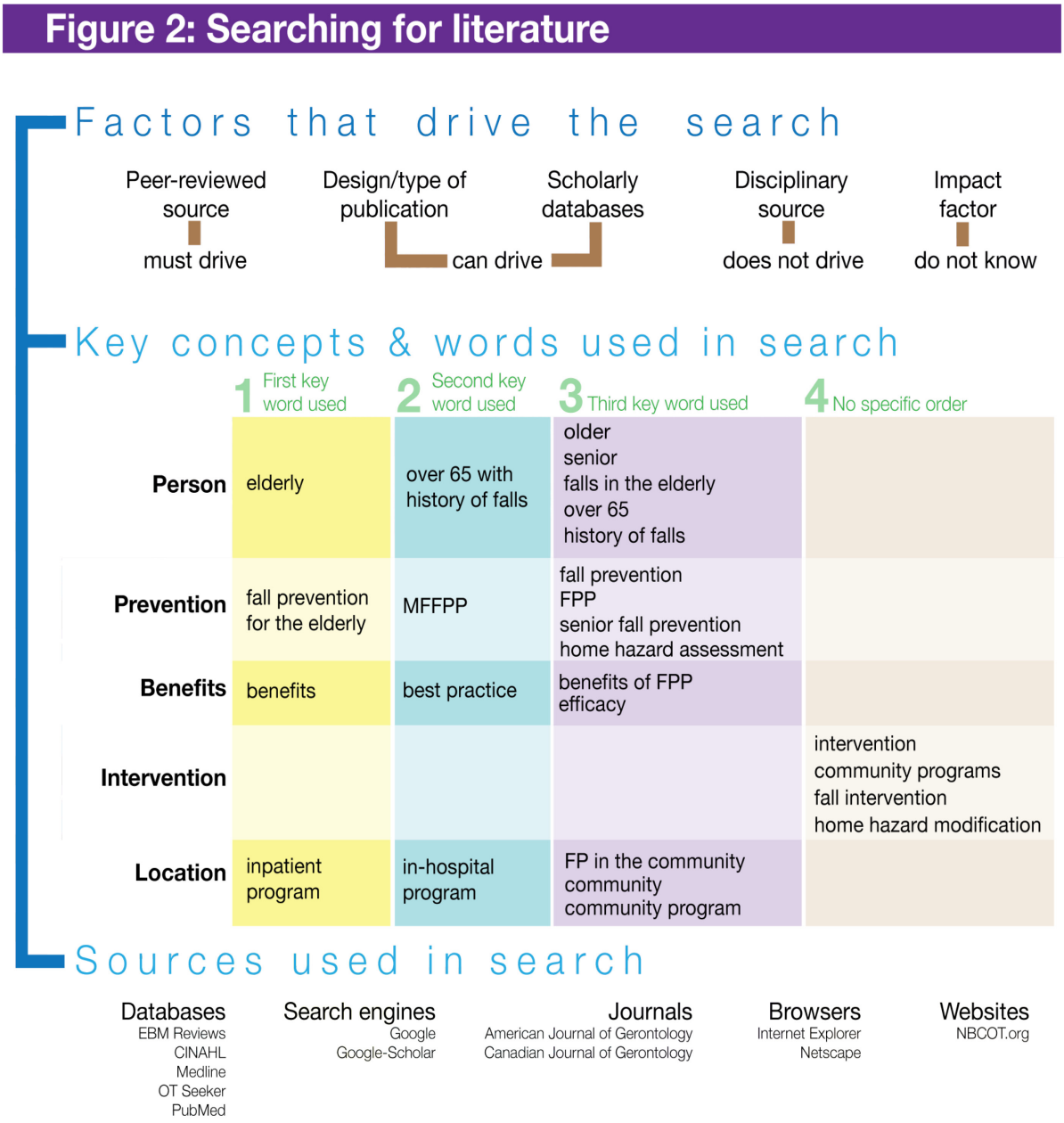
Task 6: What will you recommend for this client? Describe your plan/ recommendations.

Task 7: The patient is now home 3 months after having completed his treatment and has fallen twice since the treatment ended. The family contacts you to let you that this has happened. What do you believe are the causes for the recurrence of falls? What will you do in this situation? What is your new plan of action?

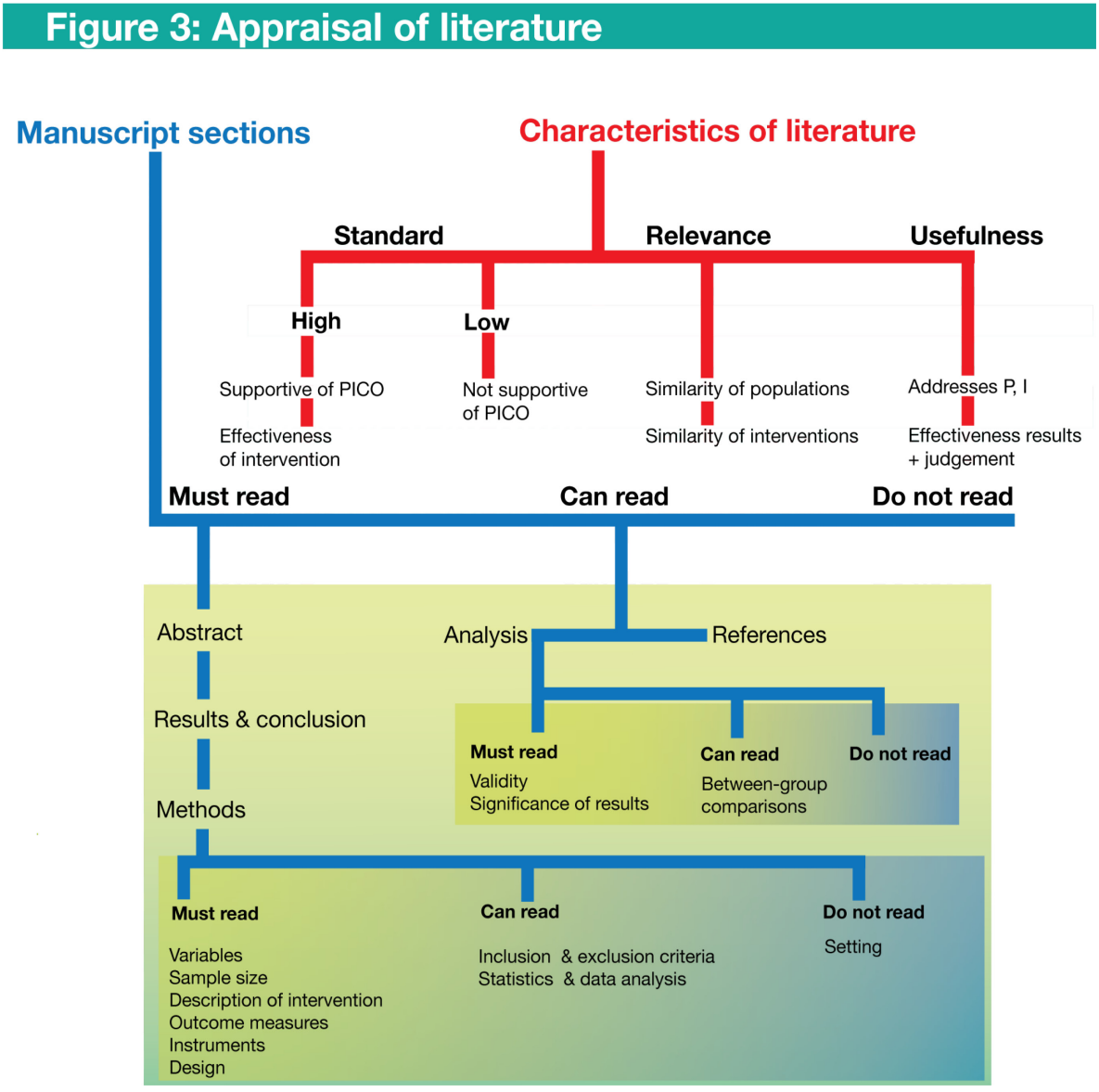
Appendix G: EBP Reference Model Step 1 PICO



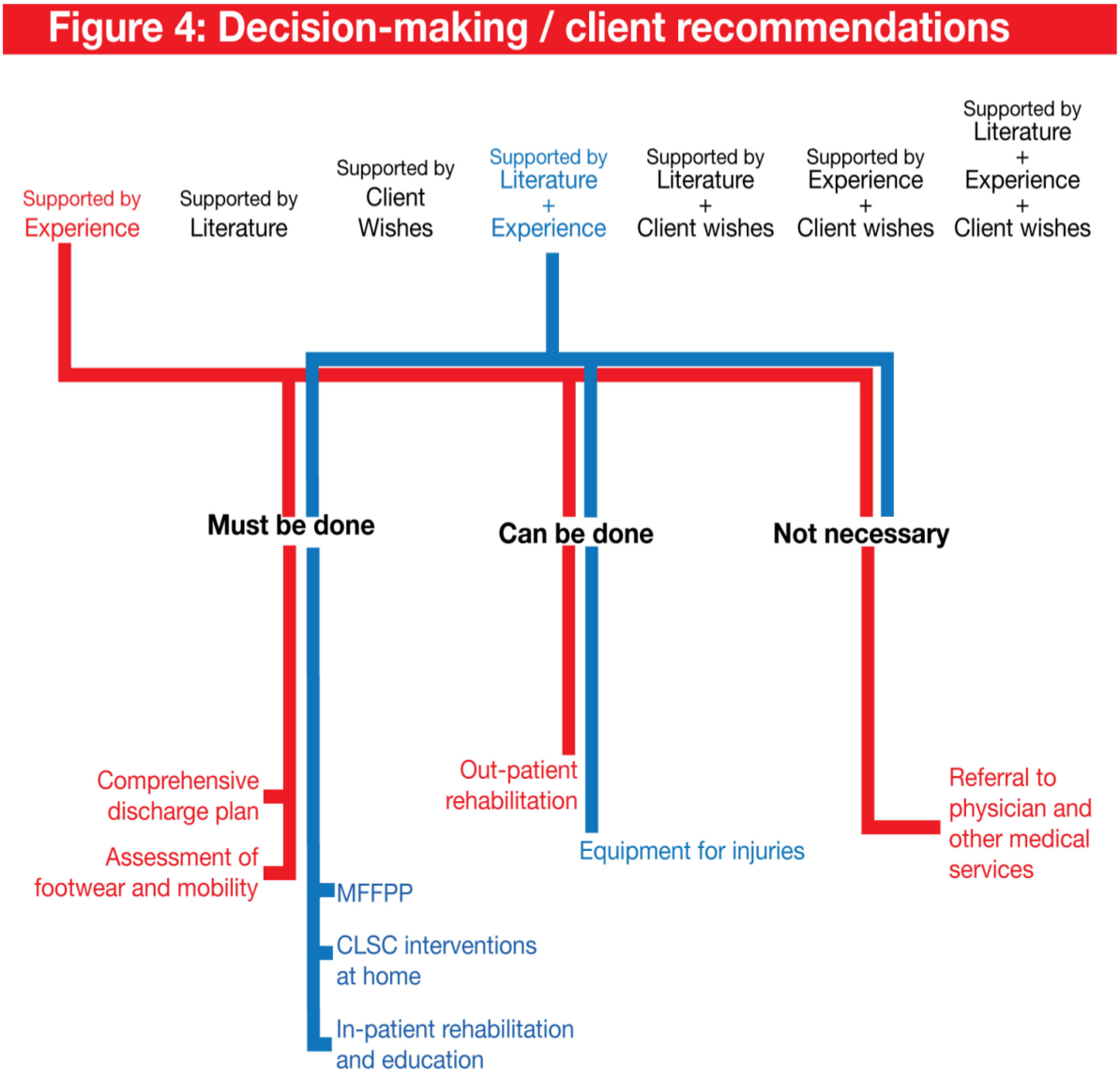
Appendix H: EBP Reference Model Step 2 Searching



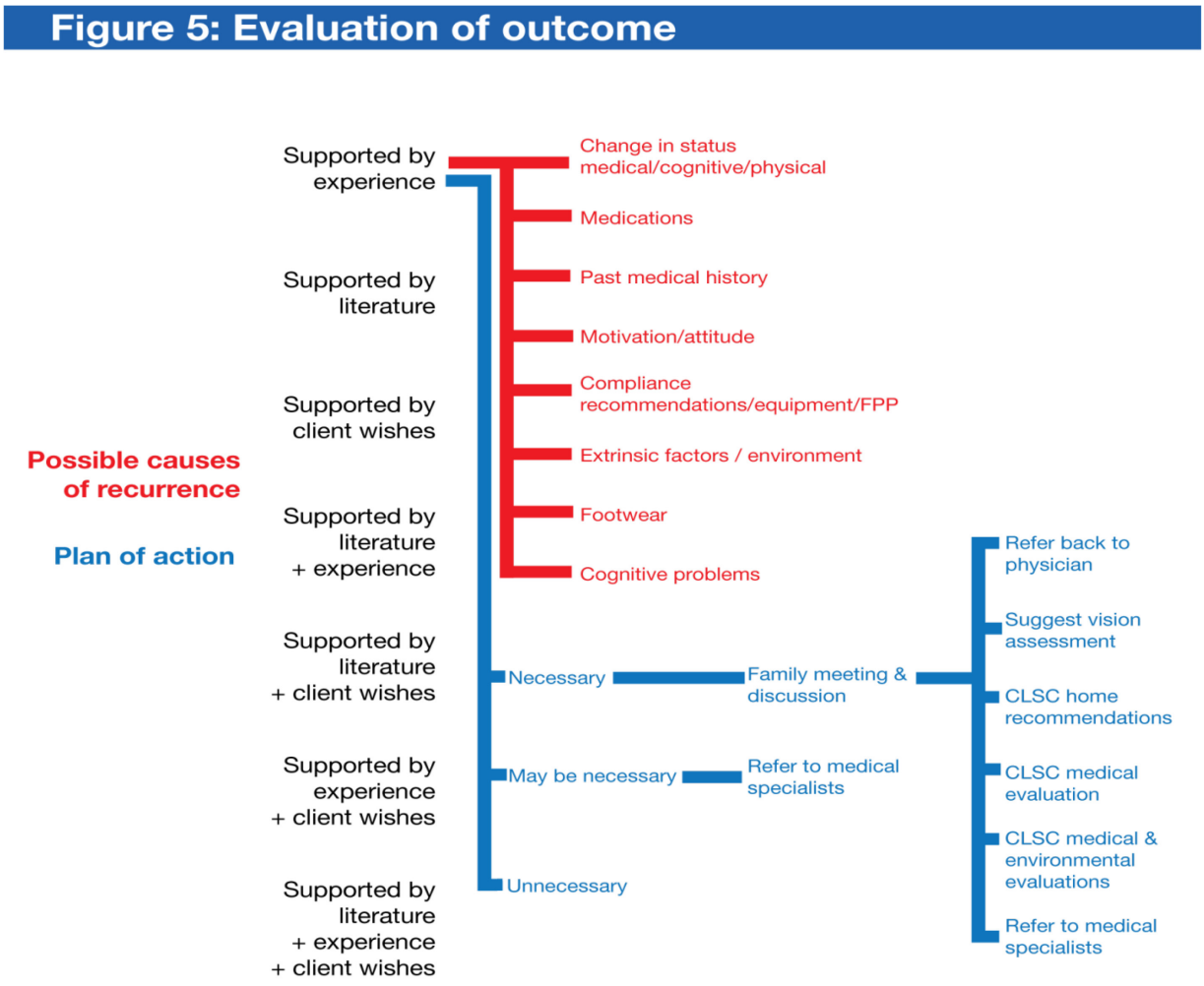
Appendix I: EBP Reference Model Step 3 Appraisal



Appendix J: EBP Reference Model Step 4 Decision-Making



Appendix K: EBP Reference Model Step 5 Re-Evaluation



Appendix L: Code Manual

Brief summary of tasks

Participants were asked to answer 5 questions that reflected the steps of the Evidence-based practice (EBP) process. Each step is assigned to a task so that Step 1 of the EBP process is Data collection Task1, Step 2 of the EBP process is data collection Task 2, etc…The highlighted text her eon page 1 is refers to the data that was collected and analyzed for this part of the study. There was more data collected, analyzed and subsequently included in the and for the model. The 5 EBP question/tasks were:

Task 1

What is your **PICO** (Population, Intervention, Comparison and Outcome) question for the client depicted in the vignette?

Task 2

Conduct a search in order to find literature that could help you answer you clinical (PICO) question. As part of your search strategy list which sources and key words you would use? Once you identify sources, which of these factors do you use to determine the value of the reference: peer-reviewed sources, type of publication and research design, type of scholarly databases, disciplinary source and impact factor. Rate each as 'must drive my search', 'can drive my search', 'does not drive my search' or 'do not know'.

Task 3

Appraise the evidence in the literature you found in relation to the client in the vignette. In critically appraising the literature for this client, list and rank, in order of importance, the sections of an article you consider most useful? (Examples of sections include: abstract, methods, discussion, results, etc.)

Task 4

What will you recommend for this client? Describe your plan/ recommendations and state which of the EBP components (research evidence, clinical experience, client wishes) informed your recommendations.

Task 5

The client has been home three months after having completed your recommended fall prevention program and has fallen twice since the treatment ended. The client's daughter has contacted you to let you know about the recent falls. Answer the following 3 questions: List the possible reasons why the client (Mrs. P.) fell again? What will you recommend in this situation? Which of the EBP components (research evidence, clinical experience, client wishes) informed your recommendations.

*******The text in black are the codes and the text in red is part of the explanations**

******* Highlighted in yellow are the categories and concepts**

STEP 1 CLINICAL (PICO) QUESTION

A PICO question has four components: the Population, the Intervention, the Comparison and the Outcome. These are recognized components of the PICO and not categories having emerged from the data

When asked to form a PICO, participants used different words/concepts for each of the components. No PICO identified

Not a PICO question

Population *The population component of the PICO has 4 categories. Person, location, condition/Patient characteristics and population person-other. This means that when thinking about the population the responses can be alluding to the person, the location where they live or will be livin , it can be alluding to a trait, characteristics or condition (medical or other) of the person or something other than these 3 categories*

person

population person-other (other words or categories that refer to the person other than older person, senior, senior over 65 and patient

older person
senior
senior over 65
patient

All synonyms

location (refer to the where the person is living or will be living at discharge or while she is taking part in the intervention)

population-location-other
community
community dwelling

condition/patient characteristic
(refer to something about the condition of the person, it can be a medical condition, a state, a character trait)

population-condition/patient characteristic-other
(anything other than a history of falls; for example what happened to the person, like the event.)
history of falls (the person has a history of falls, has had a previous fall)

Intervention *The intervention component of the PICO has 4 categories: intervention-other, length, location and type. This means that when thinking about the intervention component for which the participant is seeking evidence, the responses can be alluding to the length of the intervention, the location of the intervention or the type.*

intervention-other (other words or categories that refer to the intervention that are not about length, location or type)

length

intervention length
full program
fall prevention program

Idea of the intervention being a full program or a fall prevention program

location

intervention location-other
(in the community, in the Hospital: so a specification of where the intervention would take place)

type (intervention type-other anything other than a fall)

prevention program

traditional rehabilitation + MFFPP in community (so here the intervention refers to having a multifactoral fall prevention program (MFFPP) in addition to the regular or traditional rehab the client receives while in hospital)

Comparison *The comparison component of the PICO has 4 categories: comparison-other, another intervention, no intervention and location of the intervention. This means that when thinking about the comparison to something else, the participant is comparing the effectiveness of a fall prevention program with a) another intervention such as traditional rehab or PT and OT only); b) to no intervention at all, c)to the location of the intervention such as a fall prevention program " while in hospital"*

comparison-other

another intervention
(so that the fall prevention program is being compared to something else, to another type of intervention)

comparison-another intervention-other
(specifies which one; so says that there is a comparison for example to a a teaching session)

traditional rehabilitation
(type of rehab typically given to client who have fallen and where there is treatment for fractures or any injuries that result from the fall

PT and OT only
(refers to physio and OT treatment only)

no intervention: in vivo code

no access to FPP
(so that the fall prevention program is being compared to not having a fall prevention program)

location of the intervention

comparison-location of the intervention-other while in hospital

Outcome this is about the anticipated outcome of the intervention or the effects that it will have

outcome-other
(refers to the idea that the intervention will have an effect other than on the incidence of falls, the severity fo the injuries, etc…(the 5 outcomes below)

decrease incidence of falls
(notion of the intervention having an impact on decreasing the number of falls)

decrease incidence of falls and effects
(notion of decreasing the number of falls BUT ALSO the effect of those falls)

decrease incidence of falls or severity
(notion of decreasing the number of BUT ALSO how severe the fall is)

avoid hospitalization
(notion that the intervention will help avoid the need to hospitalize the person)

avoid subsequent falls
(notion that the intervention will help avoid any future falls altogether)

STEP 2 SEARCHING THE LITERATURE

factors that drive the search

must drive

peer-reviewed source [0]

can drive [0]

scholarly databases [0]

design/type of publication [0]

does not drive [0]

disciplinary source [0]

do not know [0]

impact factor [0]

Part of the model but not asked of the participants in this phase of the study

key words concepts and words used in search when asked to list the words that they would use to search the literature the words were divided into 5 categories that were alluding to "other", "person", "prevention", "benefits", "intervention" and "location". Within each of these 5 categories were the exact terms they would use

none identified
(used for when a participant did not list any)

don't know
(used for when a participant said they did not know)

key words-other
(other than person, prevention, benefits, intervention and location)

person

key words-person-other ----not about any of the 7 below but having to do with the person example gender

elderly
over 65 with history of falls
older
senior
falls in the elderly
over 65
history of falls

7 different words that relate to the individual for which they are scientific evidence/literature is being sought

prevention
(notion of prevention given that the program is about fall prevention)

key words-prevention-other
(not about any of the 6 below but having to do with prevention)

fall prevention for the elderly
MFFPP
fall prevention
FPP *(fall prevention program)*
senior fall prevention
home hazard assessment

6 possible interventions related to preventing falls;

benefits
(this is about what benefits or positive effect will the intervention have)

key words-benefits-other
(does not belong to any of the concepts below but has to do with notion of positive effect or benefit)

benefits
best practice
benefits of FPP
efficacy

Should be clear

intervention
(this is about how they refer to the actual intervention for which they are searching for literature)

key words-intervention-other ----key words that do not belong to any of the concepts below but have to do with the concept of intervention

intervention

community programs

fall intervention

home hazard modification

4 types of interventions

location
(where the program will take place)

key words-location-other
(key words that do not belong to any of the concepts below but have to do with the concept of location)

in-patient program
in hospital program
fall prevention in the community
community
community program

So in hospital or in the community

sources used in search
(what are the sources they would use to find their information to help them make a decision about their client)

sources used in search
(other not any of the following 5 sources: browser, databases, search engines, journals, websites)

browsers

sources used in search-browsers-other
(browser other than Netscape and explorer)
netscape
internet explorer

databases

sources used in search-databases-other (databases other than the 5 below):
EBM reviews
CINHAL
Medline
OT seeker
Pubmed

Search engines

sources used in search-search engines other-
(engines other than Google and Google scholar)
Google
Google scholar

Journals

sources used in search-journals-other journals other than these 2 below:
American Journal of Gerontology
Canadian Journal of Gerontology

websites

Sources used in search-websites-other any other websites

NBCOT.org

STEP 3 APPRAISAL OF LITERATURE [0]

****** disregard the must reads, can read and do not read; code as if they were not there. Used for model but not for students data

Incomplete

manuscript sections

must read

manuscript sections-
(other sections other than: abstract, results and conclusion, methods, analysis and references which are the 5 major categories of manuscript sections identified in the model and highlighted in green)

abstract
results and conclusion
methods

must read

manuscript sections-methods-other
(within methods there are many other subsections that are typically included such as recruitment, sampling, etc but not part of the 6 below:

variables
sample size
description of the intervention
outcome measures
instruments
design

can read

inclusion & exclusion criteria
statistics and data analysis

do not read

setting

can read

analysis

must read

manuscript sections-analysis-other
(within analysis there are many other subsections that are typically included such as P value, etc…but not listed below)

validity
significance of results

can read

between group comparisons

do not read

references

do not read

characteristics of literature participants may or may not in their responses to this question allude to any of the categories having to do with the quality, relevance or usefulness of the literature they find

Standard

high standard
Supportive of PICO
effectiveness of intervention

low standard

not supportive of PICO

Relevance
similarity of populations
similarity of interventions

Usefulness

addresses P + I
effectiveness results + clinical judgment

STEP 4 DECISION-MAKING/CLIENT RECOMMENDATIONS

*** disregard the must be done, can be done and not necessary; code as if they were not there. Used for model but not for students data

**** code as blue categories only if the participant alludes to the reason for their recommendation i.e they state that the are doing intervention X because the literature says its good, or because they know from experience or because their client want to, etc…

no recommendations
(don't offer any)

decision-making/client recommendations other
(other offer a treatment other than the 8 below highlighted in yellow)

supported by experience

must be done

1. comprehensive discharge plan
   (refers to all the planning that takes place before a client leaves the hospital)
2. assessment of footwear and mobility
   (refers to an evaluation of their shoes or of the mobility/gait/walking)

can be done

3. out-patient rehabilitation
   (refers to sending the client for more therapy but as an out-patient)

not necessary

4. referral to physician and other medical services
   (refers to sending/recommending that the client be seen/evaluated by their doctor or another professional or medical services such as eye specialist, pharmacist, etc…)

supported by literature

supported by client wishes

supported by literature and experience

must be done

5. MFFPP
   (refers to actually recommending that the client take part in the falls prevention program whether it is multifactoral or not)
6. CLSC interventions at home
   (refers to any kind of help or services or interventions from the CLSC (community resources) that the client will received at home
7. in-patient rehabilitation and education
   (refers to the actual treatment that the client is receiving as part of the rehabilitation program that she already engaged in addition to having education

   can be done

8. equipment for preventing injuries
   (any device, piece of equipment that would facilitate the independence and safety of the client)

   not necessary

supported by literature and client wishes

supported by experience and client wishes

supported by literature + experience + client wishes

STEP 5 EVALUATION OF OUTCOME

**** code something in blue categories only of the participant alludes to the reason for their recommendation i.e. they state that the are doing intervention X because they know from experience or because their client want to, etc…

****disregard the necessary, may be necessary and not necessary highlighted in green; code as if they were not there. Used for model but not for data in this study

possible causes of recurrence of falls

possible causes of recurrence-other any other reason for why the client fell again other than the 8 below

supported by experience

1. change in status: medical, cognitive or physical
   (refers to a decline in the condition, a worsening of condition, a change in the client's health status either at a medical level, cognitive level or physical level).
2. medications
   (refers to the meds being the reason for the new fall, because they made her groggy, because they were changed, because they have side effects, etc…
3. past medical history
   (refers to any of the problems, or conditions which she had before her fall)
4. motivation/attitude
   (refers to anything having to do with affective aspects of client)
5. compliance with recommendations, with equipment or with FPP
   (refers to not following through with suggestions or recommendation, not wiling to comply with what was leaned or taught in the FPP or from the therapist)
6. extrinsic factors/ environment
   (this refers to reasons that may be out of the client control, external reasons such as weather, home environments, clutter, obstacles, stairs)
7. footwear
   (her shoes don't fit properly, not comfortable, not good quality)
8. cognitive problems
   (has cognitive deficits, doesn't pay attention, don't concentrate, cant learn new info so cant apply what she learned or what was suggested *** not a new problem or old problem)

new plan of action

new plan of action-other any new plan of action other than the 9 below

supported by experience

necessary [0]

family meeting and discussion
(refers to any talk/discussion meeting with family to discuss circumstances of falls or what to do next, or to help better understand the problem)

refer back to physician
suggest vision assessment
CLSC home recommendations
CLSC medical evaluation
CLSC medical and environmental evaluations
refer to medical specialists

coded as things that would be done after the meeting or coded directly as new action

may be necessary

referral to medical specialists

not necessary

Appendix M: Frequency of Segments Coded as "other"
Step 1 PICO

		U1 (N=15)		QY (N=20)		U3 (N= 18)		OT (N=9)		
	N seg in category	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	Total N part. (%)
population-person-other	73	5 (33.3)	10 (13.7)	16 (80)	29 (39.7)	17 (94.4)	25 (34.2)	5 (55.6)	9 (12.3)	43 (69.3)
population-location-other	8	1 (6.7)	1 (12.5)	2 (10)	2 (25)	2 (11.1)	3 (37.5)	3 (33.3)	2 (25)	8 (13)
population-condition/ patient characteristic-other	56	8 (53.3)	13 (23.2)	14 (70)	16 (28.6)	15 (83.3)	19 (33.9)	4 (44.4)	8 (14.3)	41 (66.1)
intervention-other	10	4 (26.7)	1 (10)	1 (5)	8 (80)	0 (0)	0 (0)	1 (11.1)	1 (10)	6 (9.7)
intervention length-other	1	0 (0)	0 (0)	0 (0)	0 (0)	1 (5.6)	0 (0)	0 (0)	1 (100)	1 (1.6)
intervention location-other	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (11.1)	1 (100)	1 (1.6)
comparison-another intervention-other	4	1 (6.7)	1 (25)	3 (15)	3 (75)	0 (0)	0 (0)	0 (0)	0 (0)	4 (6.5)
outcome-other	33	5 (33.3)	5 (15.2)	6 (30)	7 (21.2)	8 (44.4)	10 (30.3)	4 (44.4)	11 (33.3)	23 (37.1)
Total (%)	186 (56)									

N= Number and (%) of participants within the cohort that reported concepts that were coded as "other"
N Seg.= Number and (%) of segments coded "other" from the cohort

Appendix N: Frequency of Segments Coded as "other"
Step 2 searching

		U1 (N=15)		QY (N=20)		U3 (N= 18)		OT (N=9)		
	N seg. in category	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	Total N part. (%)
sources-other	19	8 (53.3)	13 (68.4)	0 (0)	0 (0)	0 (0)	0 (0)	5 (55.6)	6 (31.6)	13 (21)
sources-databases-other	39	1 (6.7)	2 (5.1)	13 (65)	17 (43.6)	7 (38.9)	19 (48.7)	1 (11.1)	1 (2.6)	22 (35.5)
sources-journals-other	4	1 (6.7)	1 (25)	0 (0)	0 (0)	1 (5.6)	3 (75)	0 (0)	0 (0)	2 (3.2)
sources-websites-other	8	2 (13.3)	3 (37.5)	0 (0)	0 (0)	4 (22.2)	4 (50)	1 (11.1)	1 (12.5)	7 (11.3)
key words-other	34	7 (46.7)	11 (32. 3)	4 (20)	4 (11.8)	7 (38.9)	12 (35.3)	5 (55.6)	7 (20.6)	23 (37.1)
key words-person-other	91	6 (40)	20 (22)	19 (95)	32 (35.2)	14 (77.8)	25 (27.5)	7 (77.8)	14 (15.4)	46 (74.2)
key words-prevention-other	7	3 (20)	3 (42.9)	2 (10)	2 (28.6)	2 (11.1)	2 (28.6)	0 (0)	0 (0)	7 (11.3)
key words-benefits-other	1	1 (6.7)	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.6)
Key words-intervention-other	40	5 (33.3)	15 (37.5)	5 (25)	9 (22.5)	6 (33.3)	11 (27.5)	3 (33.3)	5 (12.5)	19 (30.6)
Total (%)	243 (55)									

N= Number and (%) of participants within the cohort that reported concepts that were coded as "other"
N Seg.= Number and (%) of segments coded "other" from the cohort

Appendix O: Frequency of Segments Coded as "other"
Step 3 appraisal

		U1 (N=15)		QY (N=20)		U3 (N= 18)		OT (N=9)		
	N seg. in category	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	Total N part. (%)
manuscript sections-other	50	5 (33.3)	8 (16)	12 (60)	14 (28)	11 (61.1)	15 (30)	8 (88.9)	13 (26)	36 (58)
manuscript sections-methods-other	59	3 (20)	2 (3.4)	11 (55)	15 (25.4)	12 (66.7)	33 (56)	3 (33.3)	9 (15.3)	28 (45.2)
manuscript sections-analysis-other	4	0 (0)	0 (0)	0 (0)	0 (0)	2 (11.1)	3 (75)	1 (11.1)	1 (25)	3 (4.8)
Total (%)	113 (40)									

N= Number and (%) of participants within the cohort that reported concepts that were coded as "other"
N Seg.= Number and (%) of segments coded "other" from the cohort

Appendix P: Frequency of Segments Coded as "other"
Step 4 decision-making

		U1 (N=15)		QY (N=20)		U3 (N= 18)		OT (N=9)		
	N seg. in category	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	Total N part. (%)
Decision-making-other	87	8 (53.3)	18 (20.7)	14 (70)	31 (35.6)	11 (61.1)	26 (29.9)	5 (55.6)	12 (13.8)	38 (61.3)
Total (%)	87 (33)									

N= Number and (%) of participants within the cohort that reported concepts that were coded as "other"
N Seg.= Number and (%) of segments coded "other" from the cohort

Appendix Q: Frequency of Segments Coded as "other"
Step 5 re-evaluation

		U1 (N=15)		QY (N=20)		U3 (N= 18)		OT (N=9)		
	N seg. in category	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	N (%)	N Seg. (%)	Total N part. (%)
possible causes of recurrence-other	64	7 (46.7)	14 (21.9)	12 (60)	16 (25)	9 (50)	18 (28.1)	6 (66.7)	16 (25)	34 (54.8)
new plan of action -other	160	13 (86.7)	33 (20.1)	18 (90)	57 (35.6)	17 (94.4)	50 (31.2)	8 (88.9)	20 (12.5)	56 (90.3)
Total N (%)	224(41)									

N= Number and (%) of participants within the cohort that reported concepts that were coded as "other"
N Seg.= Number and (%) of segments coded "other" from the cohort

Chapter V: Summary of Research, Implications and Future Directions

Summary of Research

Consumers of health services expect the best possible care from competent, up to date professionals whose clinical decisions are supported by expert judgment, sound research evidence and client choice. In occupational therapy (OT), the advocated approach to meet these expectations is evidence-based practice (EBP). In 2009, the Canadian Association of Occupational Therapists (CAOT) revised the position statement on evidence-based occupational therapy (EBOT), emphasizing the background, information, responsibilities and challenges required for EBOT. Practicing clinicians and graduates from all Master's entry-level programs in Canada are now expected to demonstrate competence in the knowledge, skills and attitudes for EBOT practice.

All OT clinical competencies including those associated with EBP are initially developed during formal higher education. If EBP competencies are to be at a level that when graduates begin their clinical careers, they can utilize corresponding skills, then academic programs must design, implement and evaluate curricula that systematically and incrementally promote entry-level competencies in EBOT. The purpose of this doctoral study was to identify the differences in EBP behaviors of OT students at the beginning, middle and end of their formal education as well as the behaviors of experienced clinicians, elicited using a written simulated scenario. The three manuscripts comprising this dissertation contribute to our knowledge of EBP and the developing nature of

related competencies in OT.

The first manuscript provided a critical review of the literature on EBP in the health professions through the lens of educational psychology. The review revealed that the meaning and significance of "evidence" continue to spark serious debate and concern from many who regard client knowledge, extended clinical experience and professional intuition, as well as forms of research other than large scale clinical trials, as valid sources of evidence. While findings from large scale scientific studies within the biomedical model have traditionally been considered the only legitimate sources of evidence, OTs believe that clinical experience and client input constitute equally valid sources of evidence. To successfully formulate a treatment plan, evidence-based OTs combine their clinical experience and expertise in a given practice area with findings from research and their clients' choices. Given that successful integration of all sources of evidence throughout the evidence-based OT decision-making process is dependent upon clinical experience and expertise in a domain, EBP competency development can be conceptualized as a progression along a path of developing expertise with clearly delineated landmarks. This review, which is based on the literature on expertise and expertise development in cognitive science, has the potential to inform the design of the EBP curriculum in OT professional programs.

The second manuscript described the results of a study entitled "Development of an occupational therapy evidence-based practice reference model". This study was carried out to capture expert clinicians' EBP behaviors

for a simulated clinical case and to create an EBP reference model in one area of OT practice. Results showed that experienced clinicians could proceed through the steps of the EBP process (PICO question, searching the literature, appraising the literature, decision-making, re-evaluation of the EBP outcomes and process) with guidance and scaffolding but that their clinical decisions were infrequently guided by research evidence. Clinicians experienced some challenges in those steps of the EBP process which are likely dependent upon formal instruction but that in the decision-making aspects of EBP, they showed highly organized and structured experiential knowledge. The model presented in this paper is a first attempt at capturing experienced clinicians' decisions in each of the EBP steps and illustrates which aspects of the decision-making process are supported by clinical experience, research evidence and client choice.

The third manuscript described the results of a study that examined the differences in EBP behaviors amongst three student groups and one group of experienced clinicians and compared these behaviors to the EBP reference model generated in the study described above. Findings indicated that students, who have received formal instruction in EBP, have greater breadth of knowledge of EBP concepts particularly in steps 1 (PICO), 2 (searching the literature) and 3 (appraising the literature) of the process but that this knowledge appears to be less organized than in the EBP reference model. Experienced clinicians, who may not have gone through a formal process of learning about EBP, show strength in using experiential aspects of the model (steps 4 and 5) but not the entire process. Results from this phase of the study suggest that a shift occurs in the trajectory of EBP

competency development from instruction-dependent to experience-dependent. Performance on the first three EBP steps may be dependent upon formal education and explicit instruction. The move towards competence in integrating the scientific evidence for decision-making and the evaluation of the EBP outcomes may occur gradually with sustained practice and clinical experience with expert or appropriate feedback.

Study Implications

The research presented in this dissertation is the first in its kind to systematically describe features of expertise and expertise development in the context of EBP in OT using a clinical scenario. Building on two major emerging areas of research in educational psychology, models of expert performance and trajectories of developing expertise, it extends the research to the professional area of OT. Studies such as the present one that attempts to close the research-practice gap have the potential to change OT clinicians' practices. With further study and clarification, an independent validation of the revised EBP reference model arising from this study can be used in OT practice to support clinicians as they use different aspects of EBP in falls prevention.

Also in the context of OT clinical practice, the research reported in this dissertation has implications for continued professional development and knowledge translation studies. OT clinicians could benefit from individually-tailored support and continuing education opportunities in order to successfully apply scientific evidence in their clinical practice and adhere to all aspects of EBP. One important finding of this dissertation is the reliance on experience as

the primary source of evidence in clinical decision-making. This findings has implications for research and practice in that it suggests that while there may be increasing scientific evidence in OT and increasing efforts to move research into practice, clinicians dealing with everyday complex client scenarios, may ultimately continue to make decisions that are based primarily on years of successful experiences with selected clients. Clinicians' perceptions of the value of professional experience will need to be carefully considered in continuing professional development activities and knowledge translation studies.

Another application of this study is in promoting EBP in OT education. Findings from this study identify possible gaps in EBP knowledge and skills in learners at different levels in their formal training. While additional empirical studies are needed to further clarify a possible trajectory of EBP competency development, this doctoral study has paved the way for looking at the specific knowledge and skills at different points in time in one OT academic program. It has also made some preliminary suggestions on the impact of the EBP curriculum at these different stages on EBP competencies. Curriculum designers can begin to take these findings into consideration as they continue to monitor and revise the EBP content in the OT program.

Future Research Directions

This study has established a direction and opportunities for future research in EBP competency development and points to two main research avenues that can be pursued in the future. The first consists of studies that would further explore and expand upon the research reported in this dissertation on expert

practice in OT. As a first attempt to capture and describe experienced clinicians' decisions in one area of OT practice, this study has paved the way for future studies on expert practice in different areas of OT practice. The development of models of expert performance in other OT practice domains should be regarded as essential in moving this line of research forward. Findings from this study suggest that the OT client-centered philosophy offers an important nuance on the role of each of the three EBP components (scientific evidence, clinical experience and client choice) for decision-making. Future investigations on expert performance in OT could therefore explore the relative contribution of each of the three EBP elements in clinical decision-making. Given that studies that measure actual patient outcomes in the context of EBP are scarce, future investigations of EBP with recognized expert evidenced-based practitioners could make important contributions to the study of EBP.

Findings from this study suggest that clinicians and students appear to benefit from cueing and support when dealing with a complex case and trying to navigate the stages of the EBP process. Future studies on EBP could examine the type and amount of scaffolding that is required to support both groups as they work on EBP cases in the academic and clinical settings. Cognitive task analyses, think aloud protocols and qualitative methodologies using observational data, interviews and focus groups could shed light on the nature and impact of the scaffolding on EBP competency development.

The second research avenue that can build upon the results from this study involves continuing to examine the impact of EBP instruction on the development

of core EBP competencies. With the new Master's entry-level curriculum now well in place in the OT program in universities including the one in which the present study was conducted, a natural extension from this study would be to replicate the study and examine EBP behaviors in each of the five academic years.

Another vital area for future research is the role of fieldwork in shaping EBP competency development. Although fieldwork experiences represent a major component of OT education and that they are expected to promote the development of core clinical competencies, their role in promoting the development of EBP competencies has been underexplored. OT students must complete 1000 hours of clinical fieldwork. These clinical placements represent ideal opportunities to not only apply knowledge and skills learned in the classroom, but they afford authentic opportunities for engaging in and evaluating EBP competencies through mentoring and feedback from preceptors and peers. In most cases, students are supervised by experienced OT preceptors who can provide an environment conducive to the application of the EBP process with real clients. Research on the role of fieldwork in promoting EBP competencies will also have to examine if and how clinical preceptors who may not adhere to EBP principles support students who are training in an OT program with a strong emphasis on EBP. Disparities between preceptors' practice behaviors and students' expectations about their education of EBP in the clinical setting can potentially create tensions and adversely affect students' experiences during fieldwork

Longitudinal explorations of professional Master's entry-level graduates'

EBP knowledge, skills, attitudes and behaviors are needed to inform educators on whether current EBP curricula are having the desired impact on EBP competencies. Canadian OT programs have designed the new Master's programs to reflect the skills needed for evidence-based OT practice. As such, the expectation is that the new generations of OTs will demonstrate practice behaviors that are more consistent with EBP. Researchers will therefore need to follow graduates longitudinally and use a combination of qualitative and quantitative research methodologies to examine practice behaviors, identify whether barriers to EBP remain prevalent and gain greater insights into individual clinicians' experiences of EBP.

In order to move the study of EBP within the OT education context forward, future studies will need to address faculty development. Promoting EBP competencies is not only about the nature of the content and when it should be offered. It is also very much about ensuring that instructors have the pedagogical content knowledge and expertise to deliver the EBP curriculum in a manner that is consistent with what is currently known about effective instruction. Instructors need to successfully implement strategies for promoting the acquisition of domain knowledge and foster the development of self-monitoring and active engagement in the learning process. Instructors have a vital role to play in moving students forward on their path to developing expertise in EBP.

Another future area of study which is larger in scope would consist of a cross Canada investigation (other Canadian university OT programs) of key aspects of EBP including student competencies, faculty development and

curriculum design. The Association of Canadian Occupational Therapy University Programs (ACOTUP) has recently announced that a group of OT academics and researchers will be collaborating to identify and plan for important future areas for OT education research. This could provide EBP scholars with a platform for research into the development of the 'scholarly practitioner' role as per the national association's practice profile.

EBP affords numerous possibilities for the study of expertise and expertise trajectories. To assist learners in moving towards expert EBP, OT and educational psychology researchers should continue to identify and clarify the EBP developmental trajectories in different areas of clinical practice. This is the first necessary step in designing instructional strategies that can help students meet interim targets. The ultimate goal is that OT graduates will develop EBP competencies that will remain with them throughout their clinical practice.

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