**Nationwide Environmental Scan of Knowledge Brokers Training**

Dina Gaid, BSc (PT), MSc, PhD; Kedar Mate, BSc (PT), MSc, PhD; Sara Ahmed, PT, PhD; Aliki Thomas, OT (C), PhD; André Bussières, DC, PhD

**Introduction:** Knowledge brokers (KBs) can promote the uptake of best practice guidelines in rehabilitation. Although many institutions offer training opportunities to health care professionals who wish to undertake KBs roles, the characteristics and content of those educational training opportunities (ETOs) are currently unknown. This study aimed to describe the ETOs available to rehabilitation professionals in Canada and determine whether the ETOs meet the competencies expected of the KBs roles.

**Methods:** We conducted a Canada-wide environmental scan to identify ETOs using three strategies: online search, phone calls, and snowball. To be included in the study, ETOs had to be offered to rehabilitation professionals in Canada and be targeting KBs competencies and/or roles. We mapped each of the content to the KBs competencies (knowledge and skills) within the five roles of KBs: information manager, linking agent, capacity builder, facilitator, and evaluator.

**Results:** A total of 51 ETOs offered in three Canadian provinces, British Columbia, Ontario, and Quebec, were included in the analysis. For KBs competencies, 76% of ETOs equipped attendees with research skills, 55% with knowledge brokering skills, and 53% with knowledge on implementation science. For KBs roles, over 60% of ETOs supported attendees to in performing the capacity builder role and 39% the evaluator role.

**Discussion:** Findings suggest that ETOs focused primarily on preparing participants with the research and knowledge brokering skills required to perform the capacity builder and evaluator roles. Comprehensive educational training covering all KBs roles and competencies are needed.

**Keywords** knowledge translation, knowledge brokering, training opportunities, environmental scan, rehabilitation

DOI: 10.1097/CEH.0000000000000355

The availability of evidence in different rehabilitation sectors and its adoption in clinical practice remains an ongoing challenge for decision-makers and practitioners. Persistent gaps between knowledge generation and its use in practice have a potential negative impact on the health outcomes of individuals and communities. Knowledge translation (KT) is a field that aims to promote the uptake of research evidence in health care systems. Evaluations of the relative effectiveness of different KT interventions in improving professional practice have shown that the use of intermediary individuals was associated with the highest improvement, with up to a 12% change in practitioners' behavior in many health care sectors, including rehabilitation. Intermediary individuals who facilitate knowledge exchange between producers and users of knowledge are called brokers or knowledge brokers (KBs).

KBs are defined as “one of the human forces which bring people together to build relationships, uncover needs, share ideas and evidence aiming to improve job productivity.” They facilitate the...
interactions and collaborations between practitioners and researchers to support evidence uptake into practice.47,49–52 The roles played by KBs are central to the KT process.33,54 Recent literature has identified roles for KBs and a set of competencies believed to be the core of the KT process. Clegg and Hoens55 proposed the Role Model for Knowledge Brokering, which outlines the role domains of knowledge brokering in health care. This model consists of five role domains: information manager, linking agent, capacity builder, facilitator, and evaluator. (see Appendix 1, Supplemental Digital Content 1, http://links.lww.com/JCEHP/A118, describes each role in detail). Mallidou et al56 reported on the core competencies, divided into knowledge and skills: requisite knowledge includes having an understanding of the context, research process, and KT processes, and awareness of the availability and diversity of evidence56; skills include interpersonal skills,36 research skills,48,56 communication skills, and mediation skills,48 and knowledge brokering skills.56,57 Supplemental Digital Content 1 (see Appendix 2, http://links.lww.com/JCEHP/A118) describes each type of KBs skills in detail.

Results from our recent survey of 182 KBs working in rehabilitation settings in Canada indicated that more than half (n = 112) of the respondents reported having received insufficient training to perform their brokering roles. Because of insufficient training, KBs relied on their accumulated experience overtime to perform these roles.58 In a parallel study,59 we interviewed 23 rehabilitation KBs to identify the factors that hinder or promote the optimal use of KBs. KBs were not always aware of existing KB-related training, which partly explained why several depended on “on-the-job” learning. Previous research has highlighted the need for comprehensive training programs for KB to perform their roles.47,55 Thus, the overall aim of this research was to identify and describe current educational training opportunities (ETOs) for KB in Canada and to explore whether these programs meet the competencies needed for the KB roles. Specifically, we aimed to (1) describe the features of the ETOs (types of knowledge, skills, roles, learning strategies, and assessment methods used) and (2) determine whether the ETOs meet the competencies related to the five roles of KBs.

Identifying existing ETOs and exploring the characteristics of these opportunities across Canada is expected to help (1) revise existing KBs programs and/or guide the development of a comprehensive KBs training program, (2) increase KBs awareness of the available training opportunities, and (3) inform developers of the training programs of the suitability of available training opportunities for actual required KBs roles.

METHODS

Ethical Approval

This study was exempted from ethical approval.

Research Design

A Canada-wide environmental scan was conducted to identify existing ETOs for KBs. Environmental scans gather basic descriptive information to provide evidence-based solutions to health care issues.60 To be eligible, (1) ETO had to be offered, but not restricted, to rehabilitation professionals or graduate students enlisted in a rehabilitation program; (2) the content needed to cover one or more of the KBs roles, knowledge, or skills; and (3) ETO’s syllabus had to provide the training objectives, course outlines, and/or expected outcomes of the training.

Recruitment Strategies

Three consecutive recruitment strategies were used. First, the project leader searched the websites of all rehabilitation organizations in Canada to determine if ETOs were offered and determine training eligibility. An e-mail invitation to participate in the study was sent to 106 organizations that our team had previously identified in a parallel study38 including rehabilitation schools (n = 18), regulatory bodies (n = 16), professional associations (n = 24), research institutions (n = 38), and KT communities of practices (n = 10). Second, follow-up phone calls were made to nonrespondent organizations asking if a KBs training opportunity was offered. Organizations offering ETOs were asked to provide the contact information of individuals responsible for the ETOs, so we could contact them by phone or e-mail. Nonrespondent instructors received follow-up e-mails every 2 weeks for 6 weeks or up to a maximum of three reminders. Third, a snowball strategy was used asking respondents if they were aware of any other similar ETOs we should consider (see Appendix 3, Supplemental Digital Content 1, http://links.lww.com/JCEHP/A118, List of invited organizations). Course instructors of eligible ETOs who agreed to participate were asked to sign a consent form and share their course syllabus.

Data Collection

A data extraction sheet was developed and adapted from the Harden comprehensive framework,61 which proposes 10 questions to guide curriculum development. This valid and reliable tool used by universities worldwide helps with the planning of lectures, courses, or complete curricula.62,63 We adapted six questions from the Harden comprehensive framework61: those that explored the course’s objectives, content, educational strategies, teaching methods, assessment tools, and educational climate. The remaining 4 questions were unrelated to the scope of our research. The data extraction table included the following categories: (1) course objectives, (2) topics, (3) expected outcomes, (4) learning strategies, and (5) assessment methods. We piloted the data extraction sheet on a sample of 10 syllabi. Two independent reviewers extracted the data from each course syllabus and/or organization website where available and resolved extraction discrepancies through discussion. Each course instructor was asked to validate the extracted information related to his/her course if they had not completed the data extraction sheet themselves.

Data Analysis

A qualitative content analysis was conducted, followed by quantitative numerical analysis for each ETOs’ syllabus and contents.

Qualitative Content Analysis

The ETOs syllabi and their content were first classified into two categories (learning strategies and assessment methods). Each category was then organized into subcategories deductively. (1) Learning features that included details related to the reading materials, didactic lectures, small group discussions, problem-based learning scenarios, online prerecorded lectures, coaching and consultation, self-reflection activities, online support, and long-term support; and (2) assessment methods that included project presentation, individual assignments, group assignments, class participation, student presentations, self-assessments, and reflections on the reading material.

The ETOs content included a number of items which displayed the objectives, outlines, or outcomes (ie, by the end of the ETO, attendees should learn how to formulate a review
question). A priority was given to the analysis of items displayed in the outlines because outlines tend to give more details about the content than they do about outcomes. The training objectives were considered in the event that outlines or outcomes were unavailable or insufficiently described. Each content item was categorized into (1) type of KBs knowledge (knowledge on KT science, knowledge on research evidence, and knowledge on brokering roles), (2) skills (research skills, communication skills, mediation, and knowledge brokering skills), and c) roles, based on the Role Model for Knowledge Brokering (capacity builder, evaluator, linking agent, facilitator, and information manager).

Quantitative Numerical Analysis
Descriptive statistics (frequencies and percentages) were computed for each category and subcategory of the ETOs’ syllabi and contents.

Mapping of the KBs Roles and Competencies
To create a formative matrix, items were labeled based on the Role Model for Knowledge Brokering using the following labels: “M” = information manager, “L” = linking agent, “C” = capacity builder, “F” = facilitator, “E” = evaluator, or “N” = no specific role. Then, the same items were labeled based on the competencies using the following labels: “1” = KT-related knowledge, “2” = evidence-based related knowledge, “3” = KBs knowledge, “4” = research skills: “5” = KBs skills, “6” = communication skills, and “7” = mediation skills. The frequency of each label was calculated within each ETO to show the weight of the label in each (eg, E4*3 means that a training opportunity included 3 items “label * 3” that provided participants with research skills “label 4” to perform an evaluator role “label E”). In addition, a descriptive analysis was performed (counts and frequencies) for each label to explore the weight of each label across all eligible ETOs.

RESULTS
Of the 84 identified ETOs, 51 (60%) met the eligibility criteria. Of those, 21 (41%) were reviewed and confirmed by the instructor(s) who deliver(s) the training. Instructors of the remaining 30 (59%) ETOs could not be reached (Figure 1). Details regarding the ETOs (ie, province, organization, course title, format, duration, frequency, audience, and fee) are provided in Supplemental Digital Content 1 (see Appendix 4, http://links.lww.com/JCEHP/A118).

The Characteristics of the ETOs
Table 1 presents the characteristics of the ETOs by province. ETOs were offered in British Columbia (n = 21, 41%), Ontario (n = 20, 39%), and Quebec (n = 10, 20%). In British Columbia, ETOs were mainly offered by regional groups (ie, Fraser Health Authority) (n = 17, 81%), whereas fewer ETOs were offered by universities (n = 3, 14%) and KT institutions (n = 1, 5%). In Ontario, ETOs were offered by universities (n = 10, 50%), clinical sites (n = 6, 30%), and KT institutions (n = 4, 20%) compared with Quebec where ETOs were mainly offered by universities (n = 8, 80%). Only 2 (20%) were offered by KT institutions. Nearly 40% (n = 20) of the ETOs were delivered over a semester, 37% (n = 19) in one day (ranged from 1 to 7 hours of training), 20% (n = 10) over two days or a week, and 4% (n = 2) over 6 months or more. More than half (n = 30) of the training opportunities were available once per year, whereas others were available twice per year (n = 2, 4%), once every two years (n = 2, 4%), on demand (n = 2, 4%), or three times per year (n = 1, 2%). Fourteen had missing information. Training opportunities were generally delivered in-person (n = 37, 73%) or online (n = 13, 25%), and one was missing and was open to health care professionals (n = 38, 75%), including rehabilitation professionals, or to graduate students alone (n = 13, 25%). The cost of most training courses/workshops in Ontario was between $500 and $5000 (n = 15, 29%). Those in Québec were commonly based on university tuition costs (n = 8, 16%), and those in British Columbia were sponsored by regional groups (ie, Fraser Health Authority) at no charge for attendees (n = 17, 33%).

Analysis of the ETOs’ Syllabus
Learning Strategies
Almost half of the ETOs (n = 24, 47%) contained multiple learning strategies (ie, reading materials, didactic lectures, prerecorded presentations, and group discussions), whereas only 5 (9%) used a single learning strategy (ie, small group discussions, case scenario, and project presentation). Respectively, the most common learning strategies were reading material (KT literature and resources) (n = 17, 33%), didactic lectures (n = 15, 29%), and small group discussions (n = 13, 25%). Other learning strategies included problem-based learning (ie, case studies) (n = 9, 18%), prerecorded

![FIGURE 1. Flowchart of educational training opportunities for knowledge brokers in Canada.](https://example.com/flowchart.png)
presentations (ie, online modules, prerecorded webinars, video presentations, or videos featuring experts) (n = 9, 18%), providing coaching and consultation with a faculty member or an expert (n = 8, 16%), and self-reflection activities (ie, exercises with answer keys) (n = 8, 16%). Only four ETOs (8%) used online collaborative platforms (ie, online discussion boards) and one used long-term support (2%) (one year of support after the training). We could not capture the learning strategies for 22 ETOs because of poor reporting on organizations’ websites.

Assessment Methods
Nearly a third of the assessment methods consisted of developing a project plan (n = 16) (ie, developing a KT plan, implementation action plan, communication plan, evaluation plan, writing a KT grant proposal, or a systematic review protocol), one quarter used individual assignments (n = 13), and the remaining consisted of class participation (n = 10, 20%). Other assessment methods included in-class student presentations (n = 7, 14%), self-assessment (ie, quizzes) (n = 6, 12%), reflection on reading material (n = 5, 10%), and group assignments (n = 4, 8%) were less common. However, because of the poor reporting, we failed to extract the assessment methods of 26 ETOs.

Analysis of the ETOs’ Content
Types of KBs Competencies
Types of knowledge: over half (n = 27, 53%) of the ETOs provided foundational knowledge on KT frameworks, models, and theories. Fewer courses (n = 7, 14%) addressed topics such as characteristics of research evidence, evidence-based practice, and evidence-based decision-making. Only two courses (4%) provided information on the various roles of KBs.

Types of skills: more than three-quarters (n = 39) of the training opportunities aimed to equip attendees with research skills such as how to formulate a research question, search for and appraise research evidence, and information on research designs, data collection methods, and developing a publication plan. Over half of the ETOs (n = 28) aimed to develop knowledge brokering skills, such as developing a KT plan, tailoring KT interventions, designing a training session, adapting clinical practice recommendations, addressing contextual barriers, sustaining organization changes, and writing the end-of-grant KT section in grant applications. Eight ETOs (16%) provided training on communication skills including how to create a communication plan, tailor key messages for end users, share ideas, using different channels of communication, develop poster and oral presentations, and prepare supporting arguments. Five ETOs (10%) provided attendees with mediation skills (eg, identifying KT partners, considering stakeholder perspectives, engaging the media, and creating the linkage with government policy makers).

Types of KBs Roles
Nearly two-thirds (n = 32) of the ETOs prepared the attendees for a capacity builder role; this consisted of applying/adapting research results to the local context, selecting/tailor effective implementation strategies, developing knowledge sharing products, sustaining change, and preparing grant applications. Several training opportunities (n = 20, 39%) prepared attendees for the evaluator role, which includes determining the applicability of research findings, measuring knowledge/practice gaps, evaluating the impact of KT interventions, and measuring outcomes of the KT process. Fewer training opportunities (n = 10, 20%) prepared the attendees to play the linking agent role, such as building an understanding of different stakeholder perspectives, using plain language to disseminate research evidence, and developing linkage with government policy makers. Seven ETOs (14%) prepared the attendees to play a facilitator role (eg, creating a communication plan by using communication strategies for reaching multiple audiences and facilitating engaging training sessions). A similar number (n = 7, 14%) prepared the attendees to play an information manager role (eg, interpreting research results to clinical practice, creating strategies to package evidence in a way that makes it accessible and relevant to users, and being engaged with qualitative and quantitative methods used to acquire and share knowledge).

Mapping the KBs Roles in Respect of KBs Competencies
Table 2 presents the mapping of the KBs roles to the KBs competencies of each ETO. In total, 421 items were available for analysis, whether from ETOs’ outlines, outcomes, or objectives. Mapping KBs roles to KBs competencies across those items suggested that the largest number of items focused on providing attendees with research skills “label=N4”
### TABLE 2.
Mapping the Competences and the Roles of Knowledge Brokers of Each Training Opportunity

| ID | Competences | Skills | Roles |
|----|-------------|--------|-------|
| 1  | N1*3 C1*1   | E4*1 C5*1 L5*1 F5*1 | E1*2 |
| 2  | N1*2        | E4*3 C5*6 E5*2 | N2*4 |
| 3  | N1*1        | E4*4 C5*6 | N2*4 |
| 4  | N1*6        | N4*1 E5*4 C5*2 | N2*4 |
| 5  | N1*5        | E4*3 E4*5 | N2*4 |
| 6  | N1*1        | C5*5 E5*2 | N2*4 |
| 7  | N1*1        | N4*2 E4*2 | E4*1 |
| 8  | N1*1        | E4*2 E4*1 | E4*1 |
| 9  | N1*6 E1*1   | N4*24 M4*1 | E4*1 |
| 10 | N1*1        | N4*2 E4*1 | E4*1 |
| 11 | C1*1        | N4*4 E4*1 | E4*1 |
| 12 | N1*1        | N4*24 M4*1 | E4*1 |
| 13 | N1*1        | N4*2 E4*2 | E4*1 |
| 14 | N1*1        | N4*2 E4*2 | E4*1 |
| 15 | N1*1        | N4*4 E4*1 | E4*1 |
| 16 | N1*1        | N4*5 E4*11 | E5*1 |
| 17 | N1*14 E1*4 | N4*25 E4*11 | E5*1 |
| 18 | N1*2 N2*2   | N4*1 E5*3 | E5*1 |
| 19 | N1*14 E1*1 | N4*2 E5*1 | E5*1 |
| 20 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 21 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 22 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 23 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 24 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 25 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 26 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 27 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 28 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 29 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 30 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 31 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 32 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 33 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 34 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 35 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 36 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 37 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 38 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 39 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 40 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 41 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 42 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 43 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 44 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 45 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 46 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 47 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 48 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 49 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 50 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |
| 51 | N1*2 N2*2   | N4*2 E5*1 | E5*1 |

**Roles**

- **N** = No specific role
- **M** = Information manager
- **C** = Capacity builder
- **L** = Linking agent
- **F** = Facilitator
- **E** = Evaluator
a greater density in areas with academic centers compared with higher level outcomes such as application and analysis.73 Assignments; such assessments are typically used to target tendencies primarily by project presentations and individual multiple learning strategies and assessed the acquired competencies primarily by project presentations and individual multiple learning strategies.73 Two reasons for this gap. First, the context of healthy aging.96 Similarly, few ETOs prepared participants for a facilitator role, although it was rated as the third role (of five) in importance for task frequency among KBs in rehabilitation84 and as an essential role of knowledge brokering.55 Several studies have also emphasized the ongoing networking as accessing research evidence) were KBs themselves as KBs, even when performing brokering roles as their primary jobs (ie, managers, opinion leaders, researchers, and educators).48,76,78 Increasing clinicians’ awareness about the types of brokering roles may help them self-identify as KBs, which may encourage them to seek opportunities to improve their KBs competencies. Second, the role model of knowledge brokering55 is a fairly new model developed in 2016, and it might not yet be used or taught in ETOs or other KT training activities. Given its value in addressing/desciribing the different roles and expected tasks for each, organizations that plan and deliver ETOs may wish to consider integrating this model in their training for KBs working in health care.

Regarding KBs skills, the ETOs seem to focus primarily on preparing participants to develop research skills, followed by knowledge brokering skills. These findings are consistent with previous studies having shown that university courses on KT focus primarily on research skills. This highlights the overlap between research skills and KT skills.36,74,75 However, it is important to emphasize that there is a shortage of ETOs available to equip participants with communication and mediation skills; this is problematic considering that KBs need to be skillful in negotiating complex environments when promoting evidence-based decision-making.79 Developers of ETOs may have deliberately omitted those skills because KBs tend to naturally possess basic communications and networking skills.39,60 Those types of skills seem to be related to other interpersonal attributes that KBs have (ie, enthusiastic,6,70,72,81,82 proactive,56,81 motivated,56,81,82 positive,56,81,82 persuasive,56,81,82 entrepreneurial,56,81 friendly,56,81 open-minded,56,79,81 having emotional intelligence56,69,81,83–85 and intellectual curiosity,56,81 and actively working to engage their peers82).

KBs Roles

None of the ETOs we reviewed covered all the five roles of KBs. The main focus of ETOs was on preparing attendees for the capacity builder role, followed by the evaluator role. Focusing on the capacity builder role aligns well with the KBs responsibilities, given that being a capacity builder was one of the most frequent roles among KBs in two recent studies undertaken by our team36,82 and with previous research as well.26,86–90 By contrast, the focus on the evaluator role is unlike previous research, which found this to be among the least common.58 The lack of training targeting the linking agent and information manager roles is also inconsistent with the required roles of KBs.58 Previous research has indicated that the linkage agent91–93 and information manager54,56,91 were key KBs roles. For example, in our survey of 198 KBs across Canada,58 tasks related to the linking agent role (such as networking with various stakeholders outside the organization) and tasks related to the information manager role (such as accessing research evidence) were KBs’ most common tasks. Several studies have also emphasized the ongoing networking as an important element in knowledge brokering49,51,59,87,94,95 Considering other health care professions beyond rehabilitation, the linkage approach seems to be commonly adopted by KBs in the context of healthy aging.26 Similarly, few ETOs prepared participants for a facilitator role, although it was rated as the third role (of five) in importance for task frequency among KBs in rehabilitation84 and as an essential role of knowledge brokering performed by advanced practice nurses.27

DISCUSSION

This environmental scan was the first to specifically target KBs ETOs in Canada, providing new insights into the nature of those opportunities. Many ETOs were excluded from this study as they were no longer being offered. This lack of sustainability of ETOs may prevent clinicians from accessing much-needed training. A collaboration between professional groups (ie, professional associations), KT institutions (ie, KT Canada), and clinical sites can bring together instructors with various perspectives and experiences and improve the sustainability of ETOs.

ETOs Characteristics

Findings showed that the ETOs are concentrated in three Canadian provinces (Ontario, Québec, and British Columbia). Previous research has found variations in the density of rehabilitation professionals in different Canadian provinces,64 with a greater density in areas with academic centers compared with rural and remote areas.65–68 The concentration of ETOs in these three provinces seems to reflect the presence of larger numbers of rehabilitation professions and academic settings in those areas and provinces. Our findings showed that ETOs’ content developers used multiple learning strategies and assessed the acquired competencies primarily by project presentations and individual assignments; such assessments are typically used to target higher level outcomes such as application and analysis.73

KBs Competencies

The ETOs were rather similar in their primary focus on certain types of KBs competencies. Regarding knowledge, the emphasis seems to be on knowledge of KT science, followed by knowledge of different sources of evidence. This finding is consistent with previous studies that found overlap between KT competencies and research competencies,56,74,75 suggesting that KT competencies encompass more than research competencies for intellectual curiosity,56,81 and actively working to engage their peers82).
Mapping KBs Competencies and Roles

The mapping process provided an informative portrait on what existing ETOs covered and pointed to a number of gaps in those trainings. The primary focus of included ETOs was on developing knowledge brokering skills to fulfill the capacity builder role, and the second main focus was on research skills needed to perform the evaluator role. The use of research skills in evaluative activities seems to be valued by ETOs’ developers, but not frequently performed by KBs. Given that most KBs did not receive any KB-related training, this may be because of a lack of KBs competence on how to use research skills to fulfill the evaluator role. On the other hand, ETOs’ developers paid less attention to the other types of competency–role combinations, for example, developing communication skills to fulfill the facilitator role, developing mediation skills to fulfill the linking agent role, and providing knowledge and skills related to the information manager role.

These findings provide insight into future ETOs’ developers on what the main elements of KBs training should be. Based on our results, a comprehensive ETOs for KBs should provide background knowledge on all five knowledge brokering roles to provide participants with deep insights into the possible requirements and responsibilities of the KBs. Providing knowledge on sources of evidence and the basic KT processes and frameworks is an important foundation for the KBs. However, for skills, research skills are essential for most of the brokering roles, especially for the evaluator and information manager roles. Knowledge brokering skills are vital for the capacity building role, whereas the need for communication and mediation skills could be based on participants’ needs given that many KBs already naturally possess those skills. Considering that by definition, KBs are “one of the human forces in the KT process,” a comprehensive training program that addresses the knowledge and skills necessary to perform the five possible roles of KBs, combined with the needed resources, may significantly promote the progression and the sustainability of the KT process, and fulfill a predetermined need to continue developing the KBs’ competencies.

FUTURE RESEARCH

Our findings suggest a number of avenues for future research. First, there is a need to further explore the reasons for the lack of sustainability of many ETOs related to KBs. Second, creating a mutual platform that links all KT organizations/institutions that offer free online short-duration ETOs, such as webinars, and provide a description of those ETOs can increase KBs’ awareness of and accessibility to the ETOs. This will allow KBs to get training from anywhere with the flexibility to view training anytime. Third, offering an overview on KBs roles and skills within the rehabilitation programs as an elective course for those who are potentially interested in performing these types of roles after graduation may be a way forward. Furthermore, we are not aware of similar research focusing on ETOs provided for KBs in other health care fields.

STRENGTHS AND LIMITATIONS

The main strengths of this research are the number of ETOs identified by our comprehensive search strategies that could be used to monitor organizations that are currently providing ETOs or could do so in the future. In addition, the Role Domains Model for Knowledge Brokering framework guiding the ETOs content analysis allowed us to assess the suitability of those trainings to the KBs roles. Although we targeted ETOs offered to rehabilitation clinicians, many ETOs were not limited to rehabilitation clinicians but were also offered to other health care professionals. Nonetheless, this study also has some limitations. First, despite using three recruitment strategies, we likely missed existing ETOs, and the total number of the ETOs (ie, denominator) in this field is unknown. Second, the unavailability of ETOs’ full descriptions, either for content (outlines, expected outcomes, and objectives) or syllabus (learning strategies and assessment methods), prevented us from providing a detailed description of each. In addition, several instructors could not be reached, and consequently, not all ETOs could be validated. Importantly, as the characteristics and content of the ETOs are expected to evolve over time, these may have changed since we collected the information. Finally, findings of this research reported mainly the characteristics of ETOs in Canada; these findings may not be applicable to KBs in other countries and/or health care systems.

CONCLUSION

Our findings provided an understanding on how clinicians may be better prepared to be KBs. Findings suggest that the focus of the ETOs was on equipping participants with research skills and knowledge brokering skills to perform capacity builder and evaluator roles. However, significant gaps observed in ETOs included not providing training on communication and mediation skills and not preparing participants for the manager, linking agent, and facilitator roles. Furthermore, ETOs are currently available in the larger provinces alone (Ontario, Quebec, and British Columbia). Comprehensive and accessible educational training programs covering all KBs roles and competencies are needed.

Lessons for Practice

- The main focus of educational training opportunities was on equipping participants with research and knowledge brokering skills to perform capacity builder and evaluator roles.
- Significant gaps were found in providing training on communication and mediation skills and in preparing participants for the manager, linking agent, and facilitator roles.
- Comprehensive and accessible educational training opportunities covering all knowledge broker roles and competencies are needed.

REFERENCES

1. Wallis J, Webster K, Levinger P, et al. What proportion of people with hip and knee osteoarthritis meet physical activity guidelines? A systematic review and meta-analysis. Osteoarthritis Cartilage. 2013;21:1648–1659.
2. Larmer PJ, Reay ND, Aubert ER, et al. Systematic review of guidelines for the physical management of osteoarthritis. Arch Phys Med Rehabil. 2014;95:375–389.
3. Burridge J, Alt Murphy M, Burkke J, et al. A systematic review of international clinical guidelines for rehabilitation of people with neurological conditions: what recommendations are made for upper limb assessment? *Front Neurol.* 2019;10:567.

4. Jolliffe L, Lannin NA, Cadilhac DA, et al. Systematic review of clinical practice guidelines to identify recommendations for rehabilitation after stroke and other acquired brain injuries. *BMJ Open.* 2018;8:e018791.

5. Ni M, Hazzard JB, Signorelli JE, et al. Exercise guidelines for gait function in Parkinson’s disease: a systematic review and meta-analysis. *Neurorehabil Neural Repair.* 2018;32:872–886.

6. Pokrenbny D, Dennett A. Exercise programs delivered according to guidelines improve mobility in people with stroke: a systematic review and meta-analysis. *J Phys Med Rehabil.* 2020;101:154–163.

7. Tomaschek R, Gmerpil A, Rupp R, et al. A systematic review of outcome measures in initial rehabilitation of individuals with newly acquired spinal cord injury: providing evidence for clinical practice guidelines. *Eur J Phys Rehabil Med.* 2019;55:605–617.

8. Konner-Bitensky N, Desrosiers J, Rochette A. A national survey of occupational therapists’ practices related to participation post-stroke. *J Rehabil Med.* 2008;40:291–297.

9. Straus SE, Tetroe J, Graham I. Defining knowledge translation. *Can Med Assoc J.* 2009;181:165–168.

10. Grimshaw JM, Eccles MP, Lavis JN, et al. Knowledge translation of research findings. *Implement Sci.* 2012;7:50.

11. Metzler MJ, Metz GA. Analyzing the barriers and supports of knowledge translation using the PEO model. *Can J Occup Ther.* 2010;77:151–158.

12. Lencucha R, Kothari A, Rouse MJ. Knowledge translation: a concept for occupational therapy? *Am J Occup Ther.* 2007;61:593.

13. Camden C, Swane B, Tetreault S, et al. Going beyond the identification of change facilitators to effectively implement a new model of services: lessons learned from a case example in paediatric rehabilitation. *Dev Neurorehabil.* 2011;14:247–260.

14. Craik J, Rappolt S. Theory of research utilization enhancement: a model for occupational therapy? *Can J Occup Ther.* 2003;70:266–275.

15. King G, Wright V, Russell DJ. Understanding paediatric rehabilitation therapists’ lack of use of outcome measures. *Disabil Rehabil.* 2011;33:2662–2671.

16. Chalmers I. If evidence-informed policy works in practice, does it matter if it doesn’t work in theory? *Evid Pol.* 2005;5:227–242.

17. LaPlante MP, Carlson D. Disability in the United States: Prevalence and Causes, 1992. U.S.Dept. of Education, Office of Special Education and Rehabilitative Services; 1996:177. Available at: https://files.eric.ed.gov/fulltext/ED400635.pdf. Accessed April 3, 2021.

18. Flodgren G, Parmelli E, Doumtt G, et al. Local opinion leaders: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2011;CD001025.

19. Jamtvedt G, Young JM, Kristofferson DT, et al. Audit and feedback: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2006;2:CD000259.

20. Grimshaw JM, Thomas RE, MacLennan G, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess.* 2004;8:ix–72.

21. French SD, Green S, Buchbinder R, et al. Interventions for improving the appropriate use of imaging in people with musculoskeletal conditions. *Cochrane Database Syst Rev.* 2010;2010:CD006904.

22. Farmer AP, Légaré F, Turcot L, et al. Printed educational materials: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2003;3:CD004398.

23. Forseuthd L, Bjornal A, Rashidian A, et al. Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2009;2009:CD003030.

24. Hakkenens S, Dodd K. Guideline implementation in allied health professions: a systematic review of the literature. *Qual Saf Health Care.* 2008;17:296–300.

25. Doumtt G, Gattellari M, Grimshaw J, et al. Local opinion leaders: effects on professional practice and health care outcomes (Review). *Cochrane Database Syst Rev.* 2007;1:CD001025.

26. Elueze IN. Evaluating the effectiveness of knowledge brokerage in health research: a systematised review with some bibliometric information. *Health Info Libr J.* 2015;32:168–181.

27. McCormack B, Rycroft-Malone J, Decorby K, et al. A realist review of interventions and strategies to promote evidence-informed healthcare: a focus on change agency. *Implement Sci.* 2013;8:107.

28. Rogers EM. Lessons for guidelines from the diffusion of innovations. *Jt Comm J Qual Improv.* 1995;21:324–328.

29. Gifford DR, Holloway RG, Frankel MR, et al. Improving adherence to dementia guidelines through education and opinion LeadersA randomized, controlled trial. *Ann Intern Med.* 1999;131:237–246.

30. Ryan DP, Marlow B, Fisher R. Educationally influential physicians: the need for construct validation. *J Contin Educ Health Prof.* 2002;22:160–165.

31. Yancey AK, Siegel JM, McDaniel KL. Role models, ethnic identity, and health-risk behaviors in urban adolescents. *Arch Pediatr Adolesc Med.* 2002;156:55–61.

32. Earp JA, Eng E, O’Malley MS, et al. Increasing use of mammography among older, rural African American women: results from a community trial. *Am J Public Health.* 2002;92:646–654.

33. Valente TW, Hoffman BR, Ritt-Olson A, et al. Effects of a social-network method for group assignment strategies on peer-led tobacco prevention programs in schools. *Am J Public Health.* 2003;93:1837–1843.

34. Perry CL, Komro KA, Veblen-Mortenson S, et al. A randomized controlled trial of the middle and junior high school DARE and DARE Plus programs. *Arch Pediatr Adolesc Med.* 2003;157:178–184.

35. Lomas J. Opinion leaders vs audit feedback to implement practice guidelines-reply. *JAMA.* 1999;282:1217.

36. Kelly JA, St Lawrence JS, Diaz YE, et al. HIV risk behavior reduction following intervention with key opinion leaders of population: an experimental analysis. *Am J Public Health.* 1991;81:168–171.

37. Latkin CA. Outreach in natural settings: the use of peer leaders for HIV prevention among injecting drug users’ networks. *Public Health Rep.* 1998;113(Suppl 1):151.

38. Sikkema KJ, Kelly JA, Winnet RA, et al. Outcomes of a randomized community-level HIV prevention intervention for women living in 18 low-income housing developments. *Am J Public Health.* 2000;90:57.

39. Ammendolia G, Hogh Johnson S, Pennick V, et al. Implementing evidence-based guidelines for radiography in acute low back pain: a pilot study in a chiropractic community. *J Manipulative Physiol Ther.* 2004;27:170–179.

40. Stevenson K, Lewis M, Hay E. Do physiotherapists’ attitudes towards evidence-based practice change as a result of an evidence-based educational programme? *J Eval Clin Pract.* 2004;10:207–217.

41. Stevenson K, Lewis M, Hay E. Does physiotherapy management of low back pain change as a result of an evidence-based educational programmes? *J Eval Clin Pract.* 2006;12:365–375.

42. Rebbeck T, Maher CG, Refshauge KM. Evaluating two implementation strategies for whiplash guidelines in physiotherapy: a cluster randomised trial. *Aust J Physiother.* 2006;52:165–174.

43. Gross DP, Lowe A. Evaluation of a knowledge translation initiative for physical therapists treating patients with work disability. *Disabil Rehabil.* 2009;31:871–879.

44. Rebbeck T, Macedo LG, Maher CG. Compliance with clinical guidelines for whiplash improved with a targeted implementation strategy: a prospective cohort study. *BMJ Health Serv Res.* 2013;13:213.

45. Karlen E, McCathie B. Implementation of a quality improvement process aimed to deliver higher-value physical therapy for patients with low back pain: case report. *Phys Ther.* 2015;95:1712–1721.

46. Lynch EA, Cadilhac DA, Luker JA, et al. Education-only versus a multifaceted intervention for improving assessment of rehabilitation needs after stroke: a cluster randomised trial. *Implement Sci.* 2016;11:120.

47. Bartrlink ME, Baggen Y, Stevens DE, et al. Facilitators and barriers to brokering between research and care by senior clinical-scientists in general practice and elderly care medicine. *Educ Prim Care.* 2019;30:80–87.

48. Canadian Health Services Research Foundation. The Theory and Practice of Knowledge Brokering in Canada’s Health System: A Report Based on a CHSRF National Consultation and a Literature Review. Canadian Health Services Research Foundation. 2003. Available at: http://www.chks4it.org/images/77/73/Theory_and_Practice_Canadas_health_System.pdf. Accessed April 3, 2021.

49. Lomas J. The in-between world of knowledge brokering. *Br Med J.* 2007;129:132–139.

50. Van Kammen J, Jansen CW, Bonsel GJ, et al. Technology assessment and knowledge brokering: the case of assisted reproduction in The Netherlands. *Int J Technol Assess Health Care.* 2006;22:302–306.
51. Van Kammen J, de Savigny D, Sewankambo N. Using knowledge brokering to promote evidence-based policy-making: the need for support structures. *Ball World Health Organ.* 2006;84:608–612.

52. Schlefer Taylor J, Verrier MC, Landry MD. What do we know about knowledge brokers in paediatric rehabilitation? A systematic search and narrative summary. *Physiother Can.* 2014;66:143–152.

53. Ward VL, House AO, Hamer S. Knowledge brokering: exploring the process of transferring knowledge into action. *BMC Health Serv Res.* 2009;9:12.

54. Ward V, House A, Hamer S. Knowledge brokering: the missing link in the evidence to action chain? *Evid Pol.* 2009;5:267.

55. Glegg SM, Hoens A. Role domains of knowledge brokering: a model for the health care setting. *J Neurol Phys Ther.* 2016;40:115–123.

56. Mallidou AA, Atherton P, Chan L, et al. Core knowledge translation competencies: a scoping review. *BMC Health Serv Res.* 2018;18:502.

57. Graham P, Evitts T, Thomas-MacLean R. Environmental scans: how useful are they for primary care research? *Can Fam Phys.* 2008;54:1022–1023.

58. Harden RM. Ten questions to ask when planning a course or curriculum. *Med Educ.* 1986;20:356–365.

59. Malik AS, Malik RH. The undergraduate curriculum of faculty of medicine and health sciences, universiti Malaysia sarawak in terms of harden’s 10 questions. *Med Teach.* 2002;24:616–621.

60. Lunn B. Understanding medical education: evidence, theory and practice (2nd edn). *Bijouph Bull.* 2015;39:103.

61. Deslauriers S, Raymond MH, Laliberté M, et al. Variations in demand and provision for publicly funded outpatient musculoskeletal physiotherapy services across Quebec, Canada. *J Eval Clin Pract.* 2017;23:1489–1497.

62. Bath B, Gabrlish J, Fritzer R, et al. Mapping the physiotherapy profession in Saskatchewan: examining rural versus urban practice patterns. *Physiother Can.* 2015;67:221–231.

63. McFadden B, Jones McGrath K, Lowe T, et al. Examining the supply of and demand for physiotherapy in Saskatchewan: the relationship between where physiotherapists work and population health need. *Physiother Can.* 2016;68:335–345.

64. Norman KE, Booth R, Chisholm B, et al. Physiotherapists and physiotherapy student placements across regions in Ontario: a descriptive comparison. *Physiother Can.* 2013;65:64–73.

65. Holyoke P, Verrier MC, Landry MD, et al. The distribution of physiotherapists in Ontario: understanding the market drivers. *Physiother Can.* 2012;64:329–337.

66. Ellidge C, Awworo A, Cochetti J, et al. Characteristics of facilitators in knowledge translation: an integrative review. *Collegian.* 2019;26:171–182.

67. Cameron D, Russell DJ, Rivard L, et al. Knowledge brokering in children’s rehabilitation organizations: perspectives from administrators. *J Contin Educ Health Prof.* 2011;31:28–33.

68. Russell DJ, Rivard LM, Walter SD, et al. Using knowledge brokers to facilitate the uptake of pediatric measurement tools into clinical practice: a before-after intervention study. *Implement Sci.* 2010;5:92.

69. Rivard L, Russell DM, Roxborough L, et al. Promoting the use of measurement tools in practice: a mixed-methods study of the activities and experiences of physical therapist knowledge brokers. *Phys Ther.* 2010;90:1580–1590.

70. Krathwohl DR. A revision of Bloom’s taxonomy: an overview. *Theor into Pract.* 2002;41:212–218.

71. Malidou AA, Converse M, Randhawa GK, et al. Health services researcher pathway for registered nurses: an integrative literature review. *Health Care Carr Rev.* 2014;2:114.

72. Dawes M, Summerskill W, Glasziou P, et al. Sicily statement on evidence-based practice. *BMC Med Educ.* 2005;5:1.

73. Dobbins M, Hanna SE, Ciliska D, et al. A randomized controlled trial evaluating the impact of knowledge translation and exchange strategies. *Implement Sci.* 2009;4:61.

74. Dogherty EJ, Harrison MB, Graham ID. Facilitating as a role and process in achieving evidence-based practice in nursing: a focused review of concept and meaning. *Worldviews Evid Based Nurs.* 2010;7:76–89.

75. Van Eerd D, Newman K, DeForge R, et al. Knowledge brokering to promote evidence-based policy-making: the need for a map? *J Contin Educ Health Prof.* 2018;16:120.

76. Scharff DP, Rabin BA, Cook RA, et al. Bridging research and practice through competency-based public health education. *J Public Health Manag Pract.* 2008;14:131–137.

77. Harvey G, Kitson A. PARIHS revisited: from heuristic to integrated framework for the successful implementation of knowledge into practice. *Implement Sci.* 2015;11:33.

78. Dobbins M, Ahmed S, Alhassani R, et al. Determinants that influence knowledge brokers’ and opinion leaders’ role to close knowledge practice gaps in rehabilitation: a realist review. *J Eval Clin Pract.* 2020. doi: 10.1111/jep.13482.

79. Dobbins M, Robeson P, Ciliska D, et al. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implement Sci.* 2009;4:23.

80. Traynor R, DeCorby K, Dobbins M. Knowledge brokering in public health: a tale of two studies. *Public Health.* 2014;128:533–544.

81. Robeson P, Dobbins M, DeCorby K. Life as a knowledge broker in public health. *J Contin Educ Health Prof.* 2015;3:29–41.

82. Whitney-Hunter BL. Validity of transactional analysis and emotional intelligence in training nursing students. *J Adv Med Educ Prof.* 2014;2:138.

83. Dagenais C, Laurendeau MC, Briand-Lamarche M. Knowledge brokering in public health: a critical analysis of the results of a qualitative evaluation. *Evals Program Plann.* 2015;53:10–17.

84. Dobbins M, Robeson P, Ciliska D, et al. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implement Sci.* 2009;4:23.

85. Yousefi-Nooraie R, Dobbins M, Marin A, et al. The evolution of social networks through the implementation of evidence-informed decision-making interventions: a longitudinal analysis of three public health units in Canada. *Implement Sci.* 2015;10:166.

86. Van Eerd D, Newman K, DeForge R, et al. Knowledge brokering for healthy aging: a scoping review of potential approaches. *Implement Sci.* 2016;11:140.

87. Gerrish K, McDonnell A, Nolan M, et al. The role of advanced practice nurses in knowledge brokering as a means of promoting evidence-based practice among clinical nurses. *J Adv Nurs.* 2011;67:2004–2014.

88. Sweeney-Cadieux E, Dagenais C, Somé DT, et al. A health knowledge brokering intervention in a district of Burkina Faso: a qualitative retrospective implementation analysis. *PLoS One.* 2019;14:e0220105.