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Inter-Professional Clinical Practice Guideline for Vocational Evaluation Following Traumatic Brain Injury: A Systematic and Evidence-Based Approach

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Abstract *Introduction* This paper introduces an inter-professional clinical practice guideline for vocational evaluation following traumatic brain injury. This guideline aims to explicate the processes and factors relevant to vocational evaluation to assist evaluators (i.e. health care teams, individuals and employers) in collaboratively determining if clients are able to work and to make recommendations for work entry, re-entry or vocational planning. *Methods* Methods in the Canadian Medical Association's (CMA) Handbook on Clinical Practice Guideline and the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument were utilized to ensure rigour. Steps in the CMA handbook were followed and included: (1) identifying the guideline's objective and questions; (2) systematic literature review; (3) study selection and quality appraisal; (4) development of clear recommendations by key stakeholders; (5) guideline pilot testing and endorsement. *Results* The resulting guideline includes 17 key recommendations within the seven domains: (1) evaluation purpose and rationale; (2) initial intake process; (3) assessment of the personal domain; (4) assessment of the environment; (5) assessment of occupational/job requirements; (6) analysis and synthesis; (7) evaluation recommendations. *Conclusions* The guideline may be useful to individually practicing clinicians, health care teams, employers and individuals with TBI. Future research will formally examine the success of the guideline's implementation.

Keywords Brain injuries · Rehabilitation vocational · Work assessment · Employment · Practice guidelines

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Introduction

Individuals returning to work following a traumatic brain injury (TBI) are challenged by the complex interaction of their physical, cognitive and emotional impairments and the multi-factorial demands of occupational requirements [1]. Consequently, a large proportion of individuals who have sustained brain injuries are unemployed or underemployed [2] with reported rates of return to work of approximately 40% 1–2 years post-injury [3]. Unemployment or underemployment following TBI can produce detrimental effects for individuals, their support system, and society [4] resulting in poor psychosocial outcomes, decreased community integration and increased economic dependence [5–7]. More specifically, studies reveal that failure to return to work can lead to poorer psychosocial adjustment and physical ailments and successful return to increased life satisfaction, community integration, economic self-sufficiency and reductions in secondary disability [5, 7]. From a financial perspective, associations are also evident between unemployment and increased rehabilitation, insurance and income replacement costs [8]. For example, in a US study, Johnstone et al. [9] estimate costs of $642 million in lost wages, $96 million in lost income

taxes and $353 million in public assistance in the 1 year alone, when individuals were unable to return to work. Thus, establishing effective processes that enhance return to work rates would positively influence health, quality of life, and economic independence of individual workers, and reduce societal costs.

Clinical practice guidelines (CPG) are systematically developed statements which aim to assist practitioners and patients in making health care decisions about specific clinical circumstances [10]. They are designed to provide a link between the best available evidence and clinical practice [11] by making explicit recommendations to improve health care services and outcomes [12]. Within the broader field of vocational rehabilitation, disease specific guidelines have been developed by associations and national organizations. For example, the National Stroke Foundation of Australia has developed Clinical Guidelines for Stroke Management [13], the American Diabetes Association, diabetes and employment guidelines [14] and the NHS Plus Project in the UK guidelines for the management of occupational aspects of chronic fatigue syndrome [15], to name a few. Guidelines have also been devised by organizations interested in managing workplace disability. For example, the Work Loss Data Institute website contains guidelines for varied workplace injuries or illnesses (e.g. head, hip and pelvis, low back, carpal tunnel syndrome, mental illness, burns, stress and pain), with a focus on diagnosing and developing clinical pathways outlining expected treatment, disability duration and return to work timelines [16]. Still other guidelines have been developed by professional organizations, interested in defining profession-specific roles and competencies in a practice area. One such example is the Occupational Therapy Practice Guidelines for Individuals with Work-related Injuries and Illnesses, developed by the American Occupational Therapy Association [17]. While existing guidelines suggest completion of vocational evaluations, they do not provide detailed recommendations on what the evaluation process should encompass, and/or do not address inter-professional/stakeholder issues.

A critical initial step towards work re-integration is the evaluation of a client's work abilities and readiness. Links between the rigour and efficacy of return to work evaluation and future vocational outcomes have been established. This research evidence indicates that evaluators should follow structured processes, clearly defining the individual, job and workplace elements requiring assessment and explaining the reasoning underlying their interpretations and recommendations [18–22]. However, currently there are no specific detailed guidelines for vocational evaluation in TBI, where individuals may face on-going challenges with physical, cognitive and psychosocial sequalae and workplace accommodations. There is also great variability in how evaluations are completed in practice [23–25].

Within the context of TBI rehabilitation, several guidelines for acute management and rehabilitation are readily available [see reference 26 & 27 for example] but do not address the vocational evaluation process thoroughly. For example, while some guidelines suggest completion of a vocational evaluation and list the factors related to vocational success [27] they do not provide adequate details on the processes that should be followed to ensure a comprehensive evaluation. Other guidelines outline relevant processes for specific service providers, but rely on expert opinion rather than a systematic review of the literature [28]. To address this gap, we developed an evidence-based clinical practice guideline (CPG) for vocational evaluation following TBI. Essential *processes* and relevant *factors* in vocational evaluation are made explicit for health care teams, individuals and employers to foster collaborative decision-making:

- To determine whether or not an individual is currently able to work following a TBI.
- To make recommendations regarding work entry, re-entry or vocational planning.

Guidelines for vocational evaluation would aid the evidence-based selection, integration and synthesis of assessment information and ensure that clinical decision-makers, (e.g. clients, health care teams, employers) base their practices on the best available evidence. The overall goal of this CPG is to promote a systematic and comprehensive approach to vocational evaluation to improve employment outcomes following TBI. This paper describes the methods used to develop the guideline and the resulting recommendations.

Method

This project received ethics approval from the University of Toronto, Health Sciences Research Ethics Board in November 2009. The guideline development process was guided by the criteria in the Appraisal of Guidelines for Research and Evaluation (AGREE) instrument [29] and the steps outlined in Canadian Medical Association's Handbook on Clinical Practice Guidelines [30]. These included: (1) articulating purpose, objectives, questions and intended audience for the guideline; (2) performance of a systematic literature review; (3) gathering a panel of key stakeholders and ensuring editorial independence; (4) developing and writing the guideline using the systematic review; (5) ensuring recommendations applicable to clinical practice. Each of the steps in the process is described in detail below. The sixth and final step involved the pilot testing of the guideline in everyday clinical practice.

Identification of Guideline Objectives and Questions

Three questions guided the retrieval of evidence relevant to vocational evaluation:

1. What processes should evaluators follow when completing a vocational evaluation of clients' work abilities post-TBI?
2. What factors should evaluators consider when completing a vocational evaluation of clients' work abilities post-TBI?
3. What do individuals who have experience a TBI and attempted to return to work perceive to be relevant to the process of return to work and vocational evaluation?

Systematic Literature Review

A full description of the methods and results of the literature review are presented in two papers: "An integrated review of the processes and factors relevant to vocational evaluation following traumatic brain injury" [31] and "Towards developing a guideline for vocational evaluation: The qualitative synthesis of clients' perspectives [32]." A summary of the methods, guided by criteria provided in the Cochrane Handbook of Systematic Reviews follows [33]. Four data bases (i.e. Medline; PsychInfo; Embase; The Cochrane Library of Systematic Reviews) were searched for descriptive articles, quantitative and qualitative studies. Nine websites were also searched for clinical practice guidelines (e.g. Scottish Intercollegiate Guideline Network; US National Guideline Clearinghouse; New Zealand Guideline Group). Two trained reviewers (first author and other expert) independently appraised methodological quality. Based on their consensus on quality, the following evidence was retrieved and constitutes the predominant evidence base from which the guideline recommendations were developed:

- Twelve descriptive articles [21, 22, 34–43] and 3 qualitative studies [24, 44, 45] which focused on the vocational evaluation process.
- Eight review articles [46–53] and 30 quantitative studies reporting factors associated with successful employment outcomes [1, 2, 54–81].
- Six qualitative studies addressing clients' experiences with return to work [82–87].
- Three clinical practice guidelines with recommendations specific to vocational evaluation [27, 28, 88].

Additional suggestion of evidence not captured in the initial review was also solicited from panel members [89, 90]. One panel member suggested the inclusion of a recent review of communication disorders [91]. This evidence was utilized to develop recommendations for assessing the communication domain. A second panel member recommended evidence from the American Academy of Clinical Neuropsychology Consensus Statement on the Neuropsychological Assessment of Effort [92] which was incorporated into the recommendation related to neuropsychological assessment. At the suggestion of another panel member, evidence on obtaining informed consent and privacy [93–96] was also retrieved.

Guideline Panel

A panel of experts was convened to review the research evidence and assist with developing recommendations. Panel members were recruited through expert clinicians in the field of TBI rehabilitation and academics studying return to work, TBI and guideline development. The resulting panel included ten members (see Table 4), representing a range of professional backgrounds (e.g. occupational therapy, physical therapy, social work, medicine, speech and language pathology, neuropsychology, employment, academic), with a breadth and depth of clinical and methodological expertise (e.g. qualitative and quantitative), and experience in broad practice contexts (e.g. publically funded hospital-based; public and privately funded community-based; academic). Eight to ten members is considered large enough to allow for exploration of issues and a reliable process, but small enough to ensure a coordinated process [97, 98]. Heterogeneous and multispecialty groups are also deemed preferable as they allow members to take on complementary roles depending on their domain of knowledge [99] and allow for a broader ranges of opinion, moderating differences between raters during consensus building, and producing better judgments [98–100].

While unable to attend the meetings, one consumer also provided input to the panel (through an interview with the first author) highlighting the significance of identifying relevant post-injury vocational goals and assessing job demands, work settings and individual's emotional readiness to return to work. This was supplemented with evidence from the previously conducted qualitative synthesis of clients' perspectives [32].

All panel members were asked to identify their respective positions, and potential biases by completing a positionality and declaration of interest statement and by discussing their specific roles and perspectives. This ensured both the editorial independence of the guideline and that panel members were made aware of one another's expertise and experience [98, 101]. Only two panel members indicated any potential conflict of interest (see Table 4). However, it should be noted that none of the

funding agencies had any authority for directing the guideline development process and the guideline is editorially independent.

Developing and Writing the Guideline Recommendations

Research Methods Used

Two overarching research methods were employed to ensure a rigorous process. First, a modified nominal group technique was used to obtain and synthesize the views of expert panel members and to build consensus on the content of the guideline and its specific recommendations [98]. This technique involved a cycle of three steps (i.e. independent private ratings; analysis of rating results, facilitated discussion of issues arising from the initial ratings) which continued until consensus was reached. The use of structured and formal consensus method provides replicable and transparent methods for synthesizing individual judgments and decreases the likelihood of bias and poor decisions [98, 100]. Second, a written audit trail was maintained by the first author for tracking how group composition, the status or personal experiences of individual members, the ways in which the evidence was presented could have influenced group decision-making processes, as well as to document the key discussion points, convergent and divergent opinions, and changes in the directions taken by the group [97, 98, 100, 102–104]. The formulation and writing of the recommendations included the following four steps.

Disseminating of the Review and Preliminary Recommendations to Panel Members

Based on the evidence gathered from the review the first author developed preliminary guideline recommendations in relation to the following 7 domains: *evaluation purpose and rationale; initial intake process; assessment of the personal domain; assessment of the environment; assessment of occupational/job requirements; analysis and synthesis; evaluation recommendations.* Studies reveal that participants who receive syntheses of evidence early in the guideline development process tend to produce judgments closer to the research evidence [98, 100, 104]. Thus, each panel member was sent an information package which included: a paper outlining the guideline development process [105]; summaries from the review with corresponding evidence tables and references; the preliminary guideline recommendations. One month later a teleconference meeting was convened to discuss the review and panel members' roles in the process.

Panel Member's Initial Rating of Preliminary Recommendations

Subsequent to this initial meeting, panel members were asked to evaluate each preliminary recommendation by completing a survey rating their level of agreement with each, using a five point scale, ranging from strongly disagree (1) to strongly agree (5). They were also asked to expand on specific recommendations, providing comments or rationales for their ratings and suggestions on additional recommendations that should be included in the guideline.

Survey results were analyzed quantitatively to identify percentages of agreement on each recommendation. A recommendation was retained for further review if 75% of panel members rated it as either agree (4) or strongly agree (5). As all preliminary recommendations met this 75% threshold all were retained for further consideration. Recommendations with the greatest divergence in ratings (between an individual panel member's ratings and the majority of the group's ratings) were extracted for further discussion during the next panel meeting. These included recommendations related to the assessment of academic and work-related skills, supervisor and co-worker's attitudes, and determinations of whether occupational goals were realistic.

A qualitative content analysis [106] of the comments accompanying panel members' ratings was completed to gain insight into their rationales and to identify additional recommendations that required further clarity and discussion. Comments were grouped into four categories: (1) the need to clarify language, expand definitions and add illustrative examples; (2) recommendations deemed by panel members as "very important"; (3) the capacity of vocational evaluators to complete the full scope of the evaluation given resource restrictions; (4) recommendations seen as more challenging to implement due to subjective measurements or circumstances beyond evaluators control. Three topic areas for additional recommendations were also suggested and included: the processes necessary for obtaining informed consent; the need for more detailed assessment of occupational requirements, communication and social adaptive skills; and the reporting of evaluation outcomes to relevant stakeholders. Based on this initial survey data, modifications and additions were made to the preliminary recommendations and summaries were prepared for panel members' further review and discussions during the planned full day panel meeting.

Full Day Meeting of the Panel

A full day, professionally facilitated panel meeting was convened at the University of Toronto on April 9, 2010. The first author assured panel members had reviewed the

Table 1 Levels of evidence

Level 1	Meta-analysis of RCTS OR at least 1 RCT
Level 2	At least one well-designed controlled study without randomization OR quasi-experimental
Level 3	Evidence from non-experimental designs e.g. qualitative, comparative, correlation, predictive
Level 4	Evidence from committee reports, opinions or clinical experience of experts

Table 2 Strength of recommendations

Grade A	At least one RCT as part of body of evidence Overall good quality and consistency
Grade B	No RCTs on the subject but well-designed clinical studies (from levels 2 or 3)
Grade C	Expert opinion and clinical experience of respected authorities (from level 4)
Good practice point	Recommended good practice based on clinical experience of guideline development Group

results from the initial survey and maintained an audit trail of the process and suggestions for modifications to the guideline. The facilitator was responsible for discussion and consensus building throughout the day. The facilitator reviewed panel members' expectations for the day and established norms for appreciating perspectives across professional and managerial status to guard against confirmation bias [97, 107].

First, using relevant questions from the AGREE [29] the panel worked as a large group to review the guideline objective, clinical questions addressed, target population and users, definitions, and processes used to ensure the rigor of the literature review, diverse panel representation, and editorial independence. Then panel members were divided into two groups to complete an in-depth review of each individual recommendation. Using questions from the AGREE [29] panel members were asked to discuss and provide written comment on each recommendation related to: clarity, specificity, linking with the research evidence, benefits, risks and potential organizational barriers to implementation, and criteria for auditing purposes. Group assignments were determined by member's professional expertise in relation to a recommendation, and attempts to balance perceived power differentials related to professional status [100, 104]. Responses to these questions were used to improve the clarity of each recommendation, and to annotate each recommendation with 'application considerations' related to potential risks and benefits, costs and organizational/contextual facilitators and barriers to implementation.

Panel members also assigned a level of evidence and strength of recommendations score using processes described by the National Institute of Clinical Excellence [89] and the New Zealand Guideline Group [90]. Panel members were provided with a summary of the number of studies that supported each recommendation and the levels of evidence, utilizing the criteria indicated in Table 1. Panel members were then asked to assign a rating for the strength of a recommendation (i.e. an indicator of level of confidence in a specific recommendation) by considering both the types of evidence available (as indicated in Table 2) and the following three additional criteria: volume of evidence (i.e. number of studies); consistency of findings (i.e. across the various studies and study types); clinical applicability (i.e. relevance and impact). Panel members' written feedback (solicited by the facilitator at the end of the full day meeting) indicated that they found the process to be "collaborative", "collegial", and "inclusive" with opportunities provided for participation, discussion and supportive communication.

Panel Members Second Rating of Recommendations

Following revision of the guidelines as recommended by panel members at the full day meeting, a second survey was administered to obtain panel members' final ratings and comments. This second survey asked panel members to rate their levels of agreement, using a five point scale (ranging from strongly disagree to strongly agree) in the following areas: the guideline's objective, intended population and users; definitions and consistency of language; individual recommendations and their sub-elements; contextual and application considerations; suggestions regarding potential future reviewers following the guideline's completion. Survey results were analyzed quantitatively to determine the percentage of agreement for each recommendation and qualitatively to identify where clarifications were required in specific recommendations. Ninety percent of panel members either agreed or strongly agreed with each primary guideline recommendation and thus all primary guideline recommendations were retained. Some sub-elements within guideline recommendations were removed to reduce redundancy (e.g. 'self-regulation' was in several recommendations) or moved to improve fit (e.g. 'anosmia' was removed from neuropsychological assessment and replaced in physical/sensory assessment).

Panel member's comments were utilized to further refine and improve the clarity of each recommendation.

Ensuring Recommendations Applicable to Practice

Several strategies were employed throughout the development of the guideline to ensure clarity and enhance the future applicability of recommendations into practice. First, recommendations were written using language accessible to clinicians, clients and employers [12] and behaviorally specific to facilitate implementation and to assist with developing criteria for evaluating implementation success [108, 109]. Second, recommendations were sequenced with respect to the day-to-day processes and ease of implementation by vocational evaluators [110, 111]. Third, recommendations were cross-referenced to the relevant evidence, with levels of evidence and strength of recommendation explicitly stated to assist users in making implementing decisions [109]. Fourth, clinical or employment issues such as potential costs, risks and benefits, contextual/organizational barriers [112, 113] that could affect recommendation implementation were summarized in a section entitled "Application Considerations".

Results: the Inter-professional Guideline for Vocational Evaluation Following TBI

In total 17 recommendations were retained and incorporated into the Inter- professional Guideline for Vocational Evaluation Following Traumatic Brain Injury. A summary of the guideline's objectives, target population and user, and the key recommendations follow. For the full guideline readers may contact the first author. The primary questions this guideline aims to address include:

1. What processes should evaluators follow when completing a vocational evaluation of individuals' work abilities post-TBI?
2. What factors should evaluators consider when completing a vocational evaluation of individuals' work abilities post-TBI?

For the purpose of this guideline, traumatic brain injury is defined as a brain injury caused by an external mechanical force such as a blow to the head, concussive forces, acceleration-deceleration forces, or a projectile missile such as a bullet [114]. Vocational evaluation is defined as a comprehensive collaborative inter-professional process of evaluating an individual's current work abilities and work functions, limitations, and tolerances in order to:

- Gain an understanding of an individual's work-related strengths and deficits.
- Determine whether the occupation or job being evaluated is consistent with the individual's interests and abilities.
- Make recommendations as to the supports necessary to achieve the identified occupational or job goal (e.g. training, education, job coaching, additional services and supports) [34].

The target population includes individuals who have experienced a traumatic brain injury (mild, moderate or severe) and who are between the ages of 18–65 (as per the research evidence used to develop the guideline). The target users of the guideline include: health and vocational professionals, employers and individuals with TBI who are involved in planning and decision-making related to work.

A summary of the 17 key recommendations in the guideline are summarized in Table 3, with accompanying indicators of level of evidence, strength of each recommendation and supporting references. Guideline users are encouraged to consult two review papers for in-depth summaries of the evidence supporting each recommendation: (1) An integrated review of the processes and factors relevant to vocational evaluation following traumatic brain injury" [31]; (2) Towards developing a guideline for vocational evaluation: The qualitative synthesis of client's perspectives [32]. The guideline recommendations are organized into 7 sections as per the key process of vocational evaluation identified in the initial review and include: evaluation purpose and rationale; initial intake process; assessment of the personal domain; assessment of the environment; assessment of occupational/job requirements; analysis and synthesis; evaluation recommendations. Specific recommendations are not assigned to a specific profession, as panel members decided that recommendations may apply across professional boundaries and that individual evaluators would consider their areas of expertise, scope of practice, and practice context when using the guideline. Furthermore, evaluators could and should invite input from other individuals and professionals where additional expertise is required. If the guideline is to be implemented by a team, members of the team should first review the guideline, establish roles and responsibilities for specific recommendations and discuss how results from varied assessments will be integrated and potential discrepancies resolved.

Contextual Considerations with Guideline Application

Evaluators must also consider the contextual factors that can influence guideline implementation including: policies and funding for vocational rehabilitation services; the medical legal contexts in which evaluations may be

Table 3 Recommendations from the inter-professional guideline for vocational evaluation following traumatic brain injury

Recommendation	L	S
Identification of the evaluation purpose and rationale		
(1) At commencement of an evaluation, the evaluator should identify the primary rationale and purpose of the evaluation. This should include: [21, 24, 35, 40, 45]	3	B
Referral source(s), who requested the evaluation		
The question(s) to be answered by the evaluation; the areas the evaluation aims to assess and assessment methods		
Identification of the relevant stakeholders and their roles		
(2) At commencement and throughout the evaluation process, the evaluator should obtain an individual's informed consent to engage in the evaluation process. [93–96]	4	C
Initial intake process		
(3) The evaluator should complete an initial intake interview and gather necessary background information on the individual being evaluated including: [1, 2, 22, 28, 34, 40, 42, 43, 54–59, 61–64, 66–69, 72–74, 76–77, 88]	3	B
Pre-injury history (e.g. demographics, health and medical history)		
Educational and work histories (e.g. educational level, credentials/certifications/licenses, jobs held, hourly wages/annual income earned, job satisfaction, pre-injury occupational interests, skills, learning styles)		
Current social status (e.g. current residence/living arrangements, marital status, supports, legal issues)		
Pre-injury job performance and performance evaluations; successes and failures in post-injury work trials		
Assessment of the person: individual's perspective		
(4) An assessment of the person should begin by gathering input from the individual being evaluated including exploration of the following: [34–36, 40, 41, 44, 45, 61–63, 66–68, 75–78, 81–87]	3	B
Work interests and preferences; work goals, values and meaning he/she attached to work pre and post-injury		
Individual's self-perceptions of work performance, strengths, weaknesses, current work competency		
Individual's self-identified use of compensatory strategies and support needs		
Individual's self-reported readiness to work and anticipated challenges/barriers to work or return to work		
Individual's own evaluation of the costs and benefits of working/not working such as financial (e.g. benefits, health coverage) and personal (e.g. physical, mental, relationships)		
Individual's understanding of his/her options re: disclosure at the workplace, right to workplace accommodations		
Individual's view of the implications of a decision not to work (e.g. insurance and benefits)		
Assessment of the person: person domains		
The evaluator should complete a thorough assessment of an individual in the following domains: physical; neuropsychological/cognitive; psychosocial; communication; functional status/level of independence, general behaviours; work-related skills/behaviours		
(5) Assessment of the physical domain should include: [34, 40, 43–45, 62, 65, 66, 88]	2	B
Assessment of the presence of physical and sensory impairments (e.g., fatigue, pain), physical abilities in relation to work goal and/or demands (e.g., mobility, stamina)		
Assessment of medical/physical restrictions, medications, treatments that may affect work/job performance		
(6) Assessment of the neuropsychological and cognitive domains should include: [1, 2, 22, 36, 39, 43–45, 53, 57, 58, 60, 65, 66, 68, 70, 72, 73, 78, 89, 92]	2	B
Intelligence/pre-morbid functioning; academic achievement; visual perception; attention and concentration; information processing; memory; praxis; insight; awareness and denial; self-regulation; executive functions		
Assessment of an individual's cognitive skills and abilities in relation to the work goal and/or work/job demands		
(7) Assessment of psychosocial domain should include: [1, 22, 28, 34, 43–46, 58, 61, 63, 66, 78, 79, 85–88]	3	B
Identification of any behavioural or emotional strengths or challenges that may affect an individual's ability to gain or maintain employment. This may include: the presence of mental health diagnoses (e.g. mood disorders, schizophrenia, substance abuse); an individual's ability to engage in and balance multiple work and non-work roles (e.g. parenting)		
Assessment of an individual's psychosocial adjustment and social adaptive skills. These may include: coping style/behaviour; self-esteem/self-confidence/self-efficacy; social appropriateness; positive relationships with peers		
Assessment of an individual's psychosocial skills and abilities in relation to work goal and/or work/job demands		
(8) Assessment of the communication domain should include: [91]	4	C
Auditory perception and hearing; speech production; auditory and reading comprehension; verbal and written expression; conversation; non-verbal communication (e.g. facial expression, tone of voice, body posture); social communication and pragmatics (e.g. ability to understand and respond to verbal-social cues, modulate affect); augmentative communication		
Assessment of an individual's communication skills/abilities in relation to the work goal and/or work/job demands		

Table 3 continued

Recommendation	L	S
(9) Assessment of an individual's functional status and level of independence should include: [2, 36, 45, 46, 56, 59, 64, 72, 82, 87]	3	B
Functional observations during self-care/household/community activities (e.g. meal preparation, finances, community travel)		
Assessment of activities of daily living including home and financial management, route finding, community travel		
Identification of whether a referral for a driving assessment is required for work or return to work		
(10) Observations of individual's general behaviours in naturalistic settings, including indicators such as: [22, 28, 34, 37, 39, 42–45]	4	C
Demonstrating interest, willingness and ability to complete work tasks monitoring, error detection and avoidance of critical errors; strategy retrieval and use; feedback-seeking and altering behaviours accordingly; level of independence and need for structure; speed, timing and accuracy of performance; new learning and performance of unfamiliar tasks; dual task performance, performance consistencies and variability; unsafe behaviours		
(11) Observations of an individual's work-related skills and behaviour during performance in real work setting, or if unavailable, simulated work tasks. This should include observations of: [22, 24, 34, 37, 39, 40, 42–45, 83, 85, 86]	3	B
How physical, cognitive, psychosocial, behavioural, communication impairments affect performance of work-related tasks		
Job searching, job seeking and interview skills		
Attendance and punctuality; productivity (e.g. quality and quantity of work, ability to meet deadlines)		
Ability to management changes in the workplace and problems encountered in the work environment		
Pre-injury work skills and abilities that can be applied to alternate work or work settings		
Environmental modifications which facilitate optimal performance and quality of work		
Assessment of the environment		
The evaluator should complete an assessment of the environmental supports and barriers to work or return to work. This Should include an assessment of the following domains: the physical workplace environment; the work culture; Social supports and opportunities available to the individual both within the workplace and his/her support network		
(12) Assessment of the physical workplace environment should include: [34, 37, 41, 42, 44, 88]	3	B
Light, noise, level of distractions, temperature control; outdoor/indoor work		
Proximity to co-workers (e.g. in relation to both supports and possible distractions); proximity to supervision		
Length of working day and flexibility in scheduling work hours		
Potential risks in the work environment (e.g. heights, dangerous machinery, heavy lifting)		
Travel required (e.g. travel to and from work; travel with work demands; effect of travel on work performance)		
(13) Assessment of the work culture should include identification of whether or not a workplace and its employees demonstrate the following attributes: [2, 22, 36, 44, 45, 70, 79, 81]	3	B
Tolerances for differences amongst employees		
Positive attitudes towards individuals with disabilities (e.g. environment free of harassment and discrimination)		
An understanding of and willingness to learn about TBI and to provide accommodations and/or job modifications		
A willingness to involve employment specialists in a collaborative work planning process		
Opportunities for social participation and team work		
(14) Assessment of supports (i.e.. formal and informal) and opportunities within the workplace and the individual's support network including: [39, 41, 42, 44, 45, 54, 61, 63, 66–68, 77–79, 83, 85, 86]	3	B
Availability of accommodations and/or job modifications in relation to:		
Work activities, work hours, and graduated return to work schedules		
Workstation modifications (including reductions to distractions)		
Adaptive aids/devices and opportunities to apply compensatory strategies		
Availability of workplace supervision; identification of individual(s) able to provide on-going feedback re: work performance		
Availability of instrumental support from natural supports in the community such as family, volunteer or hired support		
Availability of vocational rehabilitation supports and services and transportation (if the individual is unable to drive)		

Table 3 continued

Recommendation	L	S
Assessment of the occupational/job requirements		
(15) The evaluator should complete an assessment of the requirements of the occupation/job the individual is considering entering or re-entering (i.e. job analysis). This should include identification and/or assessment of the following:[37, 38, 40, 42, 44, 45, 88]	3	B
Occupational/job title/category/classification; occupation/job description; complexity, and associated tasks		
Job demands including:		
Physical demands (e.g. lifting, carrying, pushing, stamina)		
Neuropsychological/cognitive demands (e.g. initiation, problem-solving, decision-making, adaptability)		
Psychological/emotional demands (e.g. emotional stability)		
Social demands (e.g. self-monitoring, changes in behaviours required, social skills required)		
Communication and social communication demands (e.g. verbal, non-verbal, written)		
Responsibilities and expectations including:		
Responsibilities related to own job, supervision of others, working with the public,		
Level of independence required to complete job tasks		
Expectations of levels of interactions and socialization with supervisors, co-workers and others (e.g. customers)		
Work hours, shifts, breaks, overtime		
Informal and formal requirements related to education, training, dress		
Safety requirements (e.g. equipment use, driving)		
Analysis and synthesis of assessment results		
(16) Following completion of the assessments, the evaluator should analyze and synthesize findings across the assessments completed. This should include: [22, 24, 34, 37, 39, 40, 42–45, 54, 61, 62, 66–68, 77–79, 83, 85, 86]	3	B
Analysis of the data to determine adequacy of information		
Identification of inconsistencies or conflicting perspectives		
Identification of an individual's work abilities and work functioning in relation to:		
Baseline physical, cognitive, psychological and behavioral impairments		
Functional abilities and limitations, strengths and deficits		
The fit between an individual's abilities, job demands and workplace culture		
Identification of physical, socio-cultural, environmental factors that can affect an individual's work performance including:		
The environments within which the individual functions best and tasks he/she can perform best in those environments		
The level of structure required by an individual and the potential value of modifications, compensatory strategies and prosthetics/aids		
Social or instrumental supports that are either available or can be made available to the individual		
Evaluation recommendations		
(17) Upon completion of the evaluation process, the evaluator should: [24, 34, 39, 40, 43–45]	3	B
Draw conclusions based on the analysis of findings from all assessments completed and data gathered		
Relate conclusions back to the original evaluation purpose/question(s)		
Make recommendations for work re-entry, return to work or future vocational planning		
Provide feedback (i.e. verbal and/or written report) to the individual being evaluated and relevant stakeholders as per consent		
Conclusions and recommendations should include:		
An opinion regarding whether or not a specific work goal is line with individual's current work interests, aptitudes and abilities		
An opinion as to whether the individual being evaluated is capable of attempting to return to a specific job at a particular workplace or whether modifying the job goal/work environment could increase chances of success		
An opinion as to whether or not compensatory strategies could be used to reduce disability, functional limitations, undesirable behaviours, or maintain consistent successful performance		
Recommendations with regards to supports, accommodations, compensatory strategies, suitable modified job duties or alternate jobs or occupations		
Recommendations regarding additional recovery, training, treatment, assessments or interventions that may be required to meet the identified work goal		

L level of evidence, *S* strength of recommendation

completed; and cultural considerations. While the panel indicated that recommendations may generally apply across many jurisdictions, specific legislative/policy, service delivery and compensation systems would need to be considered in each jurisdiction (e.g. country, province, state). For instance, from funding and policy perspectives, in the US vocational rehabilitation services are supported by the Rehabilitation Amendment Act (1986) at the state level. In Sweden, the National Security System oversees the provision of both work trials with pre-injury employers and income replacement benefits. In New Zealand, a single entity, the Accident Compensation Corporation (ACC) funds both vocational rehabilitation services and income replacement benefits. In Canada, funding may be provided through public universal health or private automobile or workplace insurance.

Vocational evaluators must also consider the medical legal and disability management contexts (e.g. automobile insurance, personal injury litigation, workers' compensation) in which vocational evaluation may take place and how this can potentially influence the completion, validity and reporting of evaluation findings. This is particularly relevant in situations where there are financial incentives, secondary gain or in legal, adversarial or forensic practice contexts [115–121]. The American Academy of Clinical Neuropsychology indicates that neuropsychological assessment should incorporate some formal evaluation of test taking motivation and effort, which may include formal symptoms validity tests, embedded measures within the neuropsychological examination itself (e.g. grip strength) and observations of inconsistencies within and across test performance [92]. Some examples of symptom validation tests reported in the TBI literature include: The Test of Memory Malingering [116], California Verbal Learning Test [116], The Recognition Memory Test [122], Word Memory Test [118, 119] and the Rey 15-Item Memory Test [119].

Evaluators must also be sensitive to cultural issues when applying the guideline. While still limited, evidence from the research literature reveals that individuals from minority groups are more vulnerable to suffering a traumatic brain injury, experience greater linguistic, economic, social and attitudinal barriers, lower access to vocational rehabilitation services, and lower rates of return to work [31, 56, 63, 123–125]. The meaning ascribed to work may also vary between individuals, cultural and ethnic groups. For example, research into how individuals define community participation reveals that individuals from different ethnic backgrounds may place different values on participation activities, including work [126, 127]. Research examining client's perspectives reveals that the meaning of work can also change following a brain injury, and that clients may re-evaluate their work goals in relation to other life demands [32]. Thus, both individual and cultural difference in values and beliefs must be considered during vocational evaluation.

Discussion

The Inter-professional Guideline for Vocational Evaluation Following Traumatic Brain Injury was developed using rigorous methods and based on both the best available research evidence (from across research designs) and the expertise of a panel of expert clinicians and academics. To our knowledge no other guideline exists which elucidates and integrates the key processes and factors relevant for evaluators to consider when completing a vocational evaluation with a survivor of TBI. Specific practice considerations are also provided for each recommendation to facilitate implementation into vocational evaluation practices.

Utilizing evidence from the literature which examines effective and rigourous work evaluations, the guideline encourages evaluators to: be clear about the purpose of their evaluation and to choose appropriate assessments for the defined purpose; to analyze their assessment results thoroughly for adequacy and consistency and to relate an individual's abilities to work demands and environmental supports; to develop clear recommendation for future vocational planning, providing specific evidence from their assessment findings to support recommendations. Utilizing the evidence base from the quantitative literature, the guideline outlines key personal, environmental and occupational factors associated with successful employment following TBI that should be considered by evaluators when assessing personal, environmental and occupational domains. Utilizing evidence from individual's own experiences with returning to work, the guideline ensures clients inclusion as integral members of the evaluation team and that their post-injury work goals, self-perceptions and potential anticipated challenges are considered. Developed by an inter-professional group this guideline also aims to encourage communication, collaboration and problem-solving amongst the varied stakeholders who may be involved in the vocational evaluation process.

Several factors and processes identified as relevant to vocational evaluation in this guideline mirror codes and categories from the International Classification of Function, Disability and Health's (ICF), which have been used most recently to develop a core sets for defining function in vocational rehabilitation [128–131]. For example, domains encompassing the assessment of physical and cognitive skills in the guideline relate to ICF codes within the level of body functions. Domains involving the assessment of communication, psychosocial, work-related skill and

general functional status relate to activity and participation categories in the ICF. Similarly, codes related to environmental supports in the ICF (e.g. from society, family, friends, professionals and employment services) are reflected in the recommendations involving assessment of the environment within the guideline. Further research may focus on exploring more formal links between this guideline and the ICF.

Limitations

Several limitations need to be considered when interpreting evidence from the initial review and resulting guideline recommendations. First, although every attempt was made to identify all current and relevant evidence from the research literature and panel members were asked to provide evidence from their own knowledge, practices or the grey literature, additional evidence may also exist. Second, the state of the literature also imposes some limitations as no evaluative or randomized control trials were identified in the original review. In addition, there was a range of diagnoses and levels of severity among the individuals included in the samples of the studies reviewed. Thus, while our inclusion criteria ensured that the studies selected for review included a majority of individuals with TBI (i.e. greater than 50%) we were not able to separate out evidence solely related to TBI in all cases. Similarly, the evidence and resulting guideline recommendations are not stratified according to mild, moderate or severe brain injuries, as many of the study samples included individuals with varied levels of injury severity. Definitive conclusions could also not be drawn about the association between injury severity as an individual factor and vocational outcomes, based on review of the research evidence [31]. Lastly, while members of the panel possessed considerable breadth in their expertise and experience (as a group having worked across three countries and/or provinces), they were recruited from a specific geographical location, in one country. While we believe the guideline has broader applicability, ultimately, review and implementation of the guideline in other countries and jurisdictions will assist in evaluating its applicability across different jurisdictions, legislative, service delivery and compensation systems.

Future Research

Several gaps in the research evidence base were identified through the review. First, while multiple factors (e.g. age, education, injury severity, length of hospital stay, post-injury neuropsychological status, type of occupation, environmental supports) have been examined in relation to employment outcomes post-TBI, there has been a limited focus on understanding the role of communication, psychosocial adjustment and workplace supports in facilitating successful return to work. Second, while it is recognized that clients play a pivotal role in the return to work process, there has been limited exploration of what this role should be, and limited inclusion of client perspectives in clinical practice guidelines. Similarly, while it is consistently recognized that environmental supports, such as social and instrumental supports from family, employers, co-workers and vocational rehabilitation services are crucial to success, there is limited understanding of how these support elements must interact to facilitate positive vocational outcomes. Third, with a predominant focus on gaining an understanding of factors that influence gaining or re-gaining employment following TBI, there is less evidence related to factors that can affect longer term employment maintenance and little is known about individuals' career trajectories post-TBI as well as larger labour market changes that can affect job availability.

Preliminary evaluation of the guideline's application in occupational therapists' vocational practices has been completed. In this preliminary study we examined the feasibility of applying the guideline in day-to day practice and facilitators and challenges to its implementation, as well as pre-tested the effects of the guideline on changes in clients' functional and vocational status. Preliminary results appear promising with participants indicating that use of guideline allowed them to identify practice gaps, systematize their evaluation processes, enhance inter-professional and stakeholder communication, and re-conceptualize vocational evaluation across populations (e.g. stroke, mental health, chronic pain. This suggests that while the factors identified within the guideline may be specifically related to the evidence in TBI, the overarching processes identified in the seven key domains may be relevant to vocational evaluations across illness, injury or disability groups. However, further testing of the guideline with other populations is warranted before any definitive conclusions can be drawn. Knowledge gained from this initial evaluation will assist us to further identify audit criteria and to develop education tools and an audit checklist to support the guideline's application. Future research will comprehensively evaluate the effectiveness of this guideline to improve vocational assessment processes and outcome for individuals with TBI. A review and update of the guideline is planned to occur in 5 years pending available resources.

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Appendix

See Table 4.

Table 4 Guideline panel

Name and affiliation	Expertise
Ms. Rosemary Anderson, Neurology Program, Toronto Rehabilitation Institute	Physical Therapist Public Hospital Services Private Community-Based Services
Ms. Jane Casey Rehabilitation Management Inc.	Vocational Rehab Counselor Case Manager Life Care Planner Private Community-Based Services
Ms. Christine David Director Employment Services, Community Head Injury Resources Services	Employment Specialist Public Community-Based Services Private Community-Based Services
Dr. Deirdre Dawson* Senior Scientist, Kunin-Lunenfeld Applied Research Unit, Baycrest Associate Professor, Department of Occupational Science & Occupational Therapy, University of Toronto	Academic Brain Injury Rehabilitation Return to Work Occupational Performance Quantitative Research Methods
Dr. Mark Dowhaniuk Day Hospital, Bridgepoint Health	Clinical Neuropsychologist Public Hospital Vocational Services Private Community-Based Services
Dr. Susan Rappolt Associate Professor & Chair, Department of Occupational Science & Occupational Therapy, University of Toronto	Academic Research Utilization; Guideline Development; Policy & Practice Qualitative Research Methods
Ms. Karen Sasaki Neurological Outpatient Services, Toronto Rehabilitation Institute	Social Worker, Public Hospital Services
Ms. Elyse Shumway Director Neuro Rehabilitation Consultants	Speech and Language Pathologist Public Hospital Services Private Community-Based Services
Ms. Mary Stergiou-Kita** Ph D candidate, Graduate Department of Rehabilitation Science,,University of Toronto	Occupational Therapist Public Hospital Services Private Community-Based Services Academic: Return to Work; Brain Injury Rehabilitation
Dr. Milan Unarket, Medical Director of Rehabilitation, Bridgepoint Health	Physician, Physical Medicine and Rehabilitation
Ms. Anne William Hunt Ph D student, Graduate Department of Rehabilitation Science, University of Toronto	Occupational Therapist Private Community-Based Services Academic: Brain Injury; Cognition; Occupational Performance

*Panel member who indicated potential conflict related to research funding

**Panel member who indicated potential conflict related to personal doctoral awards

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