



Implementing Evidence-Based Assessment Practices for the Monitoring of Spoken Language Outcomes in Children who are Deaf or Hard of Hearing in a Large Community Program



Intégrer des pratiques d'évaluation fondées sur les données probantes aux protocoles qui servent à faire le suivi du développement des habiletés de langage oral des enfants sourds ou malentendants dans un programme communautaire de grande envergure

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Abstract

The purpose of this quality improvement pilot was to evaluate the effectiveness of an online learning module for (a) changing speech-language pathologists' perceptions about outcome monitoring and assessment protocols for children who are deaf or hard of hearing and (b) supporting speech-language pathologists' understanding of evidence-based protocols to be implemented in their community-based program. Using principles of integrated knowledge translation and the Ottawa Model of Research Use, an online learning module was designed to support the implementation of evidence-based assessment protocols for these children in a large publicly funded program in Ontario, Canada. A pre-post study was then conducted with 56 speech-language pathologists (56/73 who were invited, 77% response rate) who took a pre-module survey, completed the online learning module, and then immediately took a post-module survey. After completing the learning module, speech-language pathologists reported improved perceptions about outcome monitoring, good understanding of the procedures to be implemented, and intentions to implement the new procedures into practice. Implementation materials were rated as highly valuable. Online learning modules can be used to effectively translate evidence-based assessment procedures to speech-language pathologists. Developing interventions using theory and in collaboration with stakeholders can support the implementation of these types of procedures into practice.

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Abrégé

L'objectif du présent projet pilote d'amélioration de la qualité était d'évaluer l'efficacité d'un module d'apprentissage en ligne pour (a) changer la perception des orthophonistes à propos des protocoles de suivi et d'évaluation utilisés avec les enfants sourds ou malentendants et (b) aider les orthophonistes à comprendre les protocoles fondés sur les données probantes qui seront intégrés au programme communautaire dans lequel ils travaillent. En utilisant les principes de transfert des connaissances intégrés et le modèle d'utilisation de la recherche d'Ottawa, un module d'apprentissage en ligne a été conçu pour soutenir l'intégration de protocoles d'évaluation fondés sur les données probantes auprès d'enfants sourds ou malentendants dans un programme de grande envergure financé par le gouvernement de l'Ontario, au Canada. Une étude pré-post a ensuite été réalisée auprès de 56 orthophonistes (56 des 73 orthophonistes qui ont été invités ont pris part à l'étude, ce qui donne un taux de réponse de 77%). Ceux-ci ont d'abord répondu à un questionnaire, ils ont ensuite complété le module d'apprentissage en ligne, puis ils ont répondu à un deuxième questionnaire (immédiatement après avoir complété le module). Après avoir terminé le module d'apprentissage, la perception des orthophonistes concernant le suivi du développement des habiletés était meilleure et les orthophonistes rapportaient avoir une bonne compréhension des procédures qui seront intégrées et des intentions derrière l'intégration des nouvelles pratiques. Le matériel supportant l'intégration a été jugé comme étant très utile. Des modules d'apprentissage en ligne peuvent donc être utilisés pour traduire efficacement aux orthophonistes des procédures d'évaluation fondées sur les données probantes. Développer des interventions en utilisant la théorie et en collaborant avec les acteurs principaux peut soutenir l'intégration de ce type de procédures fondées sur les données probantes dans la pratique.

This paper describes how principles of integrated knowledge translation and the Ottawa Model of Research Use were used to develop materials and methods for implementing evidence-based assessment procedures in a large community-based program (Ontario, Canada's Infant Hearing Program [IHP]) and how speech-language pathologists' (S-LPs) perceptions changed following their participation in a quality improvement pilot study to evaluate the impact of those implementation efforts.

Background

The IHP is a branch of the Ontario Ministry of Children, Community and Social Services in Ontario, Canada. The program provides family-centered Early Hearing Detection and Intervention services. Its policies and procedures are informed by the Joint Committee on Infant Hearing best practice recommendations (Joint Committee on Infant Hearing, 2007; Joint Committee on Infant Hearing et al., 2013) and international Early Hearing Detection and Intervention consensus statements (Moeller, Carr, Seaver, Stredler-Brown, & Holzinger, 2013). Broadly, the IHP supports families through the provision of universal newborn hearing screening, continued monitoring of babies at risk of developing childhood hearing loss, follow-up audiological assessment and services, provision of amplification technologies (i.e., hearing aids), and spoken or signed language development services (as decided by the family) for children who are deaf or hard of hearing from birth until 6 years of age. S-LPs working to support spoken language development in this program provide assessment, consultation, and intervention services for over 900 children who are deaf or hard of hearing each year (Ontario Ministry of Children, Community and Social Services, personal communication, July 20, 2018).

For families who choose for their child to learn spoken language, the IHP recognizes the benefit of routine assessment of children's spoken language skills (Joint Committee on Infant Hearing, 2007). Since 2009, S-LPs working in the IHP have been required to complete both the auditory comprehension and expressive language scales from the Preschool Language Scales (4th ed.; PLS-4; Zimmerman, Steiner, & Pond, 2002) for all children every 6 months for the duration of their time accessing services. Informally, S-LPs reported a lack of appreciation for the outcome monitoring program. They reported not understanding the need for program-level outcome monitoring, how or why the data they submitted were used, and concerns that regularly scheduled assessments meant time lost from direct intervention. S-LPs had also identified concerns with the choice of measurement tool based in part on a blog post that had been circulated that portrayed the Preschool Language Scales as invalid ([https://](https://community.asha.org/blogs/kristin-smith/2014/10/28/pls-5)

community.asha.org/blogs/kristin-smith/2014/10/28/pls-5). In part, these challenges led to inconsistent understanding and application of outcome monitoring procedures and irregular submission of outcomes data (Daub, 2016).

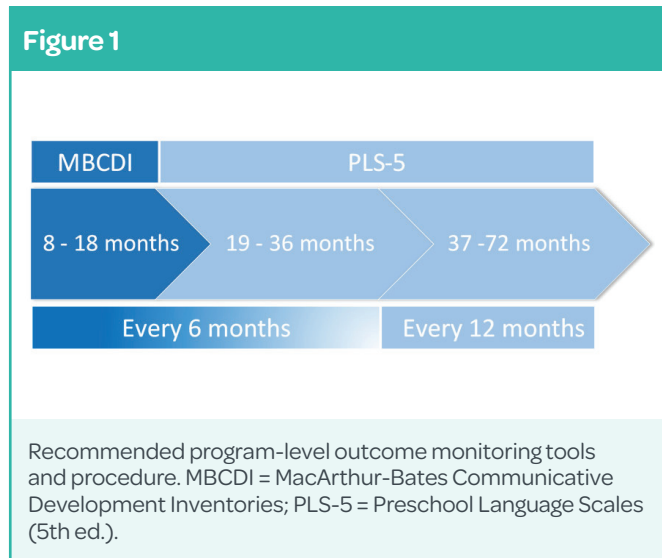
Collaborating to Improve Outcome Monitoring

A newer version of the Preschool Language Scales was developed in 2011, the Preschool Language Scales, Fifth Edition (PLS-5; Zimmerman, Steiner, & Pond, 2011). This, together with S-LPs' concerns, prompted the IHP to review their program level outcome monitoring procedures to determine whether the Preschool Language Scales was still the best tool for measuring spoken language outcomes in children who are deaf or hard of hearing.

Our research team was approached to support the review of procedures and asked to conduct an independent review of the literature to (a) identify the best tools for measuring spoken language outcomes in the IHP and (b) make recommendations about spoken language outcome monitoring procedures for the program. The review included a systematic search of three databases (i.e., CINAHL, Pubmed, and Scopus) to identify studies published in English between 1990 and 2016 that included children who wore hearing aids (Oram Cardy & Daub, 2017). Twenty-two tests that had been used with children who are deaf or hard of hearing between birth and 6 years of age were identified. The 22 tests were then evaluated and compared for basic (publication year, time to administer, format, skills tested, age range covered) and psychometric (sensitivity, specificity, diagnostic accuracy, reliability, validity) properties. Evidence was weighted for each test to generate an overall determination of whether it was effective in identifying disorders and detecting change in children who are deaf or hard of hearing, and an overall conclusion for appropriateness for use in the IHP was made (Oram Cardy & Daub, 2017). Based on this analysis, the PLS-5 was identified as the best tool for measuring program level spoken language outcomes due to its psychometric properties and because it provides norm-referenced scores for all ages (birth to 6;0 years) of children the IHP serves (Oram Cardy & Daub, 2017).

The literature review supported clinical use of the PLS-5 for children who are deaf or hard of hearing right from birth; however, S-LPs identified clinical concerns with using the PLS-5 with the IHP's youngest children (i.e., those under 18 months of age). Further review of the literature supported the use of the MacArthur-Bates Communicative Development Inventories – Words and Gestures (2nd ed.; MBCDI; Fenson et al., 2007) as the best alternative for evaluating spoken language outcomes for children up to 18 months of age (Oram Cardy & Daub,

2017). In accordance with the Joint Committee on Infant Hearing recommendations, we recommended that S-LPs test all children who are deaf or hard of hearing with the MBCDI (up to 18 months) or the PLS-5 (19 months and older) every 6 months during the first 3 years of life and every year thereafter until 6 years of age (Figure 1). This was recommended regardless of whether children's skills were found to be within normal limits after testing and would allow the IHP to compare spoken language scores to normative data for same-aged children with typical hearing.



In addition to increased risk for delays in overall spoken language development, children who are deaf or hard of hearing are also at increased risk for delays in specific areas of speech and language (i.e., aspects of vocalization/articulation, vocabulary, grammar, and early literacy) even when they score within age expectations on broadly focused tools like the PLS-5 (Moeller, Hoover et al., 2007; Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007; Oram Cardy & Daub, 2017). As such, we also recommended that S-LPs monitor children's skills in these specific areas to ensure the IHP would identify children in need of support who may not be identified through program-level outcome monitoring. A restricted set of standardized tests were recommended based on review of the literature as well as clinical and research expertise. The tests were selected to monitor skills specific to (a) articulation, (b) vocabulary and use of grammar, and (c) emergent literacy and phonological awareness at regular intervals (Table 1). Early vocal development and babbling were also domains identified as key vulnerabilities, but our literature review identified no tools for this purpose that were commercially available, clinically feasible, and psychometrically sound (Oram Cardy & Daub, 2017). We are currently working to validate a tool that can be used in the IHP to monitor early vocal development.

Our research team was next tasked with developing methods and materials to implement program-level outcome monitoring and individual vulnerability testing assessment procedures into practice in the IHP. Using an integrated knowledge translation approach, research should be of direct relevance to stakeholders and knowledge users and should find solutions to problems that can be applied in real-world clinical settings (Graham, Tetroe, & Maclean, 2014). We collaborated with policy makers, managers, and S-LPs to develop an online learning module that would provide S-LPs with the knowledge and skills required to complete program-level outcome monitoring and individual vulnerability testing. We worked to ensure the materials and information presented in our online module were directly linked to clinical practice (Olswang & Prelock, 2015). Specific methods for ensuring clinical relevance and value were developed through discussion with stakeholders (i.e., policy makers, managers, and S-LPs), based on our own clinical experience working in the program, and by applying concepts from the Ottawa Model of Research Use (Logan & Graham, 1998) to identify and address known barriers and facilitators to implementation. The format and content of the online learning module (including implementation materials) were designed to address barriers and highlight supports. Integrated knowledge translation is believed to increase the relevance, applicability, and impact of research, and may help to close the well-documented research-to-practice gap because stakeholders (e.g., government, management) and knowledge users (e.g., S-LPs) are collaborators throughout the research process (Graham, Kothari, McCutcheon, & the Integrated Knowledge Translation Research Project Leads, 2018; Olswang & Prelock, 2015).

The online learning module was primarily designed to provide information about program-level outcome monitoring; however, it also provided information about assessment for individual vulnerability testing for a subgroup of S-LPs who agreed to test this assessment procedure as well. Prior to implementing the new program-level outcome monitoring and individual vulnerability testing procedures across the IHP, it was agreed that both procedures should be tested at select sites in a quality improvement pilot study so that results could support the team in further improving materials (if necessary) prior to provincial implementation (Olswang & Prelock, 2015). The research team designed the pilot study methods, with input about feasibility and timing from policy makers and managers.

Study Aims

The aims of this study were to (a) confirm S-LPs' understanding of and perceptions about program-level

Table 1 Key Areas of Vulnerability and Recommended Assessment Tools and Schedule for Individual Outcome Monitoring		
Areas of vulnerability	Recommended assessment tools	Developmental stage
Vocalization/babbling/articulation	Test to be identified	< 30 months
	Goldman Fristoe Test of Articulation – Sounds in Words subtest (3rd ed.; Goldman & Fristoe, 2015)	30 months and older
Vocabulary and syntax	MacArthur-Bates Communicative Development Inventories, Words and Gestures – Words produced (2nd ed.; Fenson et al., 2007)*	8 to 18 months
	MacArthur-Bates Communicative Development Inventories, Words and Sentences – Words produced (2nd ed.; Fenson et al., 2007)	19 to 30 months
	Expressive One Word Picture Vocabulary Test (4th ed.; Martin & Brownell, 2010)	2 to 3 years
	Clinical Evaluation of Language Fundamentals Preschool – Word Structure subtest (2nd ed.; Wiig, Secord, & Semel, 2004)	3 to 6 years
	Comprehensive Assessment of Spoken Language Preschool – Grammatical Morphemes subtest (2nd ed.; Carrow-Woolfolk, 2016)	3 to 6 years
Emergent literacy and phonological awareness	Clinical Evaluation of Language Fundamentals Preschool – Pre-literacy rating scale (2nd ed.; Wiig, Secord, & Semel, 2004)	4 to 6 years
	Clinical Evaluation of Language Fundamentals Preschool – Phonological Awareness subtest (2nd ed.; Wiig, Secord, & Semel, 2004)	4 to 6 years

Note. *The MacArthur-Bates Words and Gestures was also recommended for program-level outcome monitoring.

monitoring procedures prior to completing an online learning module; (b) document our efforts to use principles of integrated knowledge translation and a theoretical framework to develop an online learning module to translate evidence-based assessment procedures to S-LPs working in the IHP; and (c) determine whether S-LPs’ perceptions about regular assessment and outcome monitoring, understanding about the procedures to be implemented, and intentions to implement changed after completing the online learning module. We anticipate that findings will be useful to the broader research community interested in using integrated knowledge translation to implement evidence-based procedures into practice. We also expect our findings will be useful to other programs considering implementing or modifying outcome monitoring procedures.

Using Theory to Support Implementation

The Ottawa Model of Research Use (Graham & Logan, 2004; Logan & Graham, 1998) was derived from theories of change and developed for policy makers and researchers wanting to implement health research evidence into practice and policy. This model informed our implementation materials and online intervention. It is interactive and has six

key interconnected elements that address the process by which research is adopted: (a) the practice environment, (b) potential adopters, (c) the evidence-based innovation, (d) transfer strategies, (e) adoption, and (f) outcomes.

During the development of interventions and throughout the implementation process, barriers are assessed to identify factors that are likely to support or hinder the uptake of evidence. These barriers are assessed within three elements of the Ottawa Model of Research Use: the practice environment, potential adopters, and evidence-based innovation. A description of these three elements follows.

The practice environment. The practice environment can facilitate or inhibit the adoption of new policies and procedures into practice. Factors affecting adoption can be structural, social, or patient-related. Structural factors include an organization’s decision-making structure; rules, regulations, and policies; resources and supplies; system of incentives; and required workload. Social factors include organizational politics, personalities, the presence of local advocates, and the culture of an organization. Patients may encourage or discourage adoption through their interest and/or willingness to participate (Logan & Graham, 1998).

Potential adopters. Potential adopters of evidence-based information may include patients, S-LPs, administrators, or policy makers. In this study, the potential adopters were S-LPs. Using the Ottawa Model of Research Use, barriers and supports that may influence the uptake of new evidence were assessed for S-LPs' knowledge about the new procedures, attitudes about implementation, and skills to implement the procedures (Logan & Graham, 1998).

The evidence-based innovation. The evidence-based innovation is evaluated for the ways in which potential adopters perceive it (i.e., the process by which the recommended procedures were developed) and for its actual content (e.g., the assessment procedures themselves). Using the Ottawa Model of Research Use, researchers should identify components of the innovation that are likely to be perceived positively/negatively ahead of time. They can use this knowledge to proactively develop implementation materials that address things that will be perceived negatively and emphasize those things predicted to be perceived positively (Logan & Graham, 1998). Specific attributes that may positively influence adoption include involving credible developers; inviting adopters to

participate in the process; using an explicit and transparent method of implementation; conducting a rigorous literature search and using objective methods for synthesizing evidence; ensuring the innovation is compatible with, yet more advantageous than, current practice; and developing an innovation that is easy to trial and seemingly easy to implement. Other factors that may influence adoption include the risk-benefit ratio for patients, ethical considerations, conflicting evidence or practice guidelines, and whether the innovation appears user-friendly and attractive (Logan & Graham, 1998).

We considered each element in the conceptualization of our implementation materials and methods. We made predictions about supports and barriers within each element based on our own experiences working in the program and through discussion with stakeholders (i.e., policy makers, managers, and S-LPs), and developed specific actions to address barriers or emphasize supports in our implementation materials and methods. Identified supports, barriers, and actions to address barriers are presented in **Table 2**.

Component	Barriers	Supports	Actions
Practice environment			
Structural	<ul style="list-style-type: none"> S-LPs faced large caseloads, high workload, limited resources, and long waiting lists for intervention. 	<ul style="list-style-type: none"> The new outcome monitoring procedure was mandated policy. 	<ul style="list-style-type: none"> S-LPs were granted time release from clinical duties by local leaders (e.g., a manager) to review implementation materials and complete surveys.
Social	<ul style="list-style-type: none"> There was a prevailing culture of limited appreciation for the relevance and importance of mandated outcome measurement tools and schedules. S-LPs may have viewed regular outcome measurement as time lost for intervention. 	<ul style="list-style-type: none"> Program leaders and S-LPs were included in the development of the recommendations and intervention materials. 	<ul style="list-style-type: none"> Persuasive messaging about the benefits of regular outcome monitoring was provided for S-LPs throughout the executive summary and webinar. Reports from the Joint Committee on Infant Hearing were included as implementation materials to provide additional evidence for the importance of regular outcome monitoring for children with hearing loss. A peer-reviewed research paper that analyzed data collected in the IHP was included as evidence of the value of outcome monitoring.

Table 2 (Continued)

Component	Barriers	Supports	Actions
Potential adopters			
Knowledge	<ul style="list-style-type: none"> S-LPs had no knowledge of the recommended changes. 	<ul style="list-style-type: none"> The recommended program-level procedure was similar to current practice. Each of the recommended outcome monitoring tools were likely familiar to S-LPs. S-LPs were skilled assessors and were familiar with the concept of regular outcome monitoring. 	<ul style="list-style-type: none"> The purpose and methods for the new procedure were clearly outlined in the webinar. Prior to the pilot, a select group of S-LPs reviewed the webinar prior to implementation to ensure messaging was clear and relevant to the practice context. S-LPs were provided with implementation materials designed to increase their knowledge of the new outcome monitoring procedures. Materials included (a) a desk reference that displayed the timing of program-level outcome monitoring assessments and tools to be used at each assessment and (b) detailed instructions for administering the MBCDI. S-LPs who were also piloting individual vulnerability testing received a second desk reference that displayed the timing of assessments and tools to be used.
Attitudes	<ul style="list-style-type: none"> S-LPs reported having limited appreciation for the relevance and importance of mandated outcome measurement tools and schedules. S-LPs may have viewed regular outcome measurement as time lost from intervention. 	<ul style="list-style-type: none"> S-LPs wanted the best possible outcome for children and families they served and were motivated to use evidence-based procedures to help them. The new outcome monitoring procedure was mandated policy. 	<ul style="list-style-type: none"> Persuasive messaging about the benefits of regular outcome monitoring was provided for S-LPs throughout the executive summary and webinar. Reports from the Joint Committee on Infant Hearing were included as implementation materials to provide additional evidence for the importance of regular outcome monitoring for children with hearing loss.
Skills	<ul style="list-style-type: none"> S-LPs may have been unfamiliar with the PLS-5 and may not have had experience using growth scale values. S-LPs may not have been familiar with all the recommended assessment tools. S-LPs have had no or limited previous experience with online data reporting. 	<ul style="list-style-type: none"> S-LPs had experience using the PLS-4 (similar to the PLS-5) and many of the other recommended tools. 	<ul style="list-style-type: none"> S-LPs were given a document that explained the transition from PLS-4 to PLS-5 (reviewed changes) as part of their implementation materials. S-LPs were given a document that served as a tutorial on use of the PLS-5 and its growth scale values as part of their implementation materials. S-LPs were provided with written instructions for how to submit outcome monitoring data online via RedCap.

Table 2 (Continued)

Component	Barriers	Supports	Actions
Evidence-based innovation			
Translation process (how procedure was determined)	<ul style="list-style-type: none"> S-LPs may have had limited knowledge of systematic research methods. 	<ul style="list-style-type: none"> The recommended procedures were developed using rigorous research methods at a respected academic institution. Program leaders and S-LPs were included in the development of the recommendations, implementation materials, and intervention. 	<ul style="list-style-type: none"> The methodology and scientific rigour used to develop the new outcome monitoring procedures was highlighted in the webinar. S-LPs were given a written copy of the evidence review used to develop the new outcome monitoring procedures providing further evidence of methodological rigour.
Innovation	<ul style="list-style-type: none"> Some S-LPs questioned use of the PLS-5 for program-level outcome monitoring because of online reports questioning its validity that were circulated within the IHP. S-LPs may have perceived the recommendations as too burdensome. S-LPs may have questioned the value of submitting outcome monitoring data online. 	<ul style="list-style-type: none"> The recommended program-level procedure was compatible with, but an improvement upon, current practice. The new procedures recommended many assessment tools S-LPs were already familiar with. 	<ul style="list-style-type: none"> A section of the webinar was dedicated to explaining why regular outcome monitoring was important and why the new procedures were an improvement on current practice. Reports from the Joint Committee on Infant Hearing were included as implementation materials to provide additional evidence for the value of the new procedures. S-LPs were provided with a document that responded to concerns they had reported regarding validity of the PLS-5 as part of their implementation materials. S-LPs were provided with instructions for reporting data as part of their implementation materials. This document also described how data could be used to inform practice and service delivery. A peer-reviewed research paper that analyzed data collected in the IHP was included as evidence of the value of outcome monitoring.

Note. S-LP = speech-language pathologist; IHP = the Infant Hearing Program; PLS-4 = the Preschool Language Scales (4th ed.); PLS-5 = the Preschool Language Scales (5th ed.); MBCDI = the MacArthur-Bates Communicative Development Inventories.

Research transfer strategy. In addition to using knowledge about barriers and supports to tailor implementation materials, knowledge is used to select research transfer strategies (Logan & Graham, 1998). These can range from passive (e.g., publishing recommendations

online) to systematic efforts that encourage and support implementation (e.g., education seminars, clinical training workshops, tailored online learning modules). Researchers should aim to address barriers and enhance supports related to the practice environment, potential adopters,

and evidence-based innovation in the development of their transfer strategies (Logan & Graham, 1998).

Our research transfer strategy was an online learning module. We established through discussion with stakeholders that this was the most efficient and effective way of reaching dozens of S-LPs at 30 sites across a wide geographic region. Content and structure of the module was developed based on our predictions about the barriers and supports for the IHP's practice environment and potential adopters, as well as our evidence-based innovation. The module was also developed in consultation with S-LPs, managers, and policy makers from the IHP to ensure content was clinically relevant and useful, and that the online learning environment was appropriate (**Table 2**). The online learning module was hosted through OWL, Western University's online learning management system. We invited S-LPs involved in this study to register for an OWL account and access the online learning module remotely at a convenient time for them. In the online module, S-LPs read an executive summary, viewed a 40-minute recorded webinar, reviewed electronic copies of printed implementation materials (with the option to download), and (optionally) reviewed publications selected to support the uptake of knowledge and implementation of outcome monitoring procedures. A detailed description of the online learning module content is available in the Appendix.

Once research transfer has happened, adoption and use are monitored and outcomes are evaluated. Research adoption and use is monitored to determine whether new ideas are being used (vs. adopted but later abandoned), and whether they are being used as intended (e.g., adopted, but no longer used as intended) allowing researchers to understand whether evidence was adopted and used, but also whether use changed over time (Logan & Graham, 1998). Outcomes can relate to patients, practitioners, or the system and are evaluated to understand the impact of the evidence-based innovation.

To monitor research adoption and use, an online discussion forum was added to the online learning module where S-LPs could ask questions, make comments, and get answers from the research team about implementing the recommended procedures. This forum served as an avenue for information sharing, but also as a research transfer strategy. For the purposes of this study, outcomes were evaluated as changes in S-LPs' (a) perceptions about outcome monitoring and its relevance to practice and program evaluation and (b) understanding of the new program-level outcome monitoring and individual vulnerability testing procedures.

Method

This quality improvement study was completed as part of a larger government program evaluation project that was reviewed by the Western University Research Ethics Board. The Research Ethics Board considered the project not to be research as described in the Canadian Tri-Council Policy Statement V.2 (Research Exempt from REB Review, Article 2.4) and therefore it was not considered to fall under its purview.

Participants

Seventy-three S-LPs working on Ontario's IHP completed a learning module for program-level outcome monitoring between September and December 2017. Among them, 56 completed both pre- and post-module surveys. These S-LPs had an average of 13 years of clinical work experience ($SD = 7.41$) and an average of 8 years of experience providing services to children who are deaf or hard of hearing ($SD = 6.74$). A sub-group of 28 S-LPs also provided survey data regarding individual vulnerability testing.

Study Design

A pre-post design was used to determine whether S-LPs' perceptions about outcome measurement, their understanding about the procedures to be implemented, and their intentions to implement procedures in practice changed after viewing the online learning module. Also, S-LPs were surveyed about their impressions of the materials and online module itself. S-LPs took an anonymous pre-module survey, completed the online learning module, and then immediately took an anonymous post-module survey.

Materials

S-LPs completed pre- and post-module surveys related to program-level outcome monitoring procedures. Most questions were repeated in parallel form on both surveys to learn about S-LPs' perceptions of the existing (pre-module) and new (post-module) procedures. The pre-module survey included 12 questions (**Table 3**). Five were open-ended questions about S-LPs' experiences working in the IHP, their knowledge of current discharge policies, and their understanding of current program-level spoken language outcome monitoring procedures. Six questions asked S-LPs to rate the extent to which they agreed/disagreed with statements about their awareness of the existing outcome monitoring procedure and beliefs about the impact of outcome monitoring on services, outcomes, and clinical practice. Ratings were made using a 5-point Likert scale that ranged from (1) *strongly disagree* to (5) *strongly agree*. The last question was a multiple-choice question that

Table 3**Speech-Language Pathologists' Responses to Pre-Module Survey Questions about Program-Level Outcome Monitoring**

Number	Question	Responses N (%)					Descriptive statistics
		Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	
3a	I am aware of existing discharge policies	4 (7%)	5 (9%)	4 (7%)	22 (39%)	21 (38%)	Mode = 4 Range = 1–5
3b	The existing outcome monitoring procedure was developed using the best available research evidence	2 (5%)	2 (4%)	26 (46%)	23 (41%)	3 (5%)	Mode = 3 Range = 1–5
3c	The existing procedure serves to improve services for children with hearing loss and their families	1 (2%)	8 (14%)	20 (36%)	24 (43%)	3 (5%)	Mode = 4 Range = 1–5
3d	The existing procedure is useful for my practice	1 (2%)	9 (16%)	26 (46%)	18 (32%)	2 (4%)	Mode = 3 Range = 1–5
3e	The Ministry uses data from outcome monitoring to inform decisions about service delivery and resource allocation	0 (0%)	3 (5%)	28 (50%)	18 (32%)	7 (13%)	Mode = 3 Range = 1–5
3f	I understand and follow the existing outcome monitoring procedure	2 (4%)	1 (2%)	13 (23%)	27 (48%)	13 (23%)	Mode = 4 Range = 1–5

asked S-LPs to correctly identify the existing program-level outcome monitoring procedure.

The post-module survey included eight questions (**Table 4**). Six were the same statements presented in the pre-module survey related to S-LPs' awareness of program-level outcome monitoring procedures (now about the new procedures for program-level outcome monitoring) and beliefs about the impact the new program-level outcome monitoring would have on services, outcomes, and clinical practice. One was a multiple-choice question that asked S-LPs to correctly identify the new program-level

outcome monitoring procedure. Another question asked S-LPs to enter comments about their understanding and perceptions of the new procedures, and their development, importance, and relevance to the program and to practice.

S-LPs who also completed training specific to individual vulnerability testing answered an additional six questions (**Table 5**). As individual vulnerability testing was a new procedure, only post-module data were collected. Five questions asked S-LPs to rate statements about the development and benefit of this procedure using the same 5-point Likert scale, and one asked S-LPs to enter

Table 4

Speech-Language Pathologists' Responses to Post-Module Survey Questions about Program-Level Outcome Monitoring

Number	Question	Responses N (%)					Descriptive statistics
		Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	
4a	The IHP's new Program-level outcome monitoring process was developed based on the best available research evidence	0 (0%)	0 (0%)	1 (2%)	15 (27%)	40 (71%)	Mode = 5 Range = 3-5
4b	The IHP's new Program-level outcome monitoring process will improve services for families of children with permanent hearing loss	0 (0%)	1 (2%)	7 (12%)	30 (54%)	18 (32%)	Mode = 4 Range = 2-5
4c	The IHP's new Program-level outcome monitoring process will be useful for my clinical practice	1 (2%)	1 (2%)	6 (10%)	33 (59%)	15 (27%)	Mode = 4 Range = 1-5
4d	Data from IHP's new Program-level outcome monitoring process will be used to inform service delivery planning and resource allocation decisions	0 (0%)	0 (0%)	10 (18%)	27 (48%)	19 (34%)	Mode = 4 Range = 3-5
4e	I understand the new Program-level outcome monitoring process	0 (0%)	0 (0%)	0 (0%)	36 (64%)	20 (36%)	Mode = 4 Range = 4-5
4f	I plan to implement the new Program-level outcome monitoring process in my clinical practice	1 (2%)	0 (0%)	1 (2%)	30 (53%)	24 (43%)	Mode = 4 Range = 1-5

Note. IHP = the Infant Hearing Program.

comments about their understanding and perceptions of the new individual vulnerability testing procedures.

Analyses

Quantitative data were analyzed descriptively using mode and range. A Wilcoxon sign-rank test was used to compare pre-module (understanding and perceptions of existing procedures) and post-module (understanding and perceptions of new procedures) ratings about program-level outcome monitoring. A McNemar's chi-square statistic was used to determine whether the proportion of S-LPs rating each item positively changed from pre- to post-module. To calculate this statistic, responses were grouped into positive (strongly agree and agree) and negative

(strongly disagree, disagree, and neutral) responses, and the proportion of positive to negative responses at pre- and post-test were compared.

Qualitative data were analyzed using content analysis. The following steps were taken: (1) familiarization of data through reading and re-reading survey responses; (2) identifying patterns, sorting responses into categories, and ensuring homogeneity across categories; and (3) reporting category labels and example quotes (Elo & Kyngäs, 2008).

Procedure

To recruit IHP S-LPs from across Ontario, an initial

Table 5

Speech-Language Pathologists' Responses to Post-Module Survey Questions About Individual Vulnerability Testing

Number	Question	Responses N (%)					Descriptive statistics
		Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	
5a	The IHP's new Individual Vulnerability testing process was developed based on the best available research evidence	0 (0%)	0 (0%)	0 (0%)	15 (54%)	13 (46%)	Mode = 4 Range = 3-5
5b	The IHP's new Individual Vulnerability testing process will improve services for families of children with permanent hearing loss	1 (3%)	0 (0%)	5 (18%)	15 (54%)	7 (25%)	Mode = 4 Range = 1-5
5c	The IHP's new Individual Vulnerability testing process will be useful for my clinical practice	1 (3%)	0 (0%)	7 (25%)	13 (46%)	7 (25%)	Mode = 4 Range = 1-5
5d	I understand the new Individual Vulnerability testing process	0 (0%)	0 (0%)	1 (3%)	19 (68%)	8 (29%)	Mode = 4 Range = 3-5
5e	I will implement the new Individual Vulnerability testing process in my clinical practice	1 (3%)	0 (0%)	1 (3%)	17 (61%)	9 (32%)	Mode = 4 Range = 1-5

Note. IHP = the Infant Hearing Program.

memorandum introducing the new outcome monitoring procedures and quality improvement pilot study was sent to IHP coordinators (local clinical leaders within the program). A known senior policy maker at the Ministry sent this memo and coordinators were invited to review the documents.

One week later, senior policy makers at the Ministry hosted a teleconference where coordinators could ask questions about the project. Representatives from the research team were available to answer questions about implementation methods and materials, the recommended procedures, and the quality improvement pilot. During the teleconference, coordinators were invited to volunteer their sites to participate in the pilot for program-level outcome monitoring or to pilot both program-level outcome monitoring and individual vulnerability testing. A deadline was set for responses within 2 weeks. Eleven sites volunteered to pilot program-level outcome monitoring. Ten also volunteered to pilot individual vulnerability testing.

Coordinators at volunteer sites provided the research team with contact information for the S-LPs who would be participating. We sent a group email to the S-LPs explaining the purpose of the pilot (i.e., for a select group of clinicians to learn the new procedures and pilot test them for 1 year) and gave instructions for accessing the online learning module. S-LPs were instructed to complete the surveys and online learning module before they began assessing children using the new procedures. Surveys were delivered using Qualtrics (Qualtrics, Provo, UT), a site that operated independently from the online learning module so S-LPs could be assured full anonymity in their response to survey questions. A self-generated anonymous username linked responses to the pre- and post-survey questions. Only S-LPs who also volunteered to pilot individual vulnerability testing, in addition to program level outcome monitoring, viewed implementation materials and methods for these procedures.

Results

Seventy of the 73 S-LPs who received the email invitation completed the pre-module survey (96% response rate). Fifty-six of the 73 S-LPs completed both the pre- and post-module surveys (77% response rate). General response trends at pretest did not differ significantly when data for those who completed the pre-module survey were compared with data for those who completed the pre- and post-module survey questions about program-level outcome monitoring. We suspect the S-LPs who did not complete post-module testing did not realize they needed to complete the survey after viewing the online learning module but have no way of confirming this. Since we assumed data were missing at random, the 14 individuals who did not complete the post-module survey were removed from the analyses.

Pre-Module Survey

The purpose of the pre-module survey was to determine S-LPs' understanding and perceptions of existing outcome monitoring procedures in the IHP (i.e., assessing all children every 6 months using the PLS-4). A question was also included to determine whether self-reported understanding of existing procedures matched S-LPs' abilities to identify the correct procedure. Ratings for items on the pre-module survey are presented in **Table 3**. Other findings from the pre-module survey are presented next.

When asked to rate how strongly they agreed with the statement "I am aware of existing discharge policies" (Question 3a), 43 respondents (77%) strongly agreed or agreed (**Table 3**). S-LPs were then asked to enter the criteria they used for discharge into a text box, and responses were categorized as correct or incorrect. Twenty-four S-LPs (43%) correctly reported that children were monitored until transition to school. Other responses included S-LPs reporting using standardized tests or clinical judgement to determine whether children's skills were within normal limits prior to discharge ($n = 22, 39\%$), and other criteria such as parent request and discharge during the child's junior kindergarten year, typically 4 years of age in Canada ($n = 5, 9\%$). Some were unsure or had not yet had to discharge a child from services ($n = 5, 9\%$).

Similarly, 40 respondents (71%) strongly agreed or agreed that they understood and followed the existing outcome monitoring procedures (Question 3f), but this was not consistent with S-LPs' abilities to select the correct procedure for outcome monitoring from a list of five options. Only 30 S-LPs (54%) chose the correct response indicating they should "complete the PLS-4 every 6 months regardless of whether the child's skills are age-appropriate." Other responses included "complete the PLS-4 every 6

months until the child is discharged from services with age-appropriate skills" ($n = 15, 27\%$); "complete the PLS-4 and the Focus on the Outcomes of Communication Under Six every 6 months until the child is discharged from services with age-appropriate skills" ($n = 9, 16\%$); and "complete the PLS-4 and the Focus on the Outcomes of Communication Under Six every 6 months until the child has achieved what I believe to be his/her individual potential" ($n = 2, 4\%$).

After completing pre-survey ratings, clinicians had the option of entering comments regarding their understanding and perceptions of the existing procedures for evaluating program-level spoken language outcomes in the IHP. We identified five categories through the content analysis: (a) concerns that the current process did not provide equitable services for all children with permanent hearing loss ($n = 3$); (b) concerns regarding validity of the PLS-4 ($n = 5$); (c) questions about what happens to program-level data once it is submitted ($n = 2$); (d) requests for clarification for testing families where children are English Language Learners ($n = 2$); and (e) other comments including positive comments about outcome monitoring and S-LPs indicating they had no IHP children on their caseloads ($n = 6$).

Post-Module Survey

Fifty-six S-LPs completed the post-module survey questions about program-level outcome monitoring. The purpose of this survey was to determine whether completing the online learning module increased their understanding and changed their perceptions about program-level outcome monitoring in the IHP. Ratings for these items on the post-module survey are presented in **Table 4**. Results comparing pre- to post-test ratings for program-level monitoring are presented next. Note that after completing the online learning module, very few S-LPs rated items as strongly disagree or disagree, and those that did not agree rated items as neutral (**Table 4**).

Did perceptions about the program-level outcome monitoring procedure being developed based on the best available evidence change? S-LPs' ratings were significantly higher on the post-module survey (Question 4a) than the pre-module survey (Question 3b), $z = -6.41, p < .01$. The proportion of S-LPs who rated this item positively was significantly higher on the post-module survey, $\chi^2 = 27.13, p < .01$ (3b and 4a; $26/56 = 46\%$ vs. $55/56 = 98\%$).

Did perceptions about program-level monitoring improving services for children and families change? Ratings were significantly higher on the post-module survey (Question 4b) than the pre-module survey (Question 3c), $z = -4.93, p < .01$. The proportion of S-LPs rating this item positively was significantly higher on the post-module

survey, $\chi^2 = 19.17, p < .01$ (3c and 4b; 27/56 = 48% vs. 48/56 = 86%).

Did perceptions about the usefulness of program-level outcome monitoring for clinical practice change?

Ratings were significantly higher on the post-module survey (Question 4c) than the pre-module survey (Question 3d), $z = -4.72, p < .01$. The proportion of S-LPs rating this item positively was significantly higher on the post-module survey, $\chi^2 = 23.06, p < .01$ (3d and 4c; 20/56 = 36% vs. 48/56 = 86%).

Did perceptions about the Ministry using program-level data to inform decision making change?

Ratings were significantly higher on the post-module survey (Question 4d) than the pre-module survey (Question 3e), $z = -4.55, p < .01$. The proportion of S-LPs rating this item positively was significantly higher on the post-module survey, $\chi^2 = 14.29, p < .01$ (3e and 4d; 25/56 = 45% vs. 46/56 = 82%).

Did understanding of program-level outcome monitoring procedures change?

Ratings for understanding of procedure were significantly higher after completing the online module (Questions 3f and 4e), $z = -3.22, p = .01$. The proportion of S-LPs rating this item positively was significantly higher on the post-module survey, $\chi^2 = 16.00, p < .01$ (3f and 4e; 30/56 = 54% vs. 54/56 = 96%).

S-LPs were also asked to select the correct outcome monitoring procedure from a list of five options. Fifty-four S-LPs (96%) chose the correct response. Using McNemar's chi-square statistic, we found a significant difference in the proportion of S-LPs who selected the correct response between the pre- and post-module, $\chi^2 = 20.57, p < .01$.

After completing the ratings above, S-LPs had the option of entering comments about their understanding and perceptions of the new program-level spoken language outcome monitoring process and its relevance to practice. We identified five categories through content analysis: (a) concern about low-functioning children not meeting the required timelines and expectations for assessment ($n = 1$); (b) preference for another standardized measure over the PLS-5 ($n = 2$); (c) requests for direction for testing children who are English Language Learners ($n = 2$); (d) not having IHP children on their caseload ($n = 1$); and (e) positive comments about the new program-level outcome monitoring procedure ($n = 5$).

S-LPs who indicated they were participating in the individual vulnerability testing sub pilot ($n = 28$) were also asked to make ratings in response to additional statements about these procedures. The majority agreed or strongly

agreed with all statements, and other responses were typically neutral. Very few disagreed or strongly disagreed with the statements about individual vulnerability testing procedures (**Table 5**).

S-LPs also had the option of entering comments regarding their understanding and perceptions of the new individual vulnerability testing procedure. Four categories were identified in the content analysis: (a) questions about testing for articulation ending at age 4 ($n = 3$); (b) concerns about spending too much time assessing or that assessments would be too difficult for some children ($n = 2$); (c) concerns about eligibility for individual vulnerability testing and subsequent missing data (e.g., a child is tested once and then gets cochlear implants and leaves the IHP, $n = 1$); and (d) a positive comment about the new individual vulnerability testing procedure ($n = 1$).

Finally, 54 S-LPs rated their agreement about how valuable each of the implementation materials presented in the online learning module were using the same 5-point Likert Scale. Over 80% of S-LPs agreed or strongly agreed that 10/13 resources were valuable. Sixty-six percent of S-LPs agreed or strongly agreed that the evidence review and overview of recommendations (Oram Cardy & Daub, 2017) and Joint Committee on Infant Hearing documents (Joint Committee on Infant Hearing, 2007; Joint Committee on Infant Hearing et al., 2013) were valuable. Further, 43% agreed or strongly agreed that the Daub, Bagatto, Johnson, and Oram Cardy (2017) article was valuable for supporting implementation (**Table 6**). Lower ratings were for the optional components (see the Appendix).

Discussion

Using the Ottawa Model of Research Use (Logan & Graham, 1998) and in collaboration with community S-LPs, managers, and policy makers, we developed an online learning module to support the implementation of evidence-based assessment procedures for the monitoring of spoken language outcomes and individual vulnerabilities in children who are deaf or hard of hearing in Ontario, Canada's Infant Hearing Program. Prior to implementing province-wide, we conducted this quality improvement pilot study to determine whether S-LPs' (previously negative) perceptions about outcome monitoring and their (previously inconsistent) understanding about outcome monitoring procedure(s) changed after completing the online learning module. This pilot served to demonstrate proof of concept for the online learning module as a knowledge translation tool and to identify additional barriers that may be important to address prior to more widespread implementation across the IHP.

Table 6

S-LPs' Ratings for Each of the Implementation Materials

	Responses <i>N</i> (%)					Descriptive statistics	Did not view
	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)		
Executive summary	0 (0%)	0 (0%)	9 (17%)	28 (54%)	15 (29%)	Mode = 4 Range = 3–4	2
Webinar	0 (0%)	1 (2%)	4 (8%)	23 (44%)	24 (46%)	Mode = 5 Range = 2–5	2
PDF of webinar slides	0 (0%)	1 (2%)	5 (10%)	24 (46%)	22 (42%)	Mode = 4 Range = 2–4	2
S-LP desk reference for program-level monitoring	0 (0%)	0 (0%)	1 (2%)	17 (33%)	34 (65%)	Mode = 5 Range = 3–5	2
Parent handout for outcome monitoring and assessment schedule	0 (0%)	0 (0%)	2 (4%)	22 (42%)	28 (54%)	Mode = 5 Range = 3–5	2
Overview of changes (PLS-4 to PLS-5)	0 (0%)	0 (0%)	6 (12%)	22 (46%)	20 (42%)	Mode = 4 Range = 3–5	6
Tutorial for using PLS-5 growth scale values	0 (0%)	0 (0%)	5 (10%)	22 (46%)	21 (44%)	Mode = 4 Range = 3–5	6
UWO Response to concerns about validity of the PLS-5	0 (0%)	0 (0%)	5 (10%)	31 (60%)	16 (30%)	Mode = 4 Range = 3–5	2
Parent instructions for completing the MBCDI	0 (0%)	0 (0%)	7 (13%)	28 (54%)	17 (33%)	Mode = 4 Range = 3–5	2
S-LP desk reference for individual vulnerability testing	0 (0%)	0 (0%)	5 (11%)	25 (54%)	16 (35%)	Mode = 4 Range = 3–5	8
UWO Evidence Review: Recommendations for the Assessment of Spoken Language in the IHP	0 (0%)	0 (0%)	10 (34%)	11 (38%)	8 (28%)	Mode = 4 Range = 3–5	25
Joint Committee on Infant Hearing Publications	0 (0%)	0 (0%)	10 (34%)	13 (45%)	6 (21%)	Mode = 4 Range = 3–5	25
Daub et al. (2017) article	0 (0%)	0 (0%)	13 (56%)	7 (30%)	3 (13%)	Mode = 3 Range = 3–5	31

Note. S-LP = speech-language pathologist; PLS-4 = the Preschool Language Scales (4th ed.); PLS-5 = the Preschool Language Scales (5th ed.); UWO = University of Western Ontario; MBCDI = the MacArthur-Bates Communicative Development Inventories; IHP = Infant Hearing Program.

After completing the online learning module, S-LPs reported improved perceptions about program-level outcome monitoring, namely, that it had been developed based on high quality research evidence and would improve practice and service delivery in the IHP, and that the Ministry would use the outcome data collected. S-LPs also reported

improved understanding of program-level outcome monitoring and intentions to implement procedures into practice after completing the online learning module. We could not report changes in S-LPs' perceptions about individual vulnerability testing procedures because these areas were not monitored prior to this pilot. However, we

did note that S-LPs rated items about their perceptions of the individual vulnerability testing procedures and their potential impact on practice and service positively. They also indicated intentions to implement these procedures in practice.

Results from this quality improvement pilot study demonstrate changes in perceptions and intentions to implement immediately after completing the online learning module. Although we cannot confirm that these intentions led to changes in practice, the theory of planned behaviour suggests that an individual's intentions are strongly linked to behaviour change (Ajzen, 1991). The theory also states that intentions are shaped by attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). After completing the online learning module, S-LPs in our pilot reported positive attitudes towards the new assessment procedures and perceptions of being able to implement them in practice. Over the pilot year, S-LPs used the new assessment procedures and submitted outcome monitoring data. Findings from this phase of the pilot are being prepared as a separate manuscript.

After reviewing the online learning module, positive changes in S-LPs' knowledge of and perceptions about the procedures to be implemented improved. We believe the online learning module was a successful implementation tool for two reasons. First, theory was used to identify barriers and supports to implementation, guide development of the educational materials used in the online learning module, and develop methods for evaluating the effectiveness of our implementation efforts (Colquhoun, Letts, Law, MacDermid, & Missiuna, 2010). Using the Ottawa Model of Research Use (Logan & Graham, 1998), we were able to develop materials and methods aimed at addressing known barriers to implementation in the IHP, which likely facilitated changes in S-LPs' perceptions (Campbell & Douglas, 2017). For example, knowing that S-LPs had large caseloads and limited flexibility, we decided to use an online training that could be accessed at times that fit into S-LPs' individual schedules. Knowing that S-LPs had negative perceptions about the validity of the PLS-4 prompted us to include a document reviewing the research evidence for the validity of the tool and debunking myths based on online blogs that had precipitated their concerns.

The second reason we believe our implementation efforts were successful was that we used principles of integrated knowledge translation throughout the development of our intervention. Integrated knowledge translation is "a model of collaborative research, where researchers work with knowledge users who identify a

problem and have the authority to implement the research recommendations" (Kothari, McCutcheon, & Graham, 2018, p. 299). In our case, knowledge users were the S-LPs who would be implementing the outcome monitoring procedures and managers and policy makers from the IHP who would be using data to evaluate the program's effectiveness. These knowledge users were collaborators and consultants informing all phases of this project to ensure clinically relevant, practical, and useful methods and materials (Campbell & Douglas, 2017; Kothari et al., 2018; Kothari & Wathen, 2017). For example, S-LPs identified concerns with our initial recommendation for program-level outcome monitoring for children under 18 months of age (i.e., the PLS-5). This prompted further review of the literature and inclusion of an alternate measure for the IHP's youngest children (i.e., the MBCDI).

Our integrated knowledge translation efforts continue as we move towards program-wide implementation. Throughout this study, we sought further feedback from S-LPs who identified additional issues to be addressed prior to provincial implementation. These included further clarification for procedures for testing children who are English Language Learners and those who are low-functioning, and for specific inclusion criteria for which children should participate in outcome monitoring. For the remainder of the pilot, S-LPs collected and reported data using the recommended outcome monitoring procedures. At the end of the year, we collected additional feedback about the process and schedule of assessments. Implementation materials and procedures are being further refined prior to provincial implementation.

We acknowledge some limitations to this study. First, a known disadvantage of using a pre-post study design is the lack of a control group. Thus, we cannot say for certain whether changes in S-LPs' perceptions were due to the online learning module or other outside factors (Ray, 1997). We do, however, feel that because the surveys were completed immediately prior to and following completion of the online learning module, it is likely the changes were due to the online learning module. Second, while self-report questionnaires can be an effective way of evaluating implementation interventions in healthcare settings, they are subject to outside influences like social desirability bias (Boyko, Dobbins, DeCorby, & Hanna, 2013). We attempted to mitigate this bias by having S-LPs complete the pre- and post-module surveys anonymously, but it is still possible our results were affected.

Despite these limitations, we believe this work can serve as a model for other research groups who collaborate with

community S-LPs and government programs to generate and implement knowledge that is meaningful and useful for practice. Engaging S-LPs and organizations in research may improve not only the implementation of research evidence into practice, but also health care processes and outcomes for children and families (Boaz, Hanney, Jones, & Soper, 2015; Campbell & Douglas, 2017).

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Appendix

Required and Optional Components of the Online Learning Module

Required components	
Item	Description
1	Executive summary
2	40-minute webinar describing the literature review, development of procedures to be implemented, and methods for implementing procedures
3	Desk reference outlining the timing for outcome monitoring assessments using the MBCDI/PLS-5
4	A letter for parents/caregivers providing information on the purpose and timing of regular outcome monitoring in the infant hearing program
5	Materials to support implementation of the PLS-5
6	Materials to support implementation of the MBCDI
7	Materials to support individual vulnerability testing
8	Online data reporting instructions
Optional components	
Item	Description
1	Oram Cardy J., & Daub, O. (2017). <i>Recommendations for the assessment of spoken language in the Ontario Infant Hearing Program</i> . Toronto, Ontario: Ontario Ministry of Children and Youth Services.
2	Joint Committee on Infant Hearing. (2007). Year 2007 position statement: Principles and guidelines for Early Hearing Detection and Intervention programs. <i>Pediatrics</i> , 120, 898–921. doi:10.1542/peds.2007-2333
3	Joint Committee on Infant Hearing, Muse, C., Harrison J., Yoshinaga-Itano, C., Grimes, A., Brookhouser, P. E., ... Martin, B. (2013). Supplement to the JCIH 2007 position statement: Principles and guidelines for early intervention after confirmation that a child is deaf or hard of hearing. <i>Pediatrics</i> , 131, e1324–1349. doi:10.1542/peds.2013-0008
4	Daub, O., Bagatto, M. P., Johnson, A. M., & Oram Cardy, J. E. (2017). Language outcomes in children who are deaf and hard of hearing: The role of language ability before hearing aid intervention. <i>Journal of Speech, Language, and Hearing Research</i> , 60, 3310–3320. doi:10.1044/2017JSLHR-L-16-0222