

# The role of a remote knowledge broker from an academic setting using an adaptive approach to implement evidence-based practice in primary care settings: A case study of integrating mood management interventions for treatment seeking tobacco users.

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## Research article

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# Abstract

**Background:** Knowledge brokering is an emerging knowledge translation strategy used within healthcare to bridge the gap between evidence and practice. Reported studies indicate that the day-to-day role of a knowledge broker often involves in-person communication with frontline workers and decision makers. However, travelling to primary care sites can be cost- and resource-intensive and thus not feasible. In this paper, we describe the role and experience of a remote knowledge broker (rKB) working in an academic health sciences centre, delivering tailored one-on-one support to end-users using phone and email communications.

**Methods:** A rKB was hired to support (n = 62) English-speaking Family Health Teams (FHTs) across Ontario with implementing mood management interventions as part of an existing smoking cessation program, the Smoking Treatment for Ontario Patients (STOP) program. We describe the eight categories of tasks performed by the rKB over a 12-month period, as well as their experience communicating via technology to develop relationships with healthcare providers (HCPs).

**Results:** Sixty-one of the 62 FHTs (n = 73 HCPs) were provided rKB services. The total number of successful phone and email communications with the rKB ranged from 3-98 interactions over 12 months. Common barriers to implementation reported by FHTs were associated with the Inner and Outer Setting domains of the Consolidated Framework for Implementation Research (CFIR) and included lack of time, resources, and patient engagement.

**Conclusions:** The role of the rKB involved building relationships with HCPs, identifying and helping to problem solve barriers, and building capacity in the field. Similar to traditional knowledge brokering, this analysis shows that developing a meaningful relationship between a remotely situated KB and HCPs could take anywhere between 1-6 months. Using implementation frameworks such as CFIR can help the rKB identify barriers and be ready to address them. In addition, hiring a rKB with previous engagements and knowledge of the local context may facilitate clinical practice change. Our future work will evaluate the cost-effectiveness of rKBs to inform its potential to be scaled up.

## Background

Healthcare interventions should incorporate the latest scientific evidence to improve patient and population health outcomes (1). Despite this concept, research has shown that engaging primary healthcare providers (HCPs) to implement evidence-based interventions as part of best-practice can be a complex and challenging process (1–3). Traditional “passive” knowledge translation (KT) strategies, which focus on the dissemination of information through journal articles, clinical guidelines and didactic instruction, are shown to have only a modest effect on promoting clinical practice change, with a median improvement in care of just 10% (2, 3). This relatively low impact may stem from barriers faced by the HCP, including lack of time and capacity to assess scientific evidence, and limited access to information in a format that is relevant to the provider’s particular needs (4–6). The professional differences found

between researchers and clinicians can also result in a failure to recognize the complexities present within both settings, and discrepancies in their interpretation and communication of new evidence (4, 7, 8). As a means to bridge the gap between evidence and practice, one KT strategy that is gaining popularity within healthcare settings is a Knowledge Broker (KB) (9, 10). A KB can be described as the “linkage agent” between investigators and end-users who facilitate the exchange and management of information and aids in capacity building, through interpersonal communication to foster clinical practice change (9, 11, 12). However, the role of a KB is dynamic and affected by several factors, including the clinical setting, research being implemented and the team member who is the recipient of the information (8, 12–14).

In 2003 a report on the theory and practice of knowledge brokering identified the need to examine the effectiveness of knowledge brokering as a KT strategy, as well as best-practice guidelines for other KBs in the field to follow (12). Since then, several studies have examined the impact of KBs in improving healthcare decision-making, including a 2015 systematic review (14). While there is still limited consensus surrounding the effectiveness of knowledge brokering in health-related settings (14–19), given the critical role of frontline providers in primary care and public health, and the growing use of KBs (12), several authors have highlighted the need for more descriptive reports on the procedures, activities, settings and best practices in knowledge brokering (8, 9, 17, 18, 20).

Currently, few published studies have reported on the day-to-day practice of a KB within the context of the healthcare system (8, 13, 17, 19, 21–23). These reports are useful in providing a framework for the daily practice of a KB in public health and primary care settings, including a description of the specific tasks performed within different clinical contexts. KB roles that were common across several reports (8, 13, 15, 17, 19, 21, 24–26) included engagement with stakeholders through site visits and in-person communication. Although literature suggests that KT strategies involving face-to-face communication with end-users may be more successful for relationship building and promoting HCP practice change (8, 17), this approach can be costly and resource intensive (18), and thus not feasible. Alternative online methods of communication, including virtual communities of practices, emails and phone calls have shown to be effective for building relationships and sharing knowledge with end-users (18, 27, 28). Therefore, a remotely situated KB, delivering tailored one-on-one support to HCPs via phone and email-based communications, may be a more pragmatic approach to knowledge brokering in real-world healthcare settings.

In this paper, we describe the recruitment, training and day-to-day role of a remote KB (rKB), working in an integrated clinical, research, and educational tobacco dependence clinic in an academic health sciences centre, as part of a cluster randomized controlled trial examining the effectiveness of two KT strategies: a general monthly email and a personalized rKB.

## Methods

### Study design and setting

Strong evidence supports the integration of a self-help mood management component as part of standard smoking cessation treatment, in order to improve patient quit outcomes among individuals with current and past depression (29–33). In 2016, the Centre for Addiction and Mental Health (CAMH) and the Association of Family Health Teams of Ontario (AFHTO) were awarded a Knowledge Translation Operating grant (No. 355746) by the Canadian Institutes of Health Research (CIHR) to examine the role and effectiveness of a rKB for implementing a mood management intervention into a smoking cessation program in primary care (33). Ethics approval was obtained from the Research Ethics Board at the Centre for Addiction and Mental Health (approval #065-2016).

## **Recruitment and hiring of a suitable rKB**

A rKB with a background in public health and health systems was hired to provide individualized support to Family Health Teams (FHTs), in order to promote the uptake of a mood intervention - the Mood Management Initiative - as part of an existing smoking cessation program, the Smoking Treatment for Ontario Patients (STOP) program (34). The rKB held a Master's of Science specializing in research and had prior experience working in an addictions and mental health setting. Through the rKB's previous work facilitating education initiatives for tobacco dependence treatment, the individual also had pre-existing relationships (both remote and face-to-face) with some HCPs working at FHTs allocated to the rKB intervention.

Sixty-two of 123 English-speaking FHTs across Ontario were randomized to receive a 12-month rKB intervention, whereby the rKB (SA) would interact with the lead smoking cessation implementer of each FHT via phone and email communications. While some FHTs were only comprised of one clinic (single-clinic FHT), other FHTs operated several clinics (multi-clinic FHTs), which sometimes required the rKB to contact more than one STOP lead implementer. In total, the rKB was responsible for communicating with 74 HCPs, who had clinical contact with patients.

## **Description of the intervention - rKB activities**

In order to operationally describe the role of the rKB in this study, we reviewed the 6 categories of KB activities assigned by Dobbins et al (17), along with the 10 KB tasks identified by Bornbaum et al (14), to derive the following 8 classifications of activities undertaken by our rKB: 1) training and self-study, 2) building and maintaining relationships, 3) obtaining and consolidating relevant information, 4) managing knowledge, 5) assessing and facilitating practice change, 6) supporting knowledge and skills development, 7) networking, and 8) sharing tailored data and promoting reflective practice. We describe these categories in more detail below.

## **Training and self-study**

To ensure that the rKB was equipped to deliver the most relevant evidence-based information to HCPs, they were required to attend a 43.5 hour training program on tobacco dependence treatment, offered by the Training Enhancement in Applied Cessation Counselling and Health (TEACH) project (35). Through this University of Toronto accredited certificate program developed by PS and RD, the rKB obtained

relevant information on the fundamentals of intensive tobacco cessation counseling, as well as specialized knowledge and skills for treating smokers with multiple risk factors, including mood disorders. Working through case studies, contact with content expert course facilitators and communicating with other participants via online discussion boards also exposed the rKB to everyday clinical cases of tobacco addiction treatment, which increased their capacity to disseminate appropriate resources, tools, and recommendations to HCPs during interactions. The rKB also attended educational webinars related to tobacco, mental health, and knowledge brokering services, and subscribed to relevant Listservs, including the TEACH Project, Ontario Tobacco Research Unit, Evidence Exchange Network for Mental Health and Addictions, and CAMH Research Listservs.

## **Building and maintaining relationships**

Arguably, one of the most important roles of the rKB in primary care is the development and maintenance of working relationships with HCPs through regular interpersonal communication (36, 37). During the first two months of the study, the rKB sought to call the lead STOP program implementer(s) at each FHT, in order to introduce themselves and provide details about the Mood Management Initiative. To increase HCP engagement, the rKB strived to establish common patient and population health goals related to smoking and depression, and used this to highlight the need for change and motivate implementation. Throughout the intervention, the rKB encouraged providers to share their experience with implementing the initiative and offer suggestions for future improvement. This feedback helped the rKB better understand how integrating mood interventions had influenced HCPs workflow and allowed for a transparent and constructive dialogue.

Before the study began, an algorithm for contacting FHTs was established by the lead scientist (NM) and the rKB using existing protocols obtained from the National Resource Centre for Academic Detailing (NaRCAD) as an example (38) (see Fig. 1). As part of the initial call pathway, if the rKB was unable to contact the HCP by phone after 3 attempts, they would send a personalized email conveying relevant information regarding the initiative, and resources to help support the implementation of mood interventions at their FHT. However, as the intervention progressed and the rKB became more cognizant about HCPs' schedules and the time taken to contact all FHTs, they began to deviate from this protocol and, instead, used their discretion as to when emails should be sent to providers (i.e. after 1–2 unsuccessful call attempts).

## **Obtaining and consolidating relevant information**

Conducting environmental scans and summarizing information was imperative to the rKB role. In order to stay up-to-date with the most current literature, databases including PubMed, Embase and Google Scholar were used to retrieve articles pertaining to areas of tobacco cessation and depression counseling. Although not directly related to the rKB intervention, as part of the larger randomized controlled trial, the rKB was required to consolidate information obtained and develop PDF resources on various topics of smoking cessation and mood management (33). These resources could then be shared with HCPs allocated to the rKB intervention to help build capacity, if the rKB deemed it appropriate. At times, the rKB

would also meet with subject matter experts to discuss their experiences and expertise with specific complex cases, such as treating co-occurring disorders and responding to suicidal ideation. This allowed the rKB to gain practical insight on integrating mood interventions into practice and helped to better support HCPs with implementation.

The method of dissemination depended on the type of information being shared with HCPs. For instance, quick facts about tobacco and depression were often shared verbally during rKB phone calls to reaffirm the importance of integrating mood interventions into practice. However, more detailed information regarding treatment approaches and external resources for patients and HCPs were shared with providers via email and could be forwarded to other FHT members if necessary.

## **Managing knowledge**

Since the rKB was responsible for communicating with 74 HCPs over the one-year intervention period, adopting a system for collecting and managing large amounts of information was essential for successful knowledge brokering. Prior to initiation, the lead scientist and rKB adapted resources for in-person brokering services, provided by NaRCAD, in order to create an Excel spreadsheet to track interactions with the rKB and categorize important information discussed (38) (see Fig. 2). To prepare for phone calls, the rKB would refer to notes from previous conversations and, if necessary, scan the current literature in order to appropriately address issues requiring follow-up and offer personalized support. Archiving functionality on the secure hospital exchange version of Microsoft Outlook and filing methods on protected computer drives were then used to organize and store communications and study related data. A reference management software, EndNote, was also used to facilitate the retrieval and dissemination of resources to HCPs.

Based on previous reports (39–41), there were central themes we expected to see over the course of the intervention, specifically with respect to barriers and enablers to implementation, including HCP-, patient-, and organization-level factors. During phone calls, the rKB would code conversations into these themes where appropriate, as well as any other themes that emerged. Since the rKB performed informal phone calls with HCPs rather than formal evaluation interviews, coding was based on the rKB's judgement of a conversation's relevance to a specific theme. For example, if a HCP mentioned they did not provide a mood intervention because they felt this was beyond the scope of their practice, this would be coded as a "barrier to implementation: HCP-level". Common barriers and enablers reported by HCPs will be discussed in the results section.

## **Assessing and facilitating practice change**

In order to facilitate practice change among HCPs, the rKB assessed the provider's overall response to the initiative (on a continuum of negative to positive) during their initial phone communication. Negative responses comprised those who were skeptical, indifferent or resistant toward the initiative, whereas positive responses included those who were interested, motivated and receptive to adopting practice change. HCPs were also asked to comment on any concerns or perceived barriers and/or enablers to integrating mood interventions into practice, and any emerging themes identified were documented in the

rKB's notes, as described above. To support and facilitate implementation by HCPs, the rKB tailored all subsequent phone and email communications towards addressing HCPs' expressed needs. Of course, a large part of facilitating practice change was through the transfer and exchange of evidence-based information to providers in order to increase capacity in delivering mood interventions; this will be discussed in more detail in the support knowledge and skills development section.

Over the course of the intervention, the rKB would follow up with HCPs to check in on any improvements with implementation, or additional issues that emerged. In cases where specific strategies to facilitate uptake were successful, such as counseling skills, resources, and patient engagement techniques, the rKB would share these approaches with other FHTs facing similar concerns to help support practice change.

## **Supporting knowledge and skills development**

As previously mentioned, one of the rKB's primary roles was to facilitate capacity building of the FHT setting by increasing the ability of HCPs to implement evidence into practice. At the beginning of the initiative, a Cochrane review on smoking cessation interventions for smokers with current and past depression(29), and a training manual with operational details about the initiative, were electronically shared with all HCPs. This information was useful in helping providers recognize the clinical relevance of integrating mood management interventions into practice, and provided instructions on how components of the initiative could facilitate delivery (i.e., screening tools, scripted brief interventions and patient resources available online). The rKB also offered one-on-one training to all HCPs to help navigate through changes to the STOP program's online platform, which facilitated screening and responses to a standard embedded depression-screening test (PHQ-9), and explain the initiative in more detail.

Future communications (phone and email) were directed toward identifying the provider's specific needs and improving their knowledge and skills through the provision of evidence and resources. On occasion, HCPs would also reach out to the rKB to request information or advice on areas of tobacco dependence treatment and other mental illnesses. Webinars, online courses, PDF resources and relevant websites were among the list of resources shared with HCPs via email.

## **Networking**

While much of the rKB's role in fostering clinical practice change came from the dissemination of evidence-based resources and tools, on some occasions the rKB would facilitate networking between HCPs and CAMH clinicians to provide more advanced support. This usually occurred in cases where providers required clinical consultation for specific complex cases related to smokers with mood disorders, beyond the scope of the rKB. The rKB also encouraged HCPs to subscribe to the TEACH Listserv, an online networking platform where providers could connect, post questions, and share research with over 900 other providers in smoking cessation counselling across Canada.

## **Sharing tailored data and promoting reflective practice**

Although the rKB provided resources and support to address provider's needs, the research team recognized that successful implementation should also involve a direct form of reflective practice based

on information from the FHT's local context (42). Thus, approximately 7 months into the initiative, when a sufficient amount of enrollment data was collected from clinics, the rKB began sharing tailored data with FHTs, during phone and, on some occasion, email communications. These data reflected HCP's activity in practice, including the number of patients reporting depression/depressive symptoms, the number of patients who were offered a brief mood intervention, the number of patients offered a self-help educational resource on mood management and the number of patients who accepted the self-help resource. Before verbally sharing these data with FHTs, the rKB consulted with a CAMH clinician (RD) to discuss effective techniques for appropriately delivering feedback to HCPs. This included asking permission to share data, providing affirmations, and using open-ended questions to address concerns with FHTs who did not appear to be providing mood interventions in practice.

The degree to which each of the 8 activities described above were executed by the rKB depended on the lead implementer's capacity and commitment toward the initiative, as well as the FHT's overall ability to implement practice change.

## Results

### Quantity, frequency and quality of rKB activities

Of the 62 FHTs allocated to the rKB intervention, 61 FHTs were provided knowledge brokering services over the 12-month period. Due to an error in obtaining contact information, 1 FHT was not offered the rKB intervention (1.6% of the sample; n = 1 HCP). For characteristics of FHTs contacted by the rKB, refer to Table 1.

Initially the rKB intended to contact each FHT over the phone at least once per month; however, after the first four months of the intervention, the rKB realized that most providers were unavailable to engage in fulsome discussions on a monthly basis due to competing priorities. Among HCPs who were successfully contacted, many reported low rates of enrollment each month; as a result, they were not presented with opportunities to offer a mood intervention to patients, and did not seek additional support. Thus, for the remainder of the intervention, contact with each FHT usually occurred every 2 months and more or less frequently as requested.

Since the rKB had previous exposure to the STOP Program's workflow, they found that understanding the clinical context under which HCPs worked was helpful for building rapport and developing trusting relationships with clinicians. However, inconsistent responses to the rKB's communications and staff turnover in the smoking cessation program (20 HCPs from 18 FHTs left their jobs during the study period) sometimes made it difficult to maintain the rKB-HCP relationship and encourage long-term practice change. At times a new lead implementer would not be appointed until months later, or the rKB was never informed that a new provider had taken over, which prevented the rKB from successfully contacting the FHT for an extended period of time.

Eight FHTs (13.1%) only communicated with the rKB via telephone once in 12 months, although five of these HCPs did respond to the rKB via email or voicemail, acknowledging their receipt of information from the rKB. The number of successful phone interactions with a single FHT ranged from 1 (minimum) to 34 (maximum). The median number of successful phone calls was 4.5 and the average number of successful phone calls was 7.9. Table 2 presents the number of successful rKB phone calls with FHTs. The total number of successful rKB-FHT interactions (phone and email communications) over the duration of the intervention ranged from 3 to 98 interactions, with an average of approximately 10 interactions per FHT. Of the FHTs offered remote knowledge brokering services, 2 FHTs (3.3%) refused to implement the mood intervention due to clinical/administrative reasons and declined further communication with the rKB. Frequencies of rKB interactions with FHTs over the 12-month intervention are presented in Table 3.

The duration of each phone call varied between providers and depended on several factors, including level of engagement, perceived capacity, purpose of the call, and the stage of the intervention. Since the rKB could not rely on the use of non-verbal cues to gauge an individual's thoughts and level of receptivity regarding the initiative, they found it was important to assess the HCP's tone of voice, and use open-ended questions to increase participation and guide further discussion.

During the first two months of the intervention, among HCPs who were successfully contacted, phone calls ranged between 5 to 24 minutes in length. The average call time was approximately 11 minutes long, and calls were primarily focused on explaining the Mood Management Initiative and gathering providers' initial thoughts on implementation. However, as the initiative progressed (> 6 months after initiation) and HCPs gained more experience implementing the mood intervention, the rKB was able to promote a more fruitful discussion, increasing the average call time to approximately 19 minutes in length; ranging between 6 to 44 minutes (See Additional File 1). The average cumulative time the rKB spent on phone calls with FHTs over the 12-month intervention was 47 minutes, ranging from 8 to 387 minutes. As expected, the rKB spent more time communicating with FHTs that required more than one lead implementer to be contacted. In addition, the rKB found that HCPs who had a pre-existing relationship with them, through the rKB's former roles in KT and continuing education, felt more comfortable expressing their concerns regarding the initiative, provided more feedback about the mood intervention tools, and actively engaged in more open and honest conversations throughout the duration of the intervention.

Table 1  
 Characteristics of FHTs provided the rKB intervention (N = 61 FHTs)

# of HCPs (lead implementers) contacted by rKB	n (% FHTs)
FHTs with 1 HCP	58 (95.1%)
FHTs with more than 1 HCP*	3 (4.9%) - 14 clinics; 11 HCPs (n = 1 FHT) - 2 clinics; 2 HCPs (n = 2 FHTs)
*multi-clinic FHTs with > 1 lead implementer	

Table 2  
 Number of successful rKB phone calls over 12-month intervention  
 (N = 61 FHTs)

# of successful rKB-FHT phone calls	n (% of FHTs)
1	8 (13.1%)
2	13 (21.3%)
3	20* (32.8%)
4	9 (14.8%)
5	5 (8.2%)
6	4 (6.6%)
8	1* (1.6%)
34	1* (1.6%)
*includes FHT with more than one lead implementer contacted	

Table 3  
 Frequencies of rKB interactions with FHTs over 12-month intervention (N = 61 FHTs)

Interaction	Minimum	Median	Maximum
Unsuccessful phone calls	1	6	64*
Successful phone calls	1	3	34*
Emails sent (by rKB or HCP)	1	5	56*
Total successful contact (phone, emails sent, email responses)	3	9	98*
*FHT with more than one lead implementer contacted			

Table 4  
Total rKB-FHT phone call time over 12-month intervention (N = 61 FHTs)

Time (Minutes)	n (% of FHTs)
8–10	3
11–20	7
21–30	14
31–40	9*
41–50	11
51–60	7
61–70	4
71–80	3
100+	3*
*Includes FHT with more than one lead implementer contacted	

## Objections and barriers to implementing a mood management intervention

While the majority of FHTs (76%; 46/61 FHTs) shared a positive response toward integrating mood management into their smoking cessation program, some FHTs (21%; 13/61 FHTs) were initially defensive and expressed concerns associated with implementation. Managing challenges reported by HCPs was essential for ensuring the uptake of mood interventions into practice; therefore, the rKB spent a significant portion of time reviewing literature and resources in knowledge brokering for clinical examples of how to effectively handle provider objections and barriers (43–46). Based on the HCP’s clinical situation, the rKB would ask permission to share information and offer tailored advice to help overcome barriers encountered in practice. From the rKB’s experience, maintaining a positive attitude and simply acknowledging the challenges faced by providers helped create a more collaborative relationship and made HCPs more receptive to discussing potential solutions for overcoming these barriers.

To better characterize challenges reported by HCPs throughout the intervention, and consider specific constructs which may be important for implementation, we have organized these barriers into the Consolidated Framework for Implementation Research (CFIR) (47). Examples of how the rKB responded to common barriers to implementation are also provided.

## Inner Setting:

### Available resources

Nearly 50% of FHTs (30/61 FHTs) reported a lack of time as the greatest barrier to implementing mood management interventions into smoking cessation practice. While providers acknowledged the importance of addressing depressive symptoms as part of a holistic approach to tobacco dependence treatment, many expressed concerns regarding its feasibility given their multiple roles in clinic, limited appointment times with patients, and the length of time taken to complete the baseline assessment. Organization capacity (21%; 13/61), including lack of access to technology to support the online intervention, was also listed as a barrier to delivering the mood intervention. To address concerns regarding time, HCPs were directed to follow best-practice guidelines for tobacco reduction and cessation and deliver brief interventions, which took no more than 2–5 minutes to conduct and required minimal resources(48). While organization-level barriers were often more challenging to overcome, the rKB used open-ended probing to better understand providers' clinical workflow, and offered suggestions, based on implementation science literature and the TEACH Project, for how they could adapt the mood intervention to their FHT's current structure (13, 40, 45, 49).

## Outer Setting:

### Patient needs and resources

Patient-level factors, including demographic characteristics and participant response to the intervention, were also conveyed (47%; 29/61 FHTs) as barriers to implementation. Although HCPs reported that some patients were open to discussing their mental health, others were reluctant to addressing anything beyond their smoking behaviour, despite depressive symptoms having an impact on cessation outcomes. Some providers also explained that by the time they were able to offer a mood intervention following enrollment, patients were often disengaged and unmotivated; therefore, they did not want to overwhelm them with more information. To address these concerns, the rKB advised HCPs to incorporate evidence-based counseling strategies to reduce ambivalence with patients, such as psychoeducation and motivational interviewing techniques (40, 50). If providers were interested in learning more about these interventions, they were encouraged to take the TEACH Project online training available to all implementers at reduced costs. In addition, the rKB emphasized the importance of offering appropriate patients a self-help educational resource for mood management (31). This resource titled, Self-awareness: Managing Your Mood, was developed by the CAMH Nicotine Dependence Clinic using evidence-based intervention approaches and included a list of external supports, activities to help patients manage their mood and reduce their smoking, and strategies for maintaining a healthy mood

(See Additional File 2). Depending on the patient's unique needs, the rKB explained how specific activities in the workbook could be used to increase engagement and maintain positive behaviour change.

## **Characteristics of Individuals:**

### **Knowledge and beliefs about the intervention and self-efficacy**

Individual capacity (10%; 6/61) was also stated as a barrier to implementation. For instance, some HCPs mentioned that they did not feel they possessed sufficient knowledge and training to address depressive symptoms and/or that the delivery of mood management interventions was beyond their scope of practice. Fundamentals of academic detailing described by NaRCAD recommend the dissemination of evidence-based information in order to highlight the benefits of implementation and counter any misconceptions and skepticism by clinicians (44). Therefore, the rKB first provided affirmations to acknowledge HCPs' efforts in cessation counselling; they then conveyed evidence on the clinical relevance of integrating mood interventions into smoking cessation practice, and applied reframing techniques to remind providers of their clinical responsibility to screen and address underlying mental health issues in order to improve patient health outcomes (51, 52). The rKB also offered appropriate resources (see methods: support knowledge and skills development) to help build capacity in delivering brief mood interventions. Collaboration between members of the interdisciplinary FHT was also encouraged, whereby patients who were identified as having depressive symptoms on their PHQ-9 could be referred to a local physician or social worker for more intensive care.

### **Informing practice and policy development**

The rKB made an effort to inform clinical practice and support capacity building with all FHTs; however, in general, HCPs who engaged with the rKB more frequently received more resources and tailored support than those who did not. As the initiative progressed, the rKB found that it was important to reinforce concepts explained during previous conversations, to ensure that HCPs understood how to employ intervention skills in practice and were utilizing the resources available to support implementation. For example, as part of the initiative, providers were advised to offer smokers presenting depressive symptoms a brief mood intervention. While over half of HCPs described being confident in performing this skill, after reviewing their FHT data and probing further, it became clear that many were unaware of what a brief intervention actually entailed. The rKB used this opportunity to define the specific steps involved in delivering brief mood interventions in practice and provided resources to further guide HCPs.

The rKB also played a role in influencing clinic protocols and policy development to align with best-practice guidelines for depression treatment in primary care. For example, four FHTs mentioned that the mood management initiative had highlighted the need for their clinic to standardize assessment and

documentation processes across treatment programs and integrate depression interventions with all patients, not just those enrolled for smoking cessation. In addition, five FHTs sought the rKB's assistance in creating or updating their organization's policies on suicide risk assessments, to ensure that all staff members were equipped to handle urgent care cases. To facilitate this process, the rKB shared evidence-based resources and standard operating procedures for responding to patients indicating suicidal ideation, including guidelines for conducting a brief risk assessment, distress and crisis lines to offer patients, and measures to take if patients refused to answer questions and/or seek support. The rKB also shared insight based on their own experience with developing protocols for non-clinical research staff, such as how to appropriately recognize and manage clients at imminent risk of suicide. To further support implementation, a PDF resource on working with smokers presenting suicidal ideation was created by the rKB, which contained information on screening tools, treatment guidelines, and safety plans for patients at risk of suicidality.

## **Sharing tailored data and promoting reflective practice**

From the rKBs experience, most HCPs were open to receiving tailored data about their FHT and appreciated the opportunity to see how their clinic was performing in practice. The data presented also allowed providers to reflect on their professional experience and gave them a sense of accountability for their clinical conduct. In most FHTs, the rKB found that the level of HCP engagement increased following the administration of tailored data, because providers could use tangible cases to describe their clinical decision-making process. Common reasons for not delivering the mood intervention included cases where the patient was only presenting mild depressive symptoms or that they were already being followed by a mental health worker; thus, an intervention did not seem necessary. Once more, the rKB used skills for handling objections to inform providers about evidence-based treatment recommendations for depression management in primary care, and encouraged clinicians to engage in reflective practice (44).

Sharing tailored data also encouraged organizational leadership among HCPs. If a FHT did not appear to be consistently implementing the initiative, the lead implementer would inquire about their team member's counseling approach and remind them about the importance of integrating mood interventions in practice. Some providers also elected to present this information at larger board meetings with physicians to showcase their FHT's performance.

## **Discussion**

This paper describes the day-to-day practice of a rKB, from an academic health sciences centre working with primary care providers. Previous authors have indicated that remote KB services, which encourage the adoption of evidence-based research into practice via phone and web-based communication, can be a cost-effective and time-efficient alternative to traditional approaches of knowledge brokering (15, 27, 28).

In our current work, we show that it is feasible to reach, develop relations, and support capacity building with HCPs exclusively using technology-facilitated methods of communication.

In this manuscript, we describe how a rKB can use phone and email communications to foster relationships with HCPs. Nevertheless, we recognize that there are certain limitations associated with using virtual modes of communication within primary care settings, including a potential lack of engagement, low prioritization, and non-responsiveness from end-users. Similar challenges have also been described by others exploring technology-based KT strategies in healthcare (15, 18, 27, 53). From the rKB's experience with staff turnover, inconsistent responses and the time taken for HCPs to become familiar with implementing the intervention, developing a meaningful relationship with lead implementers could take anywhere between 1–6 months to achieve, depending on when initial contact was successfully made. KBs working in primary care must consider the unique complexities associated with clinical settings, including the multiple roles of clinicians, demanding schedules, and competing priorities faced by providers. Our experience is comparable to reports by Dobbins et al (17) who found that building collaborative relationships took considerably more time than initially anticipated, and suggest that multi-year KB interventions may be more appropriate for enhancing capacity among HCPs (17). Similar to recommendations made by Traynor et al (18), we reflect on the possibility of having an initial face-to-face interaction between the KB and stakeholders to first develop a meaningful connection and thoroughly explain the initiative, and once this relationship is established, the KB can shift to remote methods of brokering. However, given the vast geography, expected turnover of staff in the primary care sites, and limited budget for travel, we were limited to either a remotely situated KB or none at all.

Several authors have emphasized that the success of knowledge brokering services goes beyond the possession of subject-specific skills, and may involve personal attributes as well, including effective communication, and interpersonal and motivational skills (8–10, 13–15, 17, 18, 54). Perceptions from the rKB are in line with this literature and suggest that social responsiveness, including assessing tone of voice, providing affirmations, and using open-ended questions, are equally, if not more, important within remote settings in order to help build rapport and encourage discussions with HCPs, despite the lack of physical presence.

The rKB found that most barriers to implementation were associated with the Inner Setting and Outer Setting domains of the CFIR constructs (47), including lack of time, resources, and patient engagement. Possessing contextual knowledge regarding the healthcare organization and being able to adapt implementation strategies to local practice settings have been recognized as important components of knowledge brokering (13, 15, 17, 18, 21, 27, 54, 55). From the rKB's experience, understanding the contextual and operational details of the STOP program, and having previous relationships with lead implementers, was beneficial to address these perceived barriers and support the integration of tailored mood interventions into practice. These findings may indicate that hiring a rKB that has existing partnerships with stakeholders, as well as a pragmatic understanding of the healthcare practice setting, including policies, processes, and populations served, can contribute to the overall success of a remote KB model.

Interestingly, we observed that sharing tailored data enhanced HCP engagement with the rKB and promoted leadership among implementers to encourage others within their organization to consistently deliver mood interventions as well. Engagement with the rKB was also greater among FHTs that required more than one lead implementer to be contacted. Dobbins et al (21) identified active leadership and the presence of “champions” who communicate information to other staff members as key facilitators to implementing evidence-informed decision making into practice. In addition, previous research has found that audit with feedback combined with knowledge brokering services can have a positive effect on HCP behaviour change (56). Based on experiences from our rKB, primary care settings are encouraged to implement knowledge brokering services to multiple end-users from a single organization in order to enhance engagement and promote active leadership. Furthermore, rKBs experiencing challenges with end-user engagement should consider the provision of tailored clinical data, in the form of audit and feedback, in order to promote reflective practice and increase HCP commitment toward mobilizing evidence into daily practice.

## Conclusion

Remote methods of KT offer a means to overcome barriers, including limited time and resources to travel to stakeholder organizations. Results from our current study illustrate that a KB in an exclusively remote environment can develop relationships with a large percentage of primary care settings. Understanding the local context and tailoring KB activities to meeting end-user’s clinical needs are important for promoting HCP practice change. Primary care settings considering the use of a rKB when collaborating with an academic centre must take into account additional challenges associated with the use of technology-based interventions, and request rKBs who possess both subject-specific and interpersonal communication skills to facilitate practice change. Our future work will seek to evaluate the cost-effectiveness of remotely situated KBs, in comparison to other KT strategies, to better inform which interventions could be scaled up depending on budgets available.

## List Of Abbreviations

HCPs - Healthcare providers

KT - Knowledge translation

KB - Knowledge broker

rKB – Remote knowledge broker

CAMH – Centre for Addiction and Mental Health

AFHTO – Association of Family Health Teams of Ontario

CHIR – Canadian Institutes of Health Research

FHTs – Family Health Teams

STOP – Smoking Treatment for Ontario Patients

TEACH - Training Enhancement in Applied Cessation Counselling and Health

NaRCAD - National Resource Centre for Academic Detailing

CFIR – Consolidated Framework for Implementation Research

## Declarations

Ethics approval and consent to participate

The implementation of a remotely situated knowledge broker within Ontario Family Health Teams, was part of a larger cluster randomized controlled trial, which was reviewed and approved by the research ethics board at the Centre for Addiction and Mental Health (protocol #065/2016).

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article and its supplementary files.

Competing interests:

The authors declare that they have no competing interests concerning this manuscript. However, some authors have general disclosures to report. PS reports receiving grants and/or salary and/or research support from the Centre for Addiction and Mental Health, Health Canada, Ontario Ministry of Health and Long-term care (MOHLTC), Canadian Institutes of Health Research (CIHR), Canadian Centre on Substance Use and Addiction, Public Health Agency of Canada (PHAC), Ontario Lung Association, Medical Psychiatry Alliance, Extensions for Community Healthcare Outcomes, Canadian Cancer Society Research Institute (CCSRI), Cancer Care Ontario, Ontario Institute for Cancer Research, Ontario Brain Institute, McLaughlin Centre, Academic Health Sciences Centre, Workplace Safety and Insurance Board, National Institutes of Health (NIH), and the Association of Faculties of Medicine of Canada. PS also reports receiving funding and/or honoraria from the following commercial organizations: Pfizer Inc./Canada, Shoppers Drug Mart, Bhasin Consulting Fund Inc., Patient-Centered Outcomes Research Institute, ABBVie, and Bristol-Myers Squibb. Further, PS reports receiving consulting fees from Pfizer Inc./Canada, Evidera Inc., Johnson & Johnson Group of Companies, Medcan Clinic, Inflexxion Inc., V-CC Systems Inc., MedPlan Communications, Kataka Medical Communications, Miller Medical Communications, Nvision Insight Group, and Sun Life Financial. Through an open tender process Johnson & Johnson, Novartis, and Pfizer Inc. are vendors of record for providing smoking cessation pharmacotherapy, free or discounted, for research studies in which PS is the principal investigator or co-investigator. LZ reports receiving grant funding from CIHR, CCSRI, Ontario MOHLTC, and Pfizer Inc/Canada.

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Authors' contributions:

PS and NM conceptualized, designed and supervised the study. LZ, AR, DB and CM provided input on the study design. SA provided remote knowledge brokering services, and collected and analyzed data from Family Health Teams under the supervision of NM. NM and SA drafted the manuscript. NM, SA, PS, LZ, AR, and CdO participated in the critical revision of the manuscript. All authors read and approved the final manuscript.

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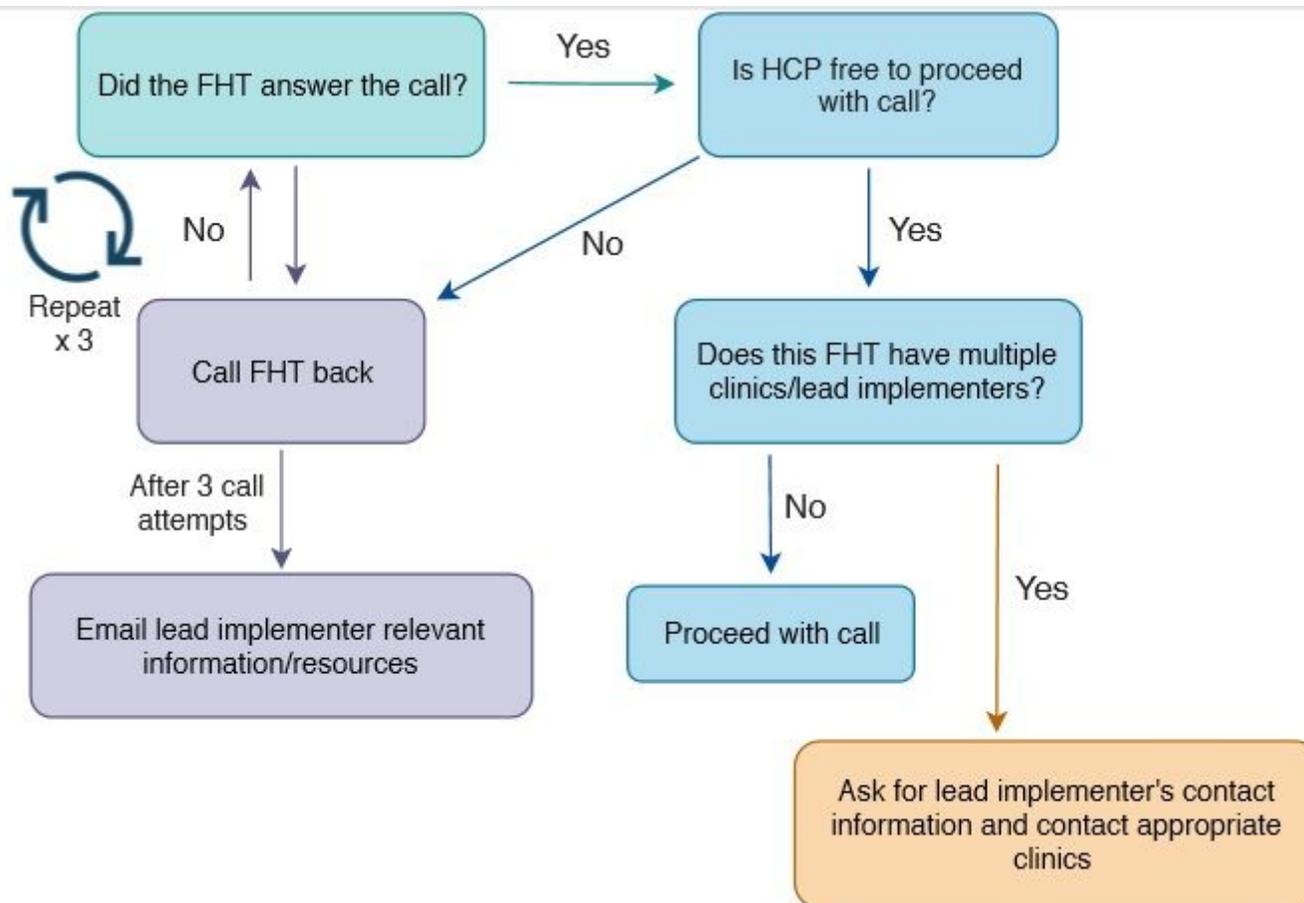
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## Figures



**Figure 1**

Remote knowledge broker call pathway

Remote Knowledge Broker Tracking Sheet				
<b>DEMOGRAPHICS</b>				
NAME				
DISCIPLINE				
ORGANIZATION				
ADDRESS				
TELEPHONE				
EMAIL				
FHT Clinic Received Call <b>Yes</b> <b>No</b>				
<b>CONTACT ATTEMPTS DOCUMENTATION</b>				
			<b>Attempt</b>	
		<b>#1</b>	<b>#2</b>	<b>#3</b>
DATE	Date of contact attempt			
PREPARATION TIME				
METHOD OF CONTACT	Options: (1) telephone (2) email			
RESULTS OF CONTACT	Options: (1) phone call no answer, (2) phone call left voicemail, (3) phone call spoke to non-provider e.g. receptionist, (4) phone call spoke to HCP, (5) phone call HCP called back, (6) email, (7) email response			
<b>Notes</b>				
CALL TIME				
<b>EMERGING THEMES CAPTURED</b>				
<b>Relationship Development and HCP Response to initiative</b>				
skeptical, indifferent, objections etc.				
motivated, interested, etc.				
<b>Concerns/Barriers</b>				
Time				
Organizational Capacity				
Individual Capacity				
Patient response (i.e. readiness, motivation, ambivalence etc.)				
Additional issues that emerged				
<b>Enablers and Improvements</b>				
Time				
Organizational Capacity				
Individual Capacity				
Patient response (i.e. readiness, motivation etc.)				
Additional improvements/things that worked well				
<b>Additional comments regarding the initiative</b>				
<b>Additional Support/Resources requested</b>				
<b>Questions requiring follow-up</b>				
<b>NOTES</b>				

Figure 2

Remote knowledge broker tracking sheet

## Supplementary Files

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