THE EFFECTIVENESS OF KNOWLEDGE TRANSLATION STRATEGIES IN PUBLIC HEALTH

THE EFFECTIVNESS OF KNOWLEDGE TRANSLATION STRATEGIES USED IN PUBLIC HEALTH

By

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Abstract

Objective: The purpose of this systematic review is to identify the effectiveness of KT strategies used to promote evidence-informed decision making (EIDM) among public health decision makers.

Methods: A search strategy was developed to identify primary studies published between 2000-2010. Studies were obtained from multiple electronic databases, supplemented by checking the reference lists of included articles and background papers. Two independent reviewers screened studies for relevance, assessed methodological quality and extracted data from relevant studies using standardized tools. Disagreements were resolved through consensus.

Results: The search identified 92, 548 titles related to KT interventions. After duplicate articles were removed 64, 391 were imported into Distiller SR of which 345 articles were deemed potentially relevant on double title and abstract review. Of the 345 articles, 30 met all relevance criteria on full text screen and after revisions to the inclusion criteria, 6 studies of moderate quality were included in this review.

KT interventions tested in the systematic review included organization change, provider reminders, education, financial incentives and feedback. Interventions tested in the five primary studies ranged from; educational sessions; dissemination channels including print, CD-ROM and Internet; technical assistance and staff training; and web-based services such as databases, information services, registries of pre-processed research evidence and tailored targeted messaging.

KT strategies shown to be less effective included access to registries of pre-processed research evidence or print materials. Simple or single KT interventions were shown in some circumstances to be as effective as multifaceted ones including organizational change, provider reminders and tailored targeted messaging. While knowledge brokering did not have a significant effect generally, results suggest that it did have a positive effect on organizations with low research culture.

Conclusion: KT research in public health is in early stages. Single interventions can be effective. Researchers and practitioners must pay attention to contextual factors.

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Finally I would like to thank my family and friends for their love and prayers and also recognize my husband for his unrelenting support and encouragement. I would not have been able to take advantage of this opportunity if it was not for his support.

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List of Abbreviations and Symbols

Knowledge Translation (KT) - "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system" (Canadian Institutes of Health Research, 2008b).

Evidence Informed Decision Making (EIDM) - "the systematic application of the best available evidence to the evaluation of options and to decision-making in clinical, management and policy settings" (Health Canada, 1997).

Declaration of Academic Achievement

The author, RL was the primary author of this work. DC and RL created the study concept, design and constructed and refined the search strategy. RL conducted double review title and abstract screening with three undergraduate nursing students from McMaster University. RL and Jenny Yost (JY), a post doctoral student at McMaster University, independently conducted full text review of potentially relevant articles and quality assessment. Data extraction was done first by RL and checked by JY. Drafting of the manuscript and critical revision for important intellectual content was done by RL, DC, MD and MB. RL wrote the final report and is the guarantor for the paper. All authors read and approved the final manuscript.

Chapter One: Introduction

The purpose of this systematic review is to identify the effectiveness of KT strategies used to promote evidence-informed decision making (EIDM) among public health decision makers. This thesis is comprised of four main chapters. Chapter One introduces the topic of knowledge translation and EIDM in general and highlights perspectives and key issues from a public health standpoint. The significance from which the purpose of the systematic review evolved is also provided. Chapter Two describes the methods of the systematic review. Chapter Three presents the main results, including assessment of risk of bias in included studies, characteristics of included studies and relevant findings. Finally, Chapter Four provides an in-depth discussion of results, limitations of the review, implications for public health practice, future research and the final conclusion of the thesis.

Literature Review

Globally, and at all levels of health care, health systems fail to use research evidence optimally (Straus, Tetroe, & Graham, 2009). Research evidence is defined as including descriptive evidence of prevalence and risk, evidence of the intervention's effectiveness and in what circumstances and among which sub-groups interventions may work or not and why (Waters, 2009). The gap between research evidence and decision making results in negative effects including a reduction in both quantity and quality of life (Davis, Evans, & Jadad, 2003; Madon, Hofman, & Kupfer, 2007, Straus et al., 2009) and inefficient use of limited health care resources (Graham et al., 2006; Straus et al., 2009). As political and societal pressures to demonstrate the use of research evidence in

decision making continues to rise, a range of strategies, often conceptualized as knowledge translation (KT) have been described and in some cases implemented (Canadian Institutes of Health Research, 2008a; Waters, Armstrong, Swinburn, Moore, Dobbins, Anderson, et al., 2011). Knowledge translation involves using high-quality research knowledge in processes of decision making (Straus et al., 2009). It is defined by the Canadian Institutes of Health Research (CIHR) as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system" (CIHR, 2008b).

Knowledge translation and evidence-informed decision making. Knowledge translation strategies are used in public health to promote EIDM. EIDM refers to incorporating the best available research evidence into public health policy and program decision making (Dobbins et al., 2009). EIDM became part of the health sector's lexicon during the 1990s following in the footsteps of the interest in and resources committed to evidence-based medicine (Canadian Health Services Research Foundation, 2000; Lomas, 2000). In Canada, the term was given more prominence in 1997 when the Prime Minister's National Forum on Health focused on EIDM and defined it in the forum's final report as "the systematic application of the best available evidence to the evaluation of options and to decision-making in clinical, management and policy settings" (Health Canada, 1997).

The rationale for engaging in EIDM is the belief that optimal patient and population health outcomes will result (Lavis, Robertson, Woodside, McLeod, &

Abelson, 2003). The potential benefits of EIDM in public health are numerous including; the adoption of effective and cost-efficient interventions or the removal of programs or services known to be ineffective; more cautious use of scarce resources, improved client satisfaction, and improved health for individuals and communities (Ciliska, Thomas, & Buffett, 2008).

Translating best available research evidence into programmatic change is a complex process (Mitton, Adair, McKenzie, Pattern, & Perry, 2007). Multiple barriers exist at different levels including the health care system itself (lack of financial incentives), health care organizations (limited access to research evidence, lack of equipment), health care teams (existing standards may not be in line with recommended practice), individual health care professionals (lack of knowledge, attitudes and skills in critically appraising and using evidence from the literature, lack of time and resistance to change) and patients (Dobbins et al., 2009; Straus et al., 2009).

The extent to which the organization values research evidence in decision making has an impact on the effectiveness of KT strategies (Dobbins et al., 2009). Dobbins and colleagues (2001) found in a cross-sectional survey that public health decision makers who perceived their organization to value the use of research evidence were more likely to use research evidence from systematic reviews in their decision making.

While barriers to the uptake of EIDM in public health have been well documented and several KT strategies exist to overcome barriers, literature related to how to effectively promote and facilitate these strategies are lacking (Armstrong, Waters, Crockett, & Keleher, 2007; Mitton et al., 2007). Passive KT strategies that have

commonly been used include printed educational materials, didactic presentations at conferences or in educational meetings and passive dissemination of guidelines; however, these have been shown to be ineffective and unlikely to result in practice change (Althabe, Bergel, Caffarata, Gibbons, Ciapponi, Aleman, et al., 2008; Bero et al, 1998; Farmer et al., 2008; Grimshaw et al., 2001; Mansouri & Lockyer, 2007; Marinopoulos et al., 2007; Torrey et al., 2001). A common belief is that strategies that promote interaction between researchers and end users involving face-to-face contact may influence more promising results (Dobbins et al., 2009). More recently, there has been a push for more dynamic KT interventions that facilitate interaction between the producers and end users of research evidence (Canadian Health Services Research Foundation, 1999; Graham et al., 2006). Some interactive KT strategies that have been shown to be more effective in various health care settings include interactive education meetings and workshops, knowledge brokering, tailored messaging, educational outreach visits and audit and feedback that is delivered more intensively (Althabe, et al., 2008; Dobbins et al., 2009; Jamtvedt, Young, Kristoffersen, O'Brien, & Oxman, 2006; Mansouri & Lockyer, 2007; Marinopoulos et al., 2007; Russell et al., 2010; Thomson O'Brien et al., 2002a; Thomson O'Brien, Oxman, Haynes, Freemantle, & Harvey, 2002b; Thomson et al., 2002c). While there is evidence to suggest that multi-faceted and interactive interventions are more effective than simpler strategies (Mansouri & Lockyer, 2007; Marinopoulos et al., 2007), this belief rests on limited and inconsistent evidence as Grimshaw et al. (2006) found in his review that multifaceted interventions did not appear to be more effective than single interventions. To complicate matters further, it is documented repeatedly in the literature

that no gold standard has been found for changing provider behaviour in health care (Grimshaw et al., 2006; Ornstein et al., 2004; Oxman, Thomson, & Davis, 1995). It is also difficult to assess the generalizibility of these findings to public health settings.

The only trial that evaluated KT strategies in public health, that was known to the authors before this review, was a randomized controlled trial conducted by Dobbins et al. (2009) involving a national sample of public health departments in Canada. Three KT interventions were evaluated and included access to an online registry of research evidence; tailored messaging; and a knowledge broker (Dobbins et al., 2009). Tailored, targeted messaging, in which a series of emails that included the title of systematic reviews relevant to the practitioner's specific scope of decision making with the link to the full reference was the most effective KT strategy in this study (Dobbins et al., 2009). Surprisingly, knowledge brokering which has been thought by many to be the optimal KT strategy due to the high level of interaction (Primary Health Care Research & Information Service, 2006) generally did not appear to be effective in promoting EIDM in the public health setting (Dobbins et al., 2009); although improvements were observed in organizations whom at baseline had perceived their organization did not value the use of evidence in program decision making.

As a result of limited evidence, there is a knowledge gap regarding which KT strategies directed at public health practitioners have demonstrated effectiveness in public and community health settings (Armstrong et al., 2007; Dobbins, DeKorby, & Twiddy, 2004; Dobbins et al., 2009; Mitton et al., 2007; Waters et al., 2011).

Public health today. Many Canadians have a limited understanding of public health since it often operates in the background, except in cases of sudden threats to the health of communities such as; water contamination in Walkerton and North Battleford, Ontario; and the threats introduced by severe acute respiratory syndrome (SARS) or H1N1 virus (National Advisory Committee on SARS and Public Health, 2003). Public health developed as a societal response to threats to the collective health of its citizens and accordingly emphasizes the health and well being of communities rather than the treatment of individual illness (National Advisory Committee on SARS and Public Health, 2003). Public health is concerned with promoting health, preventing disease, and prolonging and improving quality of life through the collaborative efforts of society (National Advisory Committee on SARS and Public Health, 2003). The programs, services and institutions involved primarily address the following: health protection, health surveillance, disease and injury prevention, population health assessment, health promotion and disaster response (National Advisory Committee on SARS and Public Health, 2003).

The effectiveness of the public health system is critically affected by capacity at local and provincial and territorial levels (National Advisory Committee on SARS and Public Health, 2003). Unfortunately catastrophic events like Walkerton and SARS have highlighted weaknesses with the infrastructure of the Ontario and Canadian public health system. Outside of Asia, Canada was the country most affected by SARS (National Advisory Committee on SARS and Public Health, 2003) and its response to the outbreak revealed a gap between what researchers know and what practitioners do (NCCMT,

2009). SARS placed unprecedented demands on the public health system which challenged regional capacity (National Advisory Committee on SARS and Public Health, 2003).

Significance. The global burden of disease is shifting from infectious diseases to noncommunicable diseases (World Health Organization (WHO), 2008). Due to changes in diet and lifestyle, major noncommunicable diseases are now rapidly adding to the worldwide burden of disease and are predicted to cause over three quarters of all deaths by 2030 (Disease Control Priorities Project, 2006; World Health Statistics, 2008). Most risk is attributable to lifestyle and behavioral patterns including obesity, hypertension, hypercholesterolemia, smoking and physical inactivity (Bush et al., 1989; Disease Control Priorities Project, 2006). These risk factors can be altered through economic and educational policies and programs that will reap savings later in medical and other direct and indirect costs to the health care system (Disease Control Priorities Project, 2006).

However, valuable research evidence in a multitude of health care settings, including public health, is not being put into action (Dobbins et al., 2009; Graham et al., 2006). For example, the World Health Organization (2008) recommends five policies for controlling tobacco use, a modifiable risk factor which kills a third to a half of all those who use it. Half of all countries in the world implement none of these five recommended policies, despite the fact that tobacco control measures are cost-effective (WHO, 2008).

Additionally, while avoidable injuries cost the nation billions of dollars in direct health spending and indirect costs; the Centers for Disease Control and Prevention in the USA identified that as much as two-thirds of premature mortality was preventable

through the application of available research evidence (National Advisory Committee on SARS and Public Health, 2003).

An objective of Healthy People 2010 (U.S. Department of Health and Human Services, 2000) emphasizes the need to expand continuing education opportunities to develop competencies in the essential public health services as new areas, problems, threats and potential diseases continue to emerge. Knowledge has become a key ingredient of successful nations. Societies with limited capacity to source and adapt, create and apply research evidence to advance social goals risk being left behind in the globalizing world (Ramphele, 2006). The ability to seek, analyze, and synthesize evidence-based information is linked to greater success in making policy choices that have the best potential to yield positive outcomes for individuals, communities and societies (Ramphele, 2006).

Research can and should be an essential component of the policy-development and decision-making processes that occur within public health agencies however, the gap between research and practice is evident (Kiefer et al., 2005). While several KT strategies exist, there is a need to evaluate the effectiveness of strategies that promote EIDM and build the evidence informed capacity of practitioners, managers and policy makers in public health.

Question

The research question that guided the systematic review is: What is the effectiveness of knowledge translation strategies used in public health to promote EIDM?

Purpose

The purpose of this systematic review is to assess, analyze, and draw conclusions about the available evidence that assess the effectiveness of knowledge translation strategies used to promote EIDM among public health practitioners in community or public health settings. The specific objectives are to evaluate the effects of knowledge translation interventions and their ability to change public health practitioners' knowledge, skills and practice.

The results of this systematic review will be beneficial to public health researchers, stakeholders, senior management, program planners and decision makers. Knowing which KT strategies are more likely to result in the application of research knowledge, and what factors are likely to modify this process, will help to build the evidence informed capacity of public health practitioners resulting in an improved public health system and, ultimately, the health of the population.

Chapter Two: Methods

In this chapter, the methodology for a comprehensive systematic review will be presented following guidelines consistent with The Cochrane Collaboration methodology for conducting rigorous systematic reviews of the literature (Higgins, 2009). This methodology was employed to prevent biases from being introduced when less rigorous methods are utilized.

Criteria for Selecting Studies

In the following section, the inclusion criteria will be expanded to define type of participants, interventions, outcome measures and types of studies as key sub-headings. Exclusion criteria will also be described throughout.

Type of participants. Studies directed towards health practitioners in a public health or community setting were included in this review. The focus of the intervention was all practitioners, including allied health professionals, involved in public health. Therefore, practitioners practicing in a community setting whose focus is on public health issues, like preventative care, were included. Review authors excluded studies where participants were students learning in a school setting and practitioners in the primary care, tertiary or community health settings focused on clinical care or treatment or those providing primary or acute care in a community setting.

Type of intervention. Any KT strategy directed towards the participants and aimed at promoting or facilitating the utilization of research evidence in public practice was included in this review. Examples of eligible KT interventions included, but were

not limited to, the use of education, reminders, audit and feedback, knowledge brokers, tailored messaging or champions (See Appendix A for definition of terms).

Type of outcome measures. This review focused on a variety of possible outcomes that can be categorized to include change in conceptual, instrumental, or strategic knowledge. Conceptual change or use of research is defined as change in knowledge, understanding or attitude (Stetler, 1994). Instrumental change is defined as the concrete application of specific knowledge to practice (Stetler, 1994). Strategic change is defined as using knowledge for powerful change (Stetler, 1994). Strategic change might be used to influence program planning or to influence policy. Strategic changes can be observed through research knowledge being referenced or utilized in public health policy, practice, program or guideline development or changes in public health policy and practice (Dobbins et al., 2009).

In addition to the types of outcomes targeted, there are various outcome measures. Outcome measures were included if they pertained to: surveys or questionnaires (measuring knowledge-related attitudes); tools (measuring adherence to recommendations, audits, evaluating administrative databases); observation; and interviews or analysis of documents (for example, reviewing policies to assess the use of evidence incorporated into the policy).

Type of studies. It is recognized by the Cochrane review group, Effective Practice and Organisation of Care Group (EPOC) (A Review Group of the Cochrane Collaboration, 2011) that it is not always feasible to evaluate organizational or professional interventions within randomized controlled trials. Reviewers assumed that

most KT interventions will be tested in real-life, practice based settings opposed to more controlled environments. Therefore study designs accepted for an EPOC review were included for this review. These designs include the following: practitioner randomized controlled trials, cluster randomized controlled trials, non-randomized cluster controlled trials, controlled before and after studies, and interrupted time series designs. Interrupted time series designs had to have met the following EPOC criteria to be included; a clearly defined point in time when the intervention occurred; and at least three data points before and three after the intervention.

Due to the specific inclusion criteria and focus on public health, the review author assumed that there would be limited studies conducted and therefore also chose to include one group before and after study designs. Relevant systematic reviews and mixed methods research studies were also included. Qualitative studies were also eligible to be included. Rationale for the inclusion of qualitative studies was to obtain perceptions of public health practitioners experience with the KT intervention. Cross-sectional studies, non-systematic reviews, discussion papers or studies utilizing a post-test only were excluded.

Changes to the protocol. Changes in the study protocol occurred when the search strategy discovered a larger than expected set of relevant studies based on the above inclusion criteria (See Results Section). After consultation with content experts, it was decided to synthesize results from studies that are accepted for an EPOC review only and systematic reviews. This meant that qualitative research studies, mixed methods and one group before and after studies were eliminated from further analysis. Study designs

with no control group cannot account for temporal effects unrelated to the intervention and therefore were excluded. Review authors also did not extract data on outcomes where data was not collected both at baseline and follow up.

Search Strategy for Identification of Studies

Multiple and competing terms exist to describe the study of implementing research findings into practice (McKibbon et al., 2010) which is referred to as "KT" in this review. Terms for related concepts are often used interchangeably, and definitions are unclear (Estabrooks, Thompson, Lovely, & Hofmeyer, 2006; Graham et al. 2006). As a result, it makes information retrieval related to the field of KT very difficult (McKibbon et al., 2010). Therefore, Dr. Ann McKibbon, an expert in the field in the Health Information Research Unit, Department of Clinical Epidemiology and Biostatistics at McMaster University helped develop the search strategy (See Appendix B). To locate primary research or systematic reviews two key concept categories were used: 'public health', and 'knowledge translation'. Terms related to KT which were used in the search strategy as key terms, were identified in a study by McKibbon and colleagues (2010). The number and frequency of terms used to refer to knowledge translation in a body of health literature in 2006 were recorded and divided into terms that discriminated between KT and non-KT articles (McKibbon et al., 2010). For this review, we used both KT terms that were shown to have high discriminatory power and medium discriminatory power in the search strategy, and declined the use of terms with low discriminatory power.

Electronic searches. The search strategy aimed to find both published and unpublished studies, limited to the English language and restricted to the dates 2000 to 2010 inclusive. Studies were required to have been conducted in a country with health practices and standards similar to the developed world. Experts from EPOC were consulted and after searching on the EPOC database with limited results, the following databases were searched: CINAHL, Medline, EMBASE, and the Cochrane Library from 2000 to 2010 (See Appendix B). Methodological study filters from EPOC were utilized in order to search for relevant study designs such as controlled before and after and interrupted times series designs.

Searching other resources. An additional stage of the search involved the hand searching of the following sources to find any additional articles:

- Reference lists in those publications identified in the initial search of the databases that were deemed relevant
- Online registries of research relevant to knowledge translation or public health including Knowledge Translation Plus and Public Health Plus
- Conference proceedings, dissertations, abstracts, reports for other 'grey literature including; Canadian Public Health Association, Research Transfer Network of Alberta, Knowledge Exchange in Public Health, National Institutes of Health, and the 2010 Public Health Policy Conference

Methods of Review

The web based application DistillerSR was used to manage all references and assist in the review process. After duplicate articles were removed, the titles and abstracts

from all search strategies were imported into DistillerSR and screened independently by the primary researcher (RL) and one of four other reviewers. Any disagreements were resolved through discussion, and when required, another reviewer was consulted. Studies deemed to be potentially relevant were retrieved and the full text was assessed for relevance independently by two reviewers: the primary reviewer (RL) and the second reviewer (JY) a postdoctoral fellow with the School of Nursing at McMaster University. Disagreements were resolved through discussion until consensus was reached (Thomas et al., 2004). When agreement could not be reached between reviewers, a third reviewer (DC) was consulted.

A study had to meet all relevance criteria listed in the table below.

Table 1: Relevance Criteria

The study involves an intervention applied in a public or community health practice
The intervention described is directed towards public/community health practitioners
The study intervention, which is a knowledge translation strategy, is aimed at increasing EIPH (i.e. increase knowledge uptake/change in a form of knowledge/promote EIDM)
Information on outcomes are reported for changes in knowledge, skills, and/or practice related to the outcome of interest
The study design is one that is included in EPOC's guidelines (RCT, cluster RCT, non-randomized cluster controlled trials, controlled before and after studies and Interrupted time series designs). Systematic reviews were also included

Those studies deemed to be relevant were then assessed for methodological quality by two independent reviewers (RL, JY) using standardized tools to independently rate each study (See Appendices C, D, E). All disagreements were resolved through discussion between reviewers and a third reviewer when required. Review authors

anticipated a small number of research studies evaluating a KT intervention and utilizing a rigorous study design would be relevant and therefore all studies regardless of methodological quality were included in the review.

Where multiple publications for the same study existed, studies were combined into one account and relevant data extracted from all articles. The article containing the most complete data was identified as the primary article.

Data extraction and management. Data was extracted from the papers included in this review using a data extraction tool developed by the Effective Public Health Practice Project (EPHPP). The EPHPP is an expert team of researchers that produce high-quality evidence synthesis documents, including systematic reviews, for public health practitioners and decision makers in Canada (EPHPP, 2009). The primary review author extracted the data from the relevant articles independently using the data extraction tool and the data extracted was reviewed by the second reviewer (JY). Reviewers resolved discrepancies through discussion or through consultation with a third reviewer until consensus was achieved. The extracted data included specific details including characteristics of included studies, details about the intervention, populations, follow-up period, attrition rates, study methods and outcomes significant to the review (for details see Characteristics of included studies Appendix F). The data prior to the intervention and at the last follow up date were extracted. If any information was unclear, the primary reviewer contacted the primary author of the original research study to provide further details.

Assessment of heterogeneity. Heterogeneity was assessed visually by reviewers by evaluating the results for each outcome in tables. Individual study characteristics were assessed and due to wide variation among studies, it was deemed inappropriate to combine the results statistically across studies. For example, the KT interventions were considerably different, including their duration and intensity, populations studied and outcome measures. With such variation present, a meta-analysis was not feasible and the results were synthesized narratively. Furthermore, it is likely that the observed estimate overestimates the actual treatment effect so results must be interpreted cautiously.

Data synthesis. Each study was summarized and described according to individual characteristics. For example, characteristics of study populations, interventions, follow up and outcomes measured. Methodological quality of studies was compared according to design utilized. Findings were summarized based on study design and the effect of the intervention on knowledge, skill or practice. Summary tables to show whether the intervention had a positive, negative or no effect were constructed and are included in the text. Outcome tables were also constructed and are included in appendices to summarize data visually and included the above study characteristics plus reported effect sizes with corresponding 95% confidence intervals and details of the measurement tools (See Appendix H).

Assessment of Risk of Bias in Included Studies

Systematic reviews. A previously developed, internationally known and tested tool (Shea et al., 2007) was used to assess the methodological quality of relevant systematic reviews (See Appendix C). The development of "A Measurement Tool to

Assess Reviews" (AMSTAR) built on previous tools, empirical evidence and expert consensus (Shea et al., 2007). AMSTAR has demonstrated good face and content validity for measuring the methodological quality of systematic reviews (Shea et al., 2007). A mean kappa of 0.70, 95% CI [0.57-0.83] was reported for interrater agreement of the individual items of the tool and an intraclass correlation coefficient of the total score for AMSTAR was 0.84, 95% CI [0.65-0.92]. The tool is an 11-item questionnaire that consists of critical quality variables for any systematic review that asks reviewers to answer "yes," "no," "can't answer," or "not applicable" (Shea et al., 2007). A review can achieve a maximum score of 11 on AMSTAR indicating a methodologically rigorous review. The eleven items include items such as an 'a priori' design provided; a comprehensive literature search performed; grey literature included (Shea et al., 2007). Reviewers responses to these items can include "yes," "no," "can't answer," or "not applicable" (Shea et al., 2007).

Randomized controlled trials. For randomized controlled trials, the reviewers (RL, JY) conducted a domain-based evaluation of the risk of bias within each included study using a tool recommended by the Cochrane Collaboration (Higgins, 2009) (See Appendix D). Critical assessments were made separately for each of the six domains with ratings of 'Yes' (low risk of bias); 'No' (high risk of bias) and 'Unclear' (uncertain risk of bias) (Higgins 2009). The following domains were addressed independently by two reviewers; sequence generation, allocation concealment, blinding, incomplete outcome data, selective outcome reporting and 'other issues.' The domains of sequence generation, allocation concealment and selective outcome reporting were addressed by a

single entry for each study while blinding and incomplete outcome data assessments were made separately for different outcomes (Higgins, 2009).

For sequence generation, reviewers (RL, JY) assessed if the allocation sequence was adequately generated and likely to produce comparable groups. If the investigators utilized and described a random component in the sequence generation process a rating of 'Yes' (low risk of bias) was given. If the method utilized a non-random approach in the sequence generation process a rating of 'No' (high risk of bias) was given. If there was no description of allocation sequence given by the investigators beyond a statement claiming to randomly allocate participants, a rating of 'Unclear' (uncertain risk of bias) was given. The method used to conceal allocation sequence was assessed to see whether it was adequate in terms of whether the assignment could have been foreseen in advance of, or during, recruitment.

For blinding, the reviewers assessed whether any steps were taken to blind participants, personnel and outcome assessors using the following rating system: 'Yes' (low risk of bias); 'No' (high risk of bias) and 'Unclear' (uncertain risk of bias). We assessed whether incomplete data was adequately addressed. Where studies did not report intention-to-treat analysis, reviewers assessed how data related to attrition and exclusions were reported and whether the data was comparable to the total randomized number. A judgment of 'Yes' (low risk of bias) was given when incomplete data was addressed adequately. A judgment of 'No' (high risk of bias) was given when incomplete data was not addressed adequately and 'Unclear' (uncertain risk of bias) for insufficient reporting of attrition to permit judgment.

For selective outcome reporting, we assessed whether reports of the study were free of suggestion of selective outcome reporting. Where all outcomes identified a priori were reported on a rating of 'Yes' (low risk of bias) was given. When pre-specified outcomes were not reported or outcomes were not pre-specified and given no justification, a rating of 'No' (high risk of bias) was given. If there was insufficient information to permit judgment, a rating of 'Unclear' (uncertain risk of bias) was given.

Other relevant sources of bias were assessed under "other sources of bias" for example: baseline characteristics and whether they were reported to be similar; risks of co-interventions or contamination; and the reliability and validity of all data collection measures.

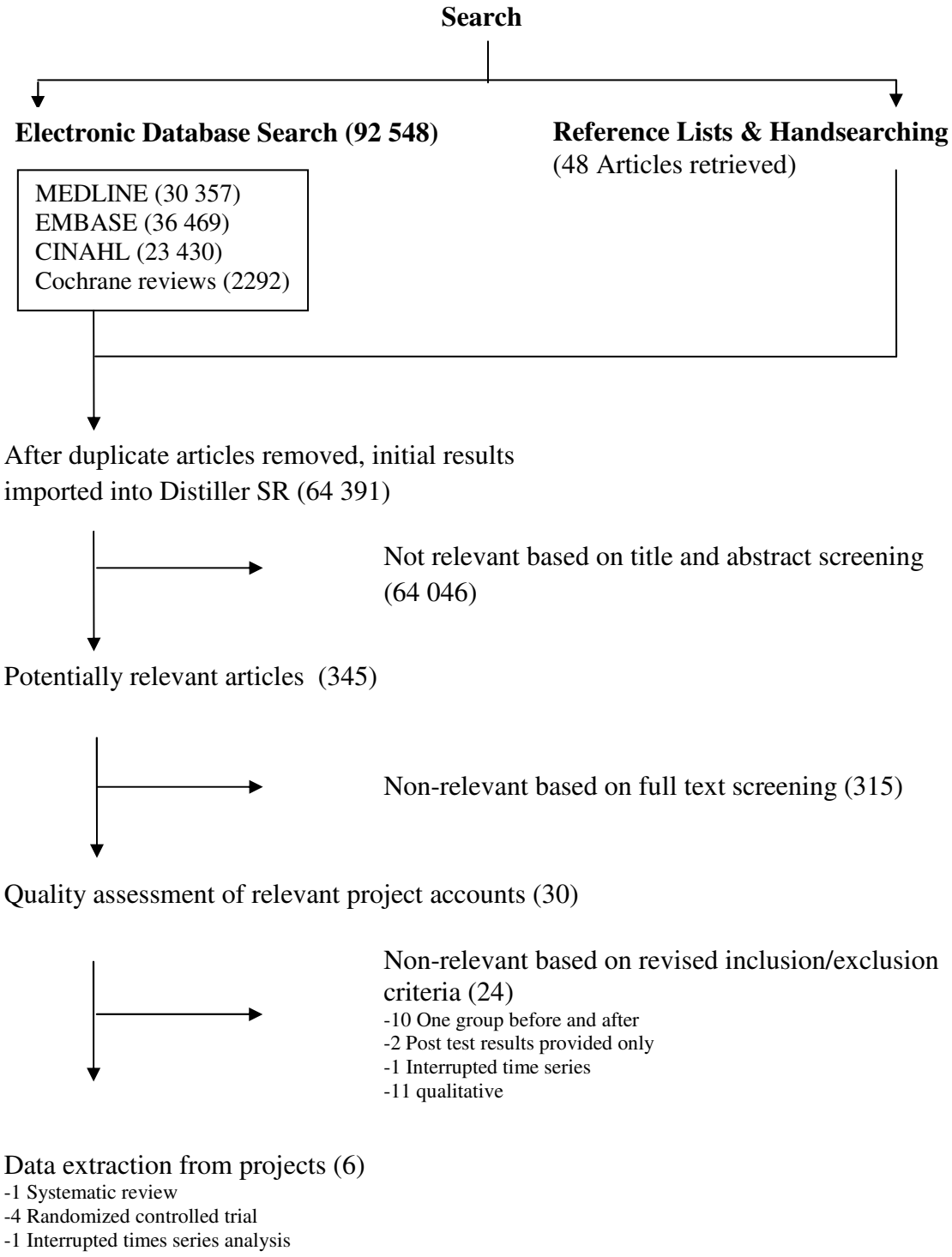
Interrupted times series analyses. For designs that utilized an interrupted time series design, risk of bias was assessed using EPOC's Risk of Bias tool for interrupted time series designs (See Appendix E). Criteria were assessed independently by two blinded reviewers including: if the intervention was unlikely to affect data collection (for example, sources and methods of data collection were the same before and after the intervention); if knowledge of the allocated interventions was adequately prevented during the study; whether incomplete outcome data was adequately addressed; if the study was free from selective outcome reporting; and whether the study was free from other risks of bias. Reviewers provided a rating of 'Yes' (low risk of bias); 'No' (high risk of bias) and 'Unclear' (uncertain risk of bias).

Chapter Three: Main Results

The following chapter will discuss key findings of the systematic review. A description of the results of the search strategies and relevant studies retrieved for full review and risk of bias assessment will be highlighted. Characteristics of included studies will be presented and findings from relevant studies presented and discussed. Findings from relevant studies will be discussed and synthesized according to the targeted outcomes studied: change in knowledge, skill or practice. Summary tables were constructed and included in the text to show in which direction the intervention had an effect. Outcomes tables showing effect sizes and their corresponding confidence intervals are included in Appendix H.

Please refer to Figure 1 for a detailed schematic diagram of the systematic review process.

Figure 1: Review flow diagram



Description of Included Studies

The search strategy identified 92, 548 titles related to KT interventions. Of these, 64, 391 were imported into Distiller SR after duplicate articles were removed. Of the 64, 391 articles imported, 345 articles were deemed potentially relevant on double title and abstract review. Titles were most often deemed not relevant because the KT intervention was not implemented in a public health or community setting, or because the KT intervention was not directed towards public health practitioners. Of the 345 articles retrieved for relevance screening, 30 met all relevance criteria on full text screen. The most common reasons studies were judged as not relevant were that the intervention was not a knowledge translation strategy or information on relevant outcomes were not reported.

Of the 30 studies initially included in the review, one study was a systematic review, eighteen studies utilized quantitative methodology including two interrupted time series designs, and eleven studies utilized qualitative methodology. When selection criteria were modified by review authors to restrict inclusion criteria, 24 studies were eliminated due to: the use of qualitative methodology (11 reports); post test results provided only or analyzed only (2 reports); no control group for comparison (10 reports); and not meeting the definition for interrupted times series of including at least three data points before and three after the intervention (1 report). See reference list of studies excluded in this review. Authors of studies with missing data were contacted and asked for the information or if any supplemental publications existed. Three studies were eliminated based on the author's response to email communication that there were no

control data (Brownson et al., 2007; Fagan, Hanson, Hawkins, & Arthur, 2008; McHugo, et al., 2007). Jerome D'Emilia, Merwin, & Stern (2010) initially had a control group assigned in their study however, after attrition the control group became too small and was excluded in their analysis and so was excluded from this review. One other study which was a randomized controlled trial (Kelly et al., 2000) did not include baseline scores in their analyses and therefore did not represent differences for the change from baseline to follow up. The author did not respond to a request for this information and was also excluded from further review.

Six included studies remained for analysis including one systematic review (Stone et al., 2002), four randomized controlled trials (Barwick, Peters, & Boydell, 2009; Di Noia, Schwinn, Dastur, & Schinke, 2003; Dobbins et al., 2009; Forsetlund et al., 2003) and one interrupted time series analysis (Hanbury, Wallace, & Clark, 2009). See Appendix F for more detailed descriptions of each included study. Of the five included primary studies one was conducted in the United States (Di Noia et al., 2003), two were conducted in Canada (Barwick et al., 2009; Dobbins et al., 2009) and the remaining two originated from European countries, Norway (Forsetlund et al., 2003) and England (Hanbury et al., 2009). All five primary studies and the systematic review were in English. The unit of allocation was done by individual (Fortselund et al., 2003), and by organization or site (Barwick et al., 2009; Di Noia et al., 2003; Dobbins et al., 2009; Hanbury et al., 2009). The smallest sample size included 34 individuals from 6 consenting organizations (Barwick et al., 2009); and the largest sample size included 108 public health departments (Dobbins et al., 2009). The duration of interventions varied

greatly from the receipt of a single pamphlet (Di Noia et al., 2003), to one year of services provided by a knowledge broker (Dobbins et al., 2009). All of the studies evaluated change in practice, none evaluated change in skill level and three evaluated change in knowledge (Barwick et al., 2009; Di Noia et al., 2003; Fortselund et al., 2003). The majority of studies evaluated outcomes immediately following the intervention, with one of the studies evaluating outcomes six months post intervention (Di Noia et al., 2003). The systematic review by Stone et al. (2002) did not include any of the individual studies mentioned above as studies included in this review were all published between 1979 to 1999.

KT interventions were aimed at a variety of public health professionals involved in public health or community prevention orientated coalitions from a range of public health disciplines including mental health (Barwick et al., 2009; Hanbury et al., 2009); preventative adolescent substance abuse services (Di Noia et al., 2003); healthy body weight promotion (Dobbins et al., 2009); and immunization and cancer screening prevention (Stone et al., 2002). The majority of interventions were primarily targeted at community providers employed by public health departments, community agencies and policy making bodies including school personnel, social workers, registered nurses, program managers, coordinators or directors (Barwick et al., 2009; Di Noia et al., 2003; Dobbins et al., 2009). One primary study (Forsetlund et al., 2003) targeted public health physicians while the intervention in the systematic review targeted mostly physicians and nurses (Stone et al., 2002).

Although the universal objective of the studies was to build capacity of practitioners involved in preventive services, KT interventions varied significantly. The systematic review by Stone et al. (2002) compared the effectiveness of organizational change, reminders, education, financial incentives or feedback on providers' use of adult immunization and cancer screening services for their clients. KT interventions tested in the five primary studies ranged from; educational sessions involving peer development (Barwick et al., 2009; Hanbury et al., 2009) and workshops (Forsetlund et al., 2003); dissemination channels including print, CD-ROM and internet (Di Noia et al., 2003); technical assistance and staff training from consultants with varying levels of interaction and supervision (Dobbins et al., 2009; Forsetlund et al., 2003); web-based services such as databases, information services and discussion lists (Forsetlund et al., 2003), and a registry of pre-processed research evidence or online tailored and targeted messaging (Dobbins et al., 2009).

KT interventions also varied in level of interaction. For example, some educational sessions or workshops were given in more of a didactic format (Hanbury et al., 2009) while others were more hands on and involved extensive group interaction (Barwick et al., 2009; Forsetlund et al., 2003; Dobbins et al., 2009). Interventions also differed by level of assistance given in the format of technical assistance. Certain KT interventions tested in studies (Di Noia et al., 2003; Dobbins et al., 2009) required participants to engage in independent study. Other studies reported on support services provided online (Forsetlund et al., 2003) and others described more involved training and

supervision provided onsite to public health professionals through the services of a knowledge broker (Dobbins et al., 2009).

The theoretical basis of interventions studied differed between studies. The multifaceted intervention in Forsetlund et al. (2003) was built to lead a participant through steps outlined in Rogers' theory of Diffusion of Innovation (Rogers, 1999). The structure of the communities of practice intervention in Barwick et al. (2009) was developed according to certain key principles outlined in communities of practice models. The interventions introduced in Dobbins et al. (2009) were based on the Framework for Research Dissemination and Utilization (Dobbins, Ciliska, Cockerill, & DiCenso, 2002). The intervention in Hanbury et al. (2009) was a Theory of Planned Behaviour (Ajzen, 1991) based intervention. In the remaining study (Di Noia et al., 2003), it was unclear whether the intervention was based on a specific theoretical framework.

Due to the variability in the KT interventions themselves and the way in which they were delivered, and differences in data collection it is difficult to estimate the magnitude of the impact. With such variation, a meta-analysis was not feasible.

Risk of Bias of Relevant Studies

Systematic review. One systematic review and meta analysis by Stone et al. (2002) was assessed for its methodological quality obtaining a moderate rating of 8 out of a possible eleven points by two blinded reviewers (RL, JY). Details of the quality assessment of the systematic review using the AMSTAR tool (Shea et al., 2007) can be found in Appendix G. Study designs included in the meta-analysis were randomized

clinical trials, controlled clinical trials and controlled before-and-after studies. The systematic review followed rigorous procedures with two independent data extractors and a consensus procedure for disagreements. The search strategy used could have been more comprehensive as only health databases were searched and not supplemented with other data sources, for example, through hand searching relevant conference proceedings or searching reference lists for related articles. To evaluate the quality of single studies, Stone et al. (2002) collected information on study design, dropout rate and agreement between the unit of randomization and analysis. While this criteria is regarded as adequate when assessing randomized controlled designs; it may not have been adequate for assessing the quality of the controlled clinical trials also included in the review. This may be considered a weakness resulting in an inability to assess strength of recommendations based on unknown methodological quality of these types of designs included in the meta-analysis.

Another limitation recognized by the study author is that the estimates and confidence intervals were not adjusted for clustering of patients within providers. Stone et al. (2002) reported that over half the studies used either the provider, the organization or community as the unit of allocation but did not correct for the potential clustering of patients within one of these larger units. This likely would result in an underestimate of the variance in the effect of the intervention leading to an overestimation of treatment effect. Also identified by Stone et al. (2002) single studies were extremely heterogeneous, lacked methodological rigor and the duration or intensity of the different intervention components is not reported. It is therefore difficult to draw conclusions

about which interventions were most effective for specific populations, geographical settings or delivery systems (Stone et al., 2002). A final weakness of this review was the failure to conduct tests of homogeneity to determine if it was appropriate to combine the results across studies. While it was appropriate to use a random effects model to aggregate the data, given the level of variation reported by review authors, a meta-analysis may not have been appropriate.

Randomized controlled trials. The results of the risk of bias assessment for randomized controlled trials are presented in Appendix G. Authors of the publications were contacted when information was missing. Three of the four randomized controlled trials (Barwick et al., 2009; Dobbins et al., 2009; Forsetlund et al., 2003) described or clarified in email communication adequate random sequence generation indicating a lower risk of selection bias. It was unclear in the remaining publication (Di Noia et al., 2003), how matched triads of sites were randomized to groups. Without knowing if sequence generation was done in a random manner, it is possible that there is some systematic bias in the way in which participants were allocated. An unpredictable sequence, combined with allocation concealment prevents the likelihood of selection bias (Higgins, 2009). Barwick et al. (2009) was contacted regarding sequence generation and replied stating that each organization was listed on a piece of paper and drawn out of a hat by the investigators. This method would result in a lower risk of bias. Participants in the study by Forsetlund et al. (2003) were more likely to have been representative of the target populations because an independent researcher generated the sequence by computer and allocation remained concealed. There was also a lower risk of selection bias that

would have occurred in Dobbins et al. (2009), who reported the use of computer-generated pseudorandom draws using standard algorithms to allocate health departments to groups in equal numbers within strata. Although sequence generation was not entirely random due to the use of standard algorithms, these methods were detailed enough to discern that the risk of introducing bias through the methods utilized was low. Similar to Forsetlund et al. (2003), it is more likely that allocation sequence in the study by Dobbins et al. (2009) was concealed from those involved in the assignment of participants through the use of computer generated draws.

Although it may not have been possible to blind participants and providers who received or delivered the KT interventions, the lack of blinding or incomplete blinding of either participants, providers, outcome assessors and data analysts may have introduced bias into some of the studies (Barwick et al., 2009; Di Noia et al., 2003). The lack of blinding may result in overestimation of the treatment effect, where a positive effect was observed. Barwick et al. (2009) confirmed via email communication that blinding was not implemented because the study was practice based implemented in a real world setting. The questionnaires measuring knowledge and practice change were filled out by participants and unlikely to have been influenced by blinding. Two studies implemented partial blinding (Forsetlund et al., 2003; Dobbins et al., 2009). Although it was not directly stated in the publications and therefore scored as being unclear in the risk of bias tables, participants as well as providers delivering the intervention in these two trials were likely not blinded due to the nature of the intervention. Participants in the intervention group in Forsetlund et al. (2003) were informed that they would be asked if they had

actually made changes related to evidence based practice 6 months later which may have influenced results. Both studies however reported blinding of data collectors and Dobbins et al. (2009) reported blinding of data analysts as well. The outcome measurement used by Di Noia et al. (2003) was a self-report survey where participants were not blinded.

It was clear in two of the four trials that intention to treat analysis was completed (Dobbins et al., 2009; Forsetlund et al., 2003). Incomplete outcome data can introduce bias and over estimate the treatment effect. Di Noia et al. (2003) implemented measures to minimize attrition and reported an attrition rate of only 9%; which likely reduced bias. However it is difficult to assess what types of outcomes occurred in those individuals or the organizations lost to follow up and how the results would differ if this data was included in the analysis. Of the 34 participants who completed baseline assessments in Barwick et al. (2009), 20 participants completed the questionnaires at follow up (42% attrition rate). It was unclear whether or not intention to treat analysis was completed.

A notable strength of all RCTs included were that they were found to be free of selective reporting. Protocols were available and all of the included study's pre-specified outcomes of interest were reported in the pre-specified way. Three of the five studies attempted to evaluate the extent to which the participants were exposed to the intervention implemented (Barwick et al., 2009; Dobbins et al., 2009; Forsetlund et al., 2003). Process evaluations or cost-effectiveness was not assessed in any of the studies. Two studies measured several important baseline characteristics of individual participants or organizations (Barwick et al., 2009; Dobbins et al., 2009) including organizational

research culture and organizational readiness for change. Forsetlund et al. (2003) reported a possible imbalance for some variables (sex, number of years as a public health physician, specialist status, previous exposure to courses in critical appraisal and number of advisory reports written during the previous half year). Di Noia et al. (2003) did not measure at baseline important characteristics that could have been confounders, such as years of experience worked and current position held. Risk of contamination was low in all of the randomized controlled trials as most studies made an effort to guard against contamination through allocation of sites as opposed to individuals within the same organization (Barwick et al., 2009; Di Noia et al., 2003; Dobbins et al., 2009). Although Forsetlund et al. (2003) randomized individual public health physicians to groups, the risk of contamination was reported to be unlikely because physicians in Norway are geographically scattered.

Other sources of bias existed in the ~~five~~ four randomized controlled trials. All studies were at risk of co-interventions occurring throughout the duration of the interventions that relate to evidence based practice. As political and societal pressures to demonstrate the use of research evidence in decision making continues to rise, there is increased interest in the concept of KT (CIHR, 2008a) and knowledge sharing between public health sectors is occurring more frequently. Participants therefore may have been influenced by other evidence based practice discussions or interventions in other public health settings influencing their general level of knowledge. All of the included studies except for Dobbins et al. (2009) utilized a convenience sample. When using this type of sampling, there is a risk that the sample is unlikely to be representative of the population

being studied. Another limitation that may affect what subgroups results are generalizable to is volunteer bias. This was inherent in all included studies. It is possible that those volunteering to participate in studies were more highly motivated or could be characterized with Rogers' terminology as 'innovators' or 'early adopters' (Rogers, 1995). Additional factors like educational level of participants must also be considered when assessing the generalizability of results. For example, although there were no between group differences, over half of the sample in Di Noia et al. (2003) were masters prepared and participants in Forsetlund et al. (2003) were all trained physicians. Although Barwick et al. (2009) utilized a multi-site design, the small group of practitioners taking part in the study may differ from other child and youth mental health practitioners in other jurisdictions.

Another significant limitation is the use of self-report for outcome measures as opposed to more objective measures. Although this was expected due to scarcity in more objective data collection tools to measure EIDM outcomes, it must still be noted as it is likely to have a significant impact on the results. This limitation could be lessened by making efforts to corroborate self reported data with other outcome measures as was done in Dobbins et al. (2009). Two of the four trials did not demonstrate or report the validity or reliability of data collection tools (Barwick et al., 2009; Di Noia et al., 2003). Other studies reported reliability or validity for some measurement tools but not all tools used in the study (Dobbins et al., 2009; Forsetlund et al., 2003).

Interrupted time series analyses. The results of the risk of bias assessment for the included time series analysis is presented in Appendix G. Hanbury et al. (2009) used

a control site for comparison in their time series analysis and recorded and accounted for other extraneous events in the analysis, both of which reduced the risk of bias introduced in this study. It was however unclear how intervention and control sites were chosen and allocated. Demographics of the sample were also not reported making it difficult to assess whether sites were comparable at baseline. Baseline data reported as adherence percentages were very different between groups with no clear explanation as to why this may be. Researchers used objective outcome measures and multiple observations were recorded over time. The intervention occurred at a clearly defined point in time however, the timing of an extraneous "local" event that occurred in the intervention group only made it difficult to isolate the effects from the intervention (Hanbury et al., 2009). There were 27 data points prior to the intervention which is sufficient to enable reliable statistical inference and the authors used a traditional time series analysis (ARIMA) model for analyses. It is unlikely that participants or providers were blinded due to the nature of the intervention however, this was unclear in the publication although outcomes were objective in nature. The primary author (Hanbury) was contacted for missing information and the data for intervention and control sites found in the outcomes tables (See Appendix H) were provided to the reviewers in an SPSS file.

Findings from Relevant Studies

Outcomes tables of the results and effect sizes of the six included studies are provided in more depth in Appendix H.

Change in knowledge. Three of the six studies evaluated change in knowledge all of which were randomized controlled trials (Barwick et al., 2009; Di Noia et al., 2003; Forsetlund et al., 2003). See table 2 below for visual summary of change in knowledge.

Table 2: Change in Knowledge

Study	KT Intervention Tested	Effect	Significant Between Group Differences?
Barwick 2009	Communities of practice- Note: Involved meeting for 6 sessions over 11 month period	+	No
Di Noia 2003	Intervention: Pamphlet	-	Yes
	Intervention: CD-ROM	+	
	Intervention: Internet	+	
Forsetlund 2003	-Workshop-11 courses on the process of evidence-based practice + goal setting -Web-based information services (databases, question and answer service, relevant links), discussion list -Newsletters-Three newsletters to serve as reminders	+	Yes

Note: (0)=No Change, (+)=Positive Change (-)= Negative Change

Two of the three studies (Di Noia et al., 2003; Forsetlund et al., 2003) found significant between group differences when comparing more interactive KT strategies versus passive means to change provider knowledge (CD-ROM, or internet versus pamphlet; workshop, information services, discussion list and access to databases versus access to library services only). Di Noia et al. (2003) disseminated adolescent substance abuse prevention program materials to school personnel, community providers and policy makers through pamphlet, CD-ROM, and Internet channels. Sites were stratified geographically to represent the United States population of interest and a random sample of sites was selected. One hundred and eighty-eight consenting practitioners were matched on their constituency and geographic locale. Participants were then assigned in an undisclosed manner to one of the three dissemination channels for a total of 55 receiving printed pamphlets, 64 CD-ROM and 69 accessed materials via the Internet.

The follow up rates were high (91%). Materials were tailored to be responsive to each constituency's prevention needs and were mailed, faxed or emailed to participants according to preference. There were no baseline differences in variables assessed. Change in knowledge was measured with Likert-scaled response options to determine where to locate drug abuse prevention findings and material. At baseline, and 6 months after receiving materials between-group differences were examined using analyses of covariance. Bonferroni post hoc comparisons were used to detect which means differed across time intervals. At 6 month follow-up a difference among groups was revealed. Respondents who received prevention materials disseminated via CD-ROM and Internet showed significantly greater knowledge of where to locate drug abuse prevention findings and materials compared to those who received printed pamphlets (F (2, 168) = 25.67, $p < .05$). The study did not report score ranges however stated that lower scores were indicative of more favourable ratings. Bonferroni post hoc comparisons revealed differences in favour of respondents using the internet compared to CD-ROM and pamphlet dissemination of materials ($p < .05$). Respondents who received the materials via CD-ROM showed the greatest improvement in the difference between mean scores (0.21) from a baseline mean score of 0.96 to a follow up mean score of 0.75. These data were compared to a difference in mean scores of 0.10 for respondents who received materials via Internet with mean scores of 0.73 at baseline to 0.63 at follow up and respondents who received materials via pamphlets with mean scores of 0.94 at baseline and 1.04 at follow up.

The second randomized controlled trial that evaluated knowledge was conducted by Forsetlund et al. (2003). The aim of this study was to evaluate whether a tailored theory-based and multifaceted intervention increased the use of research in public health physician's decision-making. All public health physicians working in Norway with more than 3000 inhabitants were invited to participate via letters. A total of 148 physicians consented, 73 of which were randomized to the intervention group and 75 to a control group by an independent researcher using computer software to minimize selection bias. The aim of the intervention was to encourage physicians to identify and use relevant scientific evidence in their decision-making.

The multi-faceted intervention was built to lead a participant through steps outlined in Rogers' Model of Innovation Diffusion and included: a total of 11 courses on evidence-based public health involving small group problem-based activities and discussion; goal setting; access to web-based information services including a question and answer service; discussion list and ongoing support services; and 3 newsletters. Goal setting was used as a motivational technique as part of the intervention which involved participants signing a contract about what they would change in their practice. The control group received access to library services only. Baseline assessments were conducted for groups before and immediately after the intervention 1.5 years later. A questionnaire yielding a Cronbach's alpha score ranging from 0.83 to 0.87 for internal consistency of scale items measured respondent’s self-perceived knowledge of evidence-based practice information sources and concepts.

Statistically significant differences were found between the two groups for both concept ($p = .001$) and source knowledge scores ($p < .001$). Respondents rated self-perceived knowledge on scales ranging from 0 to 2 and from 0 to 3 with higher scores indicative of more favourable ratings. A mean difference of 0.4, 95% CI [0.2, 0.6] was reported in the scores for knowledge of evidence-based practice information sources (source knowledge) and a mean difference of 0.2, 95% CI [0.0, 0.3] in the scores for knowledge of evidence-based practice concepts (concept knowledge). Sensitivity analyses were conducted and a significant difference remained even after assigning the control group's mean value (1.1) to missing values in both groups. However, when assigning the control group's lowest value (0) to replace missing data in both groups the results for concept knowledge became non-significant (Forsetlund et al., 2003).

Barwick et al. (2009) was the third study that evaluated change in knowledge and although there was not a statistically significant difference found between groups, practitioners involved in an interactive communities of practice group versus usual practice revealed increased knowledge scores from baseline to follow up (Barwick et al., 2009). Barwick et al. (2009) reported on the outcomes of a randomized controlled trial comparing child and youth mental health practitioners assigned to a community of practice or a practice as usual group. Members in the community of practice group were defined as deliberate communities of people who share knowledge, learn together and create common practices supporting knowledge exchange among practitioners. Seventeen of 34 practitioners assigned to the community of practice group were expected to participate in six sessions over an eleven month period. Overall, clinicians participated

in an average of 3.7 sessions. To assess whether changes were influenced by differences in perceived organizational readiness for change or individual readiness for change, these outcomes were examined using independent t-tests and revealed no between group differences on the organizational readiness scale ($p > .05$). High levels were found in both groups among items that measured individual readiness for change suggesting high individual readiness to change among participants.

A two-way repeated measures ANOVA was used to examine the difference between change in knowledge scores related to a standardized outcome measurement tool called the Child and Adolescent Functional Assessment Scale (CAFAS) which is intended to monitor client response to treatment and measure service outcomes. To examine whether participants in the community of practice group demonstrated greater knowledge of the CAFAS tool than those in the practice as usual group, participants answered 20 true or false questions measuring knowledge related to clinical use of the scale. Score ranges were from 0 to 20 with higher scores indicative of greater knowledge. The mean score at baseline for the community of practice group was 12.1 and increased to 14.1 among the 11 of 17 participants who responded at follow up. The mean score at baseline for the practice as usual group was 10.4 and increased to 10.8 at follow up for 9 of the 17 participants who responded. This illustrates that knowledge scores for participants in the intervention group improved to a greater extent than those in the control group. Although there is a larger increase in knowledge for the community of practice group from baseline to follow up, multivariate tests did not find a ~~statically~~ statistically significant difference in knowledge between groups F (1, 15) = 2.37, p = .14.

Change in practice. The systematic review (Stone et al., 2002), all of the randomized controlled trials (Barwick et al., 2009; Di Noia et al., 2003; Dobbins et al., 2009; Forsetlund et al., 2003) and the time series analyses (Hanbury et al., 2009) evaluated change in practice. While change in knowledge often resulted from more interactive KT strategies, this was not consistently found for change in practice.

Systematic review. Stone et al. (2002) reported the results of a meta-regression analysis of 81 controlled studies (70 of which were randomized controlled trials) that evaluated the effectiveness of five different interventions to increase the use of immunization and cancer screening services by providers for their adult clients. Intervention components aimed at patients were excluded as they are not in the scope of this review. The intervention components aimed at providers were classified as provider reminders, provider feedback, provider education, provider financial incentive, legislative action, organizational change, or mass media campaign. Legislative action and the mass media campaign however were not included in the analysis. Study designs included in the meta-analysis were randomized clinical trials, controlled clinical trials and controlled before-and-after studies. Interventions were tested in studies focused on increasing rates of immunizations (29 studies), screening mammography (33 studies), cervical cytology screening (27 studies), and colon cancer screening via fecal occult blood test (19 studies).

The adjusted odds ratios for improved use of adult preventative services by providers revealed that organizational change (20 studies) was the most effective intervention increasing the rates of immunization *OR* = 16.0, 95% CI [11.2, 22.8], mammography screening *OR* = 2.47, 95% CI [1.97, 3.10], cervical cytology screening

OR = 3.03, 95% CI [2.56, 3.58], and colon cancer screening *OR* = 17.6, 95% CI [12.3, 25.2]. Organizational changes implemented in these studies included establishing a separate clinic devoted to screening and prevention (3 studies), assigning a non-physician staff to specific prevention responsibilities (14 studies), the use of a planned care visit for prevention (2 studies) and the use of techniques similar to continuous quality improvement (one study). The least effective intervention was provider feedback. Provider reminders and provider education did not show a consistent pattern. Provider reminders were effective at improving receipt of immunization and moderately effective at improving the use of cancer screening services. Provider financial incentive was only assessed in rates of immunization and was ineffective with a reported odds ratio of 1.26, 95% CI [0.83, 1.90].

Randomized controlled trials. See table 3 below for visual summary of change in practice reported in randomized controlled trials.

Table 3: Change in Practice

Study	KT Intervention Tested	Effect	Significant Between Group Differences?
Barwick 2009 (RCT)	Communities of practice -Involved meeting for 6 sessions over 11 month period	+	No
Di Noia 2003 (RCT)	Intervention: Pamphlet	-	No
	Intervention: CD-ROM	+	
	Intervention: Internet	+	
Dobbins 2009 (RCT)	Tailored and targeted messaging (Effect on the extent to which research evidence was considered in a recent program planning decision)	+	No
	Services of a knowledge broker (Effect on the extent to which research evidence was considered in a recent program planning decision)	+	
	Access to online registry of pre-processed research evidence (Effect on the extent to which research evidence was considered in a recent program planning decision)	+	

	Tailored and targeted messaging (Effect on number of public health policies and programs implemented)	+	Yes
	Services of a knowledge broker (Effect on number of public health policies and programs implemented)	-	
	Access to online registry of pre-processed research evidence (Effect on number of public health policies and programs implemented)	-	
Forsetlund 2003 (RCT)	Multifaceted intervention including the following: Workshop-11 courses on the process of evidence-based practice + goal setting -Web-based information services (Access to databases, question and answer service, relevant links to information), Discussion list -Newsletters-Three newsletters to serve as reminders	-	Not tested statistically

Note: (0)=No Change, (+)=Positive Change (-)= Negative Change

Barwick et al. (2009) examined change in practice captured by questionnaires regarding self reported use of CAFAS implementation supports, reduced to a total CAFAS Supports score and degree of self-reported change, reduced to a total Practice Change score. Score ranges were from 0 to 20 for the self reported use of CAFAS supports questionnaire with higher scores indicative or more favourable ratings. Participants in the community of practice group (see page 38 for detailed description of intervention), had a baseline mean score of 4.88 and a follow up score of 6.55 regarding their use of CAFAS implementation supports. This is compared to a mean baseline score of 4.88 in the practice as usual group and a mean score of 4.22 at follow up. A larger increase also occurred in the community of practice group from baseline to follow up related to self reported degree of change. Score ranges were from 0 to 10 with higher scores more favorable. A mean score of 3.00 was reported for the community of practice group at baseline and 8.81 at follow up. For the practice as usual group, a mean score of 1.33 at baseline was reported and 1.80 at follow up. Results of the repeated measures

ANOVA however revealed no significant main effects of the Use of CAFAS Implementation Supports Questionnaire between the two groups, F (1, 15) = 0.02, p = .87. There was also no significant main effects between groups reported by the Practice Change Questionnaire which assessed the degree of self reported change, F (1, 17) = 0.20, p = .65. Practice change was also assessed by the total number of times clinicians used the CAFAS. These data revealed that practitioners in the community of practice group used the tool more frequently, conducting a total of 152 ratings over the 12 month study period compared to 65 by participants in the practice as usual group (Barwick et al., 2009). The statistical significance of these findings was not reported.

Due to the small sample size, this study was likely underpowered to detect even large differences between groups. It was probably not feasible to increase power with a larger sample size as the sample was restricted to a new cohort of CAFAS-user practitioners with no previous experience with the tool or supports already in place. This would have been a limited group as 117 child mental health organizations in Ontario had already been mandated since 2000 to adopt this practice.

Di Noia et al. (2003) also examined change in practice by measuring frequency of searching for prevention program materials after receiving materials disseminated by pamphlet, CD-ROM or internet. While not statistically significant, those receiving information via the Internet showed larger increases in frequency of searching for prevention program materials. Bonferroni post hoc comparisons also revealed differences in favour of Internet respondents ($p < .05$). The range of possible scores was not reported however lower scores were indicative of more favourable ratings. The mean score at

baseline for those who received prevention materials via pamphlet was 1.56 and increased to 1.60 at 6 month follow up. This is compared to a baseline mean score of 1.53 and follow up score of 1.48 for CD-ROM and a baseline mean score of 1.62 and follow up score of 1.51 for Internet. A subgroup analysis and examination of interactions among dissemination channel, constituency and program was not feasible.

Two remaining randomized controlled trials evaluated change in practice (Dobbins et al., 2009; Forsetlund et al., 2003). Dobbins et al. (2009) evaluated the effectiveness of three knowledge translation strategies in the incorporation of research evidence into public health policies and programs. All health departments in Canada were invited to participate with follow-up data obtained from 88 out of 108 departments. Following consent from the most senior person in the public health departments; the name of the person most directly responsible for making decisions about healthy body weight promotion was identified and contacted via letter and follow up phone call.

Health departments were allocated to one of three intervention groups according to level of interaction (36 in each group). The least interactive group used as the control group was provided with access to Health-evidence.ca, an online repository of systematic reviews which included the title, citation, and assessment of the methodological quality of seven systematic reviews evaluating the effectiveness of interventions to promote healthy body weight in children. All participants in this intervention group received electronic communication about the availability of this site; however, an independent search within the database had to be conducted by the individual decision maker to locate the seven reviews including free access to full text articles. Also provided was a short summary for

each of the systematic reviews, written by the research team, identifying the key findings and recommendations for public health policy and practice. The second intervention group was the tailored messaging group and included tailored, targeted messages plus access to Health-evidence.ca. Over seven successive weeks, on the same day each week and the same time of day, participants in the tailored messaging group were sent an email indicating that a systematic review related to healthy body weight promotion in children was available in full text at the link provided. The third intervention group was the most interactive KT intervention and included both components mentioned above and a masters prepared knowledge broker who worked one on one with decision makers in the public health departments. Specific tasks conducted by the knowledge broker included: ensuring relevant research evidence related to healthy body weight promotion was transferred to the public health decision makers in ways that were most useful to them, assisting them to develop the skill and capacity for evidence-informed decision making, and assisting them in translating evidence into local practice.

Change in practice was measured using a telephone-administered survey. A cronbach's alpha of 0.65 was reported. Respondents gave a self reported score ranging from one (not at all) to seven (completely) on the extent to which research evidence was considered in a recent program planning decision in the previous 12 months. Mean scores revealed there was no statistically significant difference between groups in the extent to which research evidence was considered in program planning ($p < .45$).

The study authors used an additional, more concrete, measure to corroborate findings. This measure was derived as the sum of actual strategies, policies, and

interventions that included research evidence for healthy body weight promotion in children being implemented by the health department. The total was summed and compared across groups from baseline to post intervention. A significant difference between groups was revealed ($p < .001$). For this outcome, the group who received tailored, targeted messages improved significantly in the number of public health policies and programs from baseline to follow up in comparison to the other two groups. When the variable *organizational* research culture was added to the mixed-effects models as a predictor, the interaction was significant and revealed that health departments with low organizational research culture benefited most from the knowledge brokering intervention, the control group was unchanged, and the tailored messaging group improved somewhat. When organizational research culture was high the control group remained unchanged, the knowledge brokering group decreased showing fewer policies and programs and the tailored messaging group increased significantly.

Intervention integrity was assessed for each intervention and revealed that approximately 15% of those exposed to the knowledge broker did not engage at all or to a limited extent which should be considered when interpreting the results.

The final randomized controlled trial that evaluated change in practice was conducted by Forsetlund et al. (2003). The aim of this study and the multi-faceted intervention is described above on page 38 as this study also evaluated change in knowledge. While this interactive, multi-faceted intervention had a significant positive effect on knowledge, it did not produce change in practice. As an indicator of practice change, Forsetlund et al. (2003) analyzed the contents of local health service reports for

use of research. Although response rates were very low (23%), respondents who responded affirmatively that they had used research in recent written reports, were asked to send in relevant documents which were then analyzed by researchers for use of research. Scores were reported as 'used' or 'not used' research. The control and intervention groups were both reported as not using research at baseline (0%). The intervention group did not change at follow up; more of the control group (1.3%) used research at follow up. However, communication with the primary author, determined that this difference was not tested statistically.

Interrupted time series analysis. Hanbury et al. (2009) tested the effectiveness of a theory of planned behaviour intervention implemented among community mental health professionals to improve adherence to a national suicide prevention guideline. See table 4 below for a visual summary of change in practice reported in the interrupted time series analysis.

Table 4: Change in Practice

Study	KT Intervention Tested	Effect	Significant Between Group Differences?
Hanbury 2009 (ITS)	Theory of planned behaviour based educational session -Comprised of didactic presentation, peer discussion, group work on real life vignettes	(0)	Yes
	National Event- Introduction of the guideline by the Health Care Commission	+	
	Local Event- Change in system monitoring	(0)	

Note: (0)=No Change, (+)=Positive Change (-)= Negative Change

A group of 93 community mental health professionals in an NHS Trust in the West Midlands were invited to attend an educational session of which 49 attended. The intervention tested was an educational session comprised of didactic presentation, peer

discussion, and group work on real life vignettes (Hanbury et al., 2009). The intervention was delivered by a training co-coordinator onsite to increase accessibility and attendance and appeared to be delivered in one day. Characteristics of the study sample were not reported. Data revealed that the intervention did not have a significant impact on adherence. During the course of the study two extraneous events occurred including: a national event where a guideline was introduced by the Health Care Commission which occurred in both intervention and control groups; and a local event causing a change in system for monitoring service-user-discharges which occurred only in the intervention site. Although the reviewers did not focus on within group data, separate analyses were run using autoregressive integrated moving average (ARMIA) modeling to try to model all non-random patterns in the data before testing the significance of the intervention. When comparing the intervention, local, and national event upon the change in the intervention group only, the national event had a statistically significant impact on adherence, $t = 3.08$, $p = .0001$. This may imply that the Theory of Planned Behaviour based intervention which had no significant effect was either as effective or even less effective than the control.

Chapter Four: Discussion

This chapter will discuss key findings from this review and how they relate to existing literature. A number of hypotheses explaining the effectiveness or lack thereof of the KT interventions tested will be presented. These hypotheses relate to the characteristics of the interventions and providers, the participants, and the organizations (Logan & Graham, 1998). The review's limitations will be acknowledged and possible future research directions will be suggested throughout. Finally, recommendations for practice for public health nurses will be provided.

Characteristics of the Interventions and Providers

Characteristics of the intervention including the dose of the intervention may have affected the extent to which the KT interventions caused change in knowledge or practice among participants. The time series analysis by Hanbury et al. (2009) tested the effectiveness of an educational session comprised of didactic presentation, peer discussion and group work on real life vignettes. The educational session in Hanbury et al. (2009) appeared to be only one day in length which may have been too short to have an impact on participants' practice. The presentation was also described as didactic in format. Literature suggests that educational sessions with interactive and didactic formats were more effective than either alone (Forsetlund et al., 2009). Dobbins et al. (2009) report that there may have been discrepancies in the ability of the interventions to be implemented, with the rate of successful intervention differing across intervention groups. Among those allocated to the knowledge broker group, 30% of participants had limited or

no engagement with the knowledge broker. These findings suggest that the 'dose' may have been in some cases inadequate to affect practice.

A characteristic of successful interventions which may have increased exposure to or 'dose' of the intervention, were those that were highly accessible and contained an element of tailoring responsive to the needs and preferences of providers. The intervention tested in Forsetlund et al. (2003) consisted of 11 courses that participants were expected to attend. In addition to the higher number of courses participants were enrolled in, the 11 courses varied from one to five days to allow them to be tailored to the different needs and preferences of participants. This may have resulted in a higher rate of attendance increasing exposure to the intervention leading to significant change in knowledge among participants. Higher attendance at educational sessions or workshops was associated with greater effects (Forsetlund et al., 2009). The intervention however did not translate to change in practice. One explanation may be that while workshops and educational sessions have been shown to modestly affect simple behaviours, they are less effective at changing complex behaviours (Forsetlund et al., 2009). Di Noia et al. (2003) disseminated prevention materials to participants for independent study so exposure to or dose of the intervention is difficult to assess. The intervention tested did not require participants to physically travel anywhere or set aside a pre-specified time to review materials. Materials were also sent out to participants by mail, fax or email according to their preference and materials were tailored to include constituency specific content responsive to differing prevention needs. Dobbins et al. (2009) corroborates the idea that KT interventions actively delivered and tailored to the needs of end users show promising

results. The most effective KT intervention in their study was tailored, targeted messages which is similar to the intervention of Di Noia et al. (2003) which employed content matching and was actively delivered to decision makers rather than requiring them to access it independently.

Providing a high level of accessibility plus tailoring the intervention to meet the personal needs of decision makers may lead to changes in knowledge and practice. The ability of tailored messaging to facilitate research use is supported by existing literature (Hawkins et al., 2008) as people show increased motivation to process information actively when they perceive the information to be personally relevant (Kreuter & Wray, 2003).

Comparisons between passive and more interactive, multi-component interventions are often cited in the literature. Commonly reported findings suggest that multifaceted interventions have greater effects than single or passive interventions (Mansouri & Lockyer, 2007; Marinopoulos et al., 2007). Differing results were found in this review. Simple or single KT interventions assessed in this review were shown in some circumstances to be as effective as complex, multifaceted ones when changing practice, a finding supported in the literature (Grimshaw et al., 2006). This was evidenced by primary studies (Di Noia et al., 2003; Dobbins et al., 2009) and the review by Stone et al. (2002). Stone et al. (2002) reported that organizational change interventions consistently produced the largest improvements in the use of preventative services. He revealed the moderate but consistent effectiveness of simple provider reminders, which were especially effective in influencing the use of immunizations

(Stone et al., 2002). Grimshaw et al. (2006) supported this finding by concluding that reminders are a potentially effective intervention and are likely to result in moderate improvements in process of care. Post hoc analyses in the study by Di Noia et al. (2003) favoured dissemination of materials via the Internet. This finding is supported in a recent meta-analysis examining internet-based learning in the health professions (Cook, Levinson, & Garside et al., 2010). Internet-based learning was shown to be educationally beneficial and resulted in effects similar to those of traditional instructional methods (Cook et al., 2010). Statistically significant differences were found favouring tutorials, longer-duration courses and online peer discussion (Cook et al., 2010) suggesting that an increased level of interaction may be beneficial. Internet is convenient and allows providers to study independently, for little or no cost. More studies are needed to investigate whether internet based learning leads to actual and sustained change in practice.

The highly interactive, multi-component interventions tested in both Forsetlund et al. (2003) and Dobbins et al. (2009) did not influence change in practice. The complexity of interventions may dilute the key messages of the intervention and reduce the ability of providers to understand or to acquire the information presented (Dobbins et al., 2009). Certain passive strategies were also shown to be ineffective; a finding that is frequently supported by existing literature (Althabe et al., 2008; Bero et al, 1998; Farmer et al., 2008; Grimshaw et al., 2001; Mansouri & Lockyer, 2007; Marinopoulos et al., 2007). Dobbins et al. (2009) demonstrated that simply having access to a resource that repackaged review contents into a short summary of key findings, assessment of the

methodological quality and recommendations, was not enough to influence evidence-informed decision making among public health practitioners. Systematic reviews have become widely recognized as a support to evidence-informed decision making in health care, but availability of a systematic review does not ensure that decision makers know about it or can interpret the findings or use the reviews (Centre for Reviews and Dissemination, 2009). This has led to the development of several resources that contain an element of translation or repackaging of the review content to help policymakers interpret a systematic review's findings. However, due to the limited evaluations of these resources and challenges that remain in translating evidence into useful and engaging formats, it remains unclear how effective these resources are at changing behaviour (Chambers et al., 2011). Studies that evaluate the effectiveness of interventions that encourage health policy makers and managers to use systematic reviews in decision making are lacking (Perrier, Mrklas, Lavis & Straus, 2011). In a recent scoping review, Chambers et al. (2011) reported user's perceptions that summaries are often too long or complex. Dobbins, Jack, Thomas & Kothari (2007) interviewed public health decision makers regarding their informational needs and preferences for receiving research evidence. The importance of receiving systematic reviews in accessible formats, executive summaries of research, and clear statements of implications for practice from health service researchers were reported by participants. More evaluations of these resources are needed to ensure users' needs and preferences are being met, to demonstrate their impact, justify their funding (Chambers et al., 2011; Lavis, 2009) and ensure the relevance and applicability of the results to the practice setting (Dobbins et al., 2007).

Another passive strategy shown to be ineffective was the use of printed materials (pamphlet) when compared with alternative interventions; including CD-ROM or Internet (Di Noia et al., 2003). This finding is supported in a recent review by Farmer et al. (2008); when compared to no intervention, printed educational materials slightly improved professional behaviour but not patient outcomes. When dissemination of printed educational materials was compared to alternative interventions reviewers concluded that they may slightly improve outcomes but there was not enough evidence to be certain (Farmer et al., 2008). Grimshaw et al. (2006) however found slightly different results when they evaluated the effects of the dissemination of educational materials. Because printed educational materials may lead to improvements in care, they recommended that policy makers should not dismiss this strategy given its possible effect, low cost and feasibility in the health care system. The variation in study findings may be due to the characteristics of the intervention itself as important features of the information source including attractiveness, content, format, mode of delivery, timing, frequency, and complexity of targeted behaviour change are likely to have an effect on uptake (Farmer, 2008). Further research is needed to determine which factors can be modified to support various types of decision making by different users.

Characteristics of Participants

Characteristics of participants also differed which may have led to differences in the effectiveness of interventions. The systematic review by Squires, Estabrooks, Gustavsson & Wallin (2011) found that nurses' use of research is positively influenced by positive attitudes towards research; education (having a graduate degree compared to a

bachelors degree or diploma); current role (leadership, advanced practice, clinical specialty compared to staff nurse); and job satisfaction. Attitude toward research was confirmed in a previous systematic review of individual characteristics related to research utilization to consistently positively affect research use (Estabrooks, Floyd, Scott-Findlay, O'Leary & Gushta, 2003).

The sample in Forsetlund et al. (2003) included public health physicians who were predominantly male, on average 47 years of age with 9 to 12 years of experience. It is noteworthy that more physicians in the intervention group had previously attended sessions in critical appraisal. It would be reasonable to assume that this sample of physicians were well educated with similar educational and training backgrounds compared to other samples included in this review with varying educational backgrounds. The sample in Di Noia et al. (2003) also consisted of well educated clinicians, almost half of which held graduate degrees. Participants were professionals employed in schools, community agencies, and policy-making bodies and included teachers, social workers and other management and executive-level personnel who exercised decision-making power over the selection and implementation of adolescent drug abuse prevention programs. Participants tended to be Caucasian females between the ages of 20 and 49 years. The sample in Barwick et al. (2009) consisted of a wide range of individuals involved in child and youth mental health including social work, child and youth care, early education and one registered nurse. Participants were mostly female and had on average 9 to 11 years of experience. The level of education among this group also varied from diploma or certification to graduate level education. The large differences in this group may have led

to more variability in change in knowledge scores among participants, due to differences in interest, willingness and ability to acquire new knowledge. The sample in Dobbins et al. (2009) consisted of program managers or coordinators and program directors from regional and local public health departments serving both urban and rural populations. Decision makers were mostly nurses (47%). Also identified were nutritionists (19%), physical education specialists (4%) and a small percentage of physicians (2%). Average years of experience in public health was 13. While participants in Hanbury et al. (2009) were community mental health professionals, demographics of the study sample were not reported.

Three studies (Barwick et al., 2009; Dobbins et al., 2009; Forsetlund et al. 2003) measured items related to individual readiness for change or previous research related experience. Although there were no differences between groups, both control and intervention groups in Barwick et al. (2009) scored high on measures of growth and efficacy suggesting high levels of individual readiness for change. Dobbins et al. (2009) measured several baseline characteristics related to research related experience. The intervention group in Forsetlund et al. (2003) was found to have more previous experience related to critical appraisal courses and number of advisory reports written indicating they may have had a higher level of knowledge at baseline. Lavis (2009) reported on existing reviews examining the factors that influence the use of research evidence in policymaking and found that when there is harmony between research evidence and the beliefs, values, interests or political goals of policymakers, the use of research evidence is likely to increase.

Several characteristics of the individual practitioner have been identified as being influential in the translation of research to practice (Squires, Hutchinson, Bostrom, O'Rourke, Cobban & Estabrooks, 2011). Further research is required to investigate which individual characteristics of public health practitioners are associated with research utilization. There is support for a relationship between positive attitude toward research and research utilization (Squires et al., 2011); therefore further research should focus on determining what causes practitioners to develop positive attitudes towards the use of research.

Characteristics of the Organizations

Finally characteristics of the organizations which also differed may have lead to differences in the effectiveness of interventions. This is evidenced by the findings presented in Dobbins et al. (2009) which revealed both positive and negative changes in the KT intervention's effectiveness when matched with organizational research culture. Barwick et al. (2009) reported improvement in knowledge and practice among public health practitioners. There were no significant differences between groups in terms of organizational readiness to change in terms of motivation for change, adequacy of resources, and organizational climate at baseline. Mean scores in both groups however ranged from 28.24 to 41.62 out of a possible 50 on items measuring readiness for organizational change indicating moderate to high levels.

It is obvious that contextual factors weigh heavily on the effectiveness of different interventions. Influences on professional behaviour are complex and are influenced by organizational and contextual variables that should be considered (Brownson, Fielding &

Maylahn, 2009). This suggests that several barriers may need to be assessed and overcome prior to implementing certain KT interventions. However, a shortage of knowledge exists regarding how organizational characteristics are related to the decision to implement evidence-based practices (Wang, Saldana, Brown & Chamberlain, 2010). Wang et al. (2010) examined factors that influenced county system leaders to implement an evidence-based program and found that their decision to adopt was influenced by their objective need for the program and by their perception of the county's organization climate and motivation to change. Orton, Lloyd-Williams, Taylor-Robinson, O'Flaherty, & Capewell (2010) examined the use of research evidence by public health policy-makers and report one of the many barriers to use of research evidence included the culture in which policy-makers work. In a systematic review by Meijers, Janssen, Cummings, Wallin, Estabrooks & Halfens (2006), statistically significant relationships were found between research use and the role of the nurse, multi-faceted access to resources, organizational climate, multi-faceted support, time for research activities, and provision of education. These findings highlight the need for future research that examines organizational characteristics and how factors of systems or agencies including capacity, climate, culture and readiness to change affect research uptake.

Implications for Practice

While some of the studies included in this review targeted nurses as participants, none of the studies targeted nurses exclusively. However, all of the interventions tested in the studies could apply to nurses in general including public health nurses. There are several recommendations for public health practitioners in planning a KT strategy arising

from this body of literature. It is evident that characteristics of the KT intervention and providers, participants and organizations can influence the effectiveness of a KT strategy. Prior to implementation, public health providers planning a KT strategy would be wise to attempt to overcome barriers and enhance facilitators that may influence uptake among participants related to these concepts. For example, when choosing from the KT strategies tested in this review, a public health practitioner should assess the organizational culture of the organization; as evidence suggests that the KT intervention's effectiveness varied based on this characteristic. Several tools exist to do so including Canadian Health Services Research Foundation's (CHSRF) self assessment tool (available from research.use@chsrf.ca). This tool helps to determine how well the organization uses research, identify gaps and provides recommendation on how to enhance research use. When implementing a KT strategy, the public health provider should also consider the advantages of tailoring interventions to meet the personal needs of decision makers. As demonstrated in this review, tailoring aspects of the intervention to make them highly accessible and matching the content presented to the individual needs of the decision maker consistently showed promise.

Finally, public health providers planning a KT strategy should keep in mind that changing behaviour is more complex than improving knowledge. Therefore, planning a KT strategy aimed at changing practice may be more time consuming and require more of an extensive evaluation to monitor for changes and whether these changes are sustained over time. It may take longer to see the effects of KT strategies aimed at changing behaviour and therefore closer monitoring for a longer duration may be required.

Strengths and Limitations of the Review

A highly comprehensive search strategy was developed in accordance with expert opinion and therefore we consider the included studies to be a relatively complete set of studies for the period 2000 to 2010. For this review, we used KT terms that were shown to have high discriminatory power and medium discriminatory power in the search strategy due to the difficulty in information retrieval related to the field of KT. Studies were obtained from multiple electronic databases, supplemented by handsearching and reference list checking of included articles and background papers for potentially relevant studies. This systematic review followed rigorous Cochrane methodology including the use of two independent reviewers to screen all studies for relevance and assessment of methodological quality of relevant studies. We also undertook detailed data abstraction about the quality of the studies, characteristics of the studies, and interventions (Higgins, 2009).

A limitation inherent in the KT literature was the quantity and quality of existing research related to this field of research. Reviewers found a paucity of literature directed towards changing knowledge, skill or practice of public health practitioners despite increased societal pressure to increase capacity of evidence-informed decision making among this group of health care providers. While many resources are being developed that target public health practitioners to do so, rigorous published evaluations are limited. The quality of evidence included in this review was moderate. While certain studies (Dobbins et al., 2009; Forsetlund et al., 2003) implemented measures like blinding and intention to treat analyses decreasing the overall risk of bias in study results, other studies'

results may have been biased due to small sample sizes (Barwick et al., 2009), lack of blinding (Barwick et al., 2009; Di Noia et al., 2003) and the inability to adjust for potential clustering of patients within one of the larger units allocated to the intervention as seen in the review by Stone et al. (2002).

Another major limitation was the variation in described settings, interventions and outcome measures across studies making it difficult to synthesize and draw conclusions from this evidence base. Studies most frequently used measures that relied on self-report, were subject to recall bias, and most had unknown validity or reliability. Despite their consistent use in the literature (Squires et al., 2011) when measuring changes in healthcare provider knowledge, skill and practice, the measures may be too vague at times to elicit trustworthy responses. In a recent review of literature reporting use or development of self-report research utilization measures used in health care; Squires et al. (2011) reported several limitations to these measures that constrain the ability to validly measure research utilization. These included: limited reporting of data reflective of reliability or validity; limited use of theory in the development and testing; and failure to re-establish validity when the measure is modified or assessed in a new population or context (Squires et al., 2011). In addition, a very small proportion of the studies included measured research utilization by healthcare decision makers (Squires et al., 2011). The development and testing of more objective data collection tools for measuring evidence-based practice is therefore required, particularly in public health among decision makers.

Conclusions

As Grimshaw et al. (2006) stated and as seen in this review, there is an imperfect evidence base to support decisions about which strategies are likely to be effective under different circumstances. Due to differing factors, including characteristics of the users, the providers, the intervention and the organizations where the interventions may have been implemented; it is difficult to predict the effectiveness of KT interventions or suggest their effectiveness will remain constant. The effects of the more multifaceted interventions did not always translate to changing provider behaviour as well. A change in knowledge may be insufficient for changing practice; and changes in knowledge occur more rapidly than changes in behaviour (Rogers, 1995). Although use of knowledge is important, the impact on patient related outcomes, providers and systems is of greatest priority (Straus et al., 2010). Transfer models that isolate knowledge from practice are therefore ineffective (Barwick et al., 2009).

Interventions were shown to be directly influenced by contextual factors including characteristics of the intervention and provider, individual characteristics of the practitioner and characteristics of the organization. Brouwers, Stacey & O'Connor (2010) stated the likelihood of success is increased when enabling factors and barriers are analyzed as other non-scientific factors influence the uptake of research knowledge. It is therefore important to address these factors prior to implementation of KT strategies. KT is a multidimensional concept that requires an understanding of its mechanisms, methods, and measurements, as well as its influencing factors at the individual and contextual levels, and the interaction between those levels (Sudsawad, 2007). While

randomized controlled designs are the most rigorous designs for evaluating effectiveness, this kind of design does not illuminate why certain KT interventions are successful or not. Other study designs including mixed methods and qualitative investigation are valuable as they may increase understanding of the processes involved between program delivery and outcome (Lipsey, 1993). Behaviour change interventions are commonly designed without evidence of a formal analysis of the target behaviour or the theoretically predicted mechanisms of action (Michie, Stralen & West, 2011). Additionally, behaviour interventions are often guided by implicit commonsense models of behaviour that do not cover the full range of possible influences often excluding potentially important variables. Further research is needed to develop more comprehensive models and evaluate the effectiveness of existing ones that guide the development of behaviour change interventions.

It is necessary that KT strategies continue to be evaluated and their usefulness documented in the literature so that they can be adjusted or modified accordingly and be used to inform others. As seen in this review studies seem to focus on awareness and behaviour. Future research is needed to evaluate KT intervention's effect on skills underlying one's competency for evidence-informed decision making.

References to studies included in this review

Barwick, M. A., Peters, J., & Boydell, K. (2009). Getting to uptake: Do communities of practice support the implementation of evidence-based practice? *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 18,* 16-29.

Di Noia, J., Schwinn, T. M., Dastur, Z. A., & Schinke, S. P. (2003). The relative efficacy of pamphlets, CD-ROM, and the Internet for disseminating adolescent drug abuse prevention programs: an exploratory study. *Preventative Medicine, 37,* 646-653.

Dobbins, M., Hanna, S. E., Ciliska, D., Manske, S., Cameron, R., Mercer, S. L., . . . Robeson, P. (2009). A randomized controlled trial evaluating the impact of knowledge translation and exchange strategies. *Implementation Science, 4,* 61.

Dobbins, M., Robeson, P., Ciliska, D., Hanna, S., Cameron, R., O'Mara, L., . . . Mercer, S. (2009b). A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implementation Science,4,* 23.

Forsetlund, L., Bradley, P., Forsen, L., Nordheim, L., Jamtvedt, G., & Bjorndal, A. (2003). Randomised controlled trial of a theoretically grounded tailored intervention to diffuse evidence-based public health practice. *BMC Medical Education, 3,* 2.

Forsetlund, L., Talseth, K. O., Bradley, P., Nordheim, L., & Bjorndal, A. (2003). Many a slip between cup and lip. Process evaluation of a program to promote and support evidence-based public health practice. *Evaluation Review, 27,* 179-209.

Hanbury, A., Wallace, L., & Clark, M. (2009). Use of a time series design to test effectiveness of a theory-based intervention targeting adherence of health professionals to a clinical guideline. *British Journal of Health Psychology, 14,* 505-518.

Stone, E., Morton, S., Hulscher, M., Maglione, M., Roth, E., Grimshaw, J., . . . Tseng, D. S. (2002). Organisational changes are more effective than education and reminders for raising adult immunisation and cancer screening rates. *Evidence-Based Healthcare, 6,* 186-187.

References to studies excluded from this review

Armstrong, R., Waters, E., Crockett, B., & Keleher, H. (2007). The nature of evidence resources and knowledge translation for health promotion practitioners. *Health Promotion International, 22,* 254-260.

Baker, E. A., Brownson, R. C., Dreisinger, M., McIntosh, L. D., & Karamehic-Muratovic, A. (2009). Examining the role of training in evidence-based public health: a qualitative study. *Health Promotion Practice, 10,* 342-348.

Brownson, R. C., Ballew, P., Brown, K. L., Elliott, M. B., Haire-Joshu, D., Heath, G. W., & Kreuter, M. W. (2007). The effect of disseminating evidence-based interventions that promote physical activity to health departments. *American Journal of Public Health, 97*(10), 1900-1907.

DePue, J. D., Goldstein, M. G., Schilling, A., Reiss, P., Papandonatos, G., Sciamanna, C. & Kazura, A. (2002). Dissemination of the AHCPR clinical practice guideline in community health centers. *Tobacco Control*, 11, 329-335.

Edwards, N., Davies, B., Ploeg, J., Virani, T., & Skelly, J. (2007). Implementing nursing best practice guidelines: Impact on patient referrals. *BMC Nursing, 6*.

Eldredge, J. D., Carr, R., Broudy, D. & Voorhees, R. E. (2008). The effect of training on question formulation among public health practitioners: results from a randomized controlled trial. *Journal of the Medical Library Association, 96*(4), 229-309.

Fagan, A. A., Hanson, K., Hawkins, J. D., & Arthur, M. W. (2008). Bridging science to practice: achieving prevention program implementation fidelity in the community

youth development study. *American Journal of Community Psychology, 41,* 235-249.

Farel, A., Umble, K., & Polhamus, B. (2001). Impact of an online analytic skills course. *Evaluation and the Health Professions, 24,* 446-459.

Fayram, E. S. & Anderko, L. (2009). Applied epidemiology for public health and community-based nurses. *Journal of Continuing Education in Nursing, 40,* 361-366.

Gioia, D. & Dziadosz, G. (2008). Adoption of evidence-based practices in community mental health: A mixed-method study of practitioner experience. *Community Mental Health Journal, 44,* 347-357.

Jerome-D'Emilia, B., Merwin, E., & Stern, S. (2010). Feasibility of using technology to disseminate evidence to rural nurses and improve patient outcomes. *Journal of Continuing Education in Nursing, 41,* 25-32.

Kelly, J. A., Somlai, A. M., DiFranceisco, W. J., Otto-Salaj, L. L., McAuliffe, T. L., Hackl, K. L., . . .Rompa, D. (2000). Bridging the gap between the science and service of HIV prevention: Transferring effective research-based HIV prevention interventions to community AIDS service providers. *American Journal of Public Health, 90,* 1082-1088.

Kothari, A., Birch, S., & Charles, C. (2005). "Interaction" and research utilisation in health policies and programs: Does it work? *Health Policy, 71,* 117-125.

MacLean, D. R., Farquharson, J., Heath, S., Barkhouse, K., Latter, C., & Joffres, C. (2003). Building capacity for heart health promotion: Results of a 5-year

experience in Nova Scotia, Canada. *American Journal of Health Promotion, 17,* 202-212.

McHugo, G. J., Drake, R. E., Whitley, R., Bond, G. R., Campbell, K., Rapp, C. A., . . Finnerty, M. T. (2007). Fidelity outcomes in the national implementing evidence-based practices project. *Psychiatric Services, 58,* 1279-1284.

Morrill, A. C., Amaro, H., Blake, S. M., Cranston, K., Averbach, A. R., Logan, J. A., . . Dunn, S. (2005). HIV prevention community planning: enhancing data-informed decision-making. *AIDS & Behavior, 9,* S55-S70.

O'Neall, M. A. & Brownson, R. C. (2005). Teaching evidence-based public health to public health practitioners. *Annals of Epidemiology, 15,* 540-544.

Ploeg, J., de Witt, L., Hutchison, B., Hayward, L., & Grayson, K. (2008). Evaluation of a research mentorship program in community care. *Evaluation and Program Planning, 31,* 22-33.

Porter, J., McGrath, R., & Costello, A. (2008). Development of an evidence-based data skills curriculum for public health professionals. *American Journal of Health Education, 39,* 314-317.

Robinson, K., Elliott, S. J., Driedger, S. M., Eyles, J., O'Loughlin, J., Riley, B., . . . Harvey, D. (2005). Using linking systems to build capacity and enhance dissemination in heart health promotion: A Canadian multiple-case study. *Health Education Research, 20,* 499-513.

Rolleri, L. A., Wilson, M. M., Paluzzi, P. A., & Sedivy, V. J. (2008). Building capacity of state adolescent pregnancy prevention coalitions to implement science-based approaches. *American Journal of Community Psychology, 41,* 225-234.

Russell, J. (2004). Soft networks for bridging the gap between research and practice: illuminative evaluation of CHAIN. *British Medical Journal*, 328, 1-6.

Sathe, N. A., Lee, P., & Giuse, N. B. (2004). A power information user (PIU) model to promote information integration in Tennessee's public health community. *Journal of the Medical Library Association, 92,* 459-464.

Sears, K. E., Cohen, J. E., & Drope, J. (2008). Comprehensive evaluation of an online tobacco control continuing education course in Canada. *Journal of Continuing Education in the Health Professions, 28,* 235-240.

Spiby, H., McCormick, F., Wallace, L., Renfrew, M. J., D'Souza, L., & Dyson, L. (2009). A systematic review of education and evidence-based practice interventions with health professionals and breast feeding counsellors on duration of breast feeding. *Midwifery, 25,* 50-61.

Stone, D. M., Barber, C. W., & Potter, L. (2005). Public health training online: The National Center for Suicide Prevention Training. *American Journal of Preventive Medicine, 29,* 247-251.

Umble, K. E., Cervero, R. M., Yang, B., & Atkinson, W. L. (2000). Effects of traditional classroom and distance continuing education: A theory-driven evaluation of a vaccine-preventable diseases course. *American Journal of Public Health, 90,* 1218-1224.

Additional references

A Review Group of the Cochrane Collaboration. (2011). Study designs for EPOC reviews. Retrieved from http://epoc.cochrane.org/epoc-resources-review-authors

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes,* 50, 179-211.

Armstrong, R., Waters, E., Crockett, B. & Keleher, H. (2007). The nature of evidence resources and knowledge translation for health promotion practitioners. *Health Promotion International, 22*(3), 254-260.

Althabe, F., Bergel, E., Caffarata, M.L., Gibbons, L., Ciapponi, A., Aleman, A., Colantonio, L. & Palacios, A.R. (2008). Strategies for improving the quality of health care in maternal and child health in low-and middle-income countries: an overview of systematic reviews. *Paediatric Perinatal Epidemiology,* Suppl 1, 42-60.

Bero, L., Grilli, R., Grimshaw, J.M., Harvey, E., Oxman, A.D. & Thomson, M.A. (1998). Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. *British Medical Journal, 317*(7156), 465-468.

Brouwers, M., Stacey, D., & O'Connor, A. (2010). Knowledge creation: synthesis, tools and products. *Canadian Medical Association Journal, 182*(2). doi:10.1503/cmaj.081230.

Brownson, R.C., Fielding, J.E. & Maylahn, C.M. (2009). Evidence-based public health: a fundamental concept for public health practice. *Annual Review of Public Health,* 30, 175-201.

Bush, P.J., Zuckerman, A.E., Theiss, P.K., Taggart, V.S., Horowitz, C., Sheridan, M.J., . . Walter, H. J. (1989). Cardiovascular risk factor prevention in black schoolchildren: two-year results of the "Know Your Body" program. *American Journal of Epidemiology, 129*(3):466–82.

Canadian Institute for Health Research (CIHR). (2008a). About knowledge translation. Retrieved from http:www.cihr-irsc.gc.ca/e/29418.html.

Canadian Institute for Health Research (CIHR). (2008b). An overview of CIHR. Retrieved from http:www.cihr-irsc.gc.ca/e/30240.html#slidei_e

Canadian Health Services Research Foundation. (2000). *Health services, research and evidence based decision making* (pp. 1-8). Ottawa, Ontario. Retrieved from www.chsrf.ca

Canadian Health Services Research Foundation. (1999). *Issues in linkage and exchange between researchers and decision makers* (pp. 1-25). Ottawa, Ontario, as cited in Dobbins, 2004.

Centre for Reviews and Dissemination. 2009. *Systematic Reviews: CRD's Guidance for Undertaking Reviews in Health Care*. York : University of York.

Chambers, D., Wilson, P.M., Thompson, C.A., Hanbury, A.H., Farley, K., & Light, K. (2011). Maximizing the impact of systematic reviews in health care decision

making: a systematic scoping review of knowledge-translation resources. *The Milbank Quarterly, 89*(1), 131-156.

Ciliska, D., Thomas, H., & Buffett, C. (2008). An introduction to evidence-informed public health and a compendium of critical appraisal tools for public health practice. Retrieved from the National Collaborating Centre for Methods and Tools: http://www.nccmt.ca/pubs/eiph_backgrounder.pdf.

Cook, D.A., Levinson, A.J., Garside, S. (2008). Internet based learning in the health professions: A meta-analysis. *JAMA,300*(10), 1181-1196.

Davis, D., Evans, M., Jadad, A. (2003) The case for knowledge translation: shortening the journey from evidence to effect. *British Medical Journal,* 327,33-35.

Davis, DA., Thomson, MA, Oxman, AD. & Haynes, RB. (1992). Evidence for the effectiveness of CME: A review of 50 randomized controlled trials. *Journal of the American Medical Association,* 268, 1111-1117.

Disease Control Priorities Project. (2006). *Noncommunicable diseases.* Retrieved from http://www.dcp2.org.

Dobbins, M., Hanna, S., Ciliska, D., Manske, S., Cameron, R., Mercer, SL., . . . Robeson, P. (2009). A randomized controlled trial evaluating the impact of knowledge translation and exchange strategies. *Implementation Science*, 4, 61-77.

Dobbins, M., Robeson, P., Ciliska, D., Hanna, S., Cameron, R., O'Mara, L., . . . Mercer, S. (2009b). A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implementation Science, 4* (23).

Dobbins, M., Jack, S., Thomas, H. & Kothari, A. (2007). Public health decision-makers' informational needs and preferences for receiving research evidence. *Worldviews on Evidence-Based Nursing*, *4*(3), 156–163.

Dobbins, M., DeKorby, K., Twiddy, T. (2004). A knowledge transfer strategy for public health decision makers. *Worldviews on Evidence-Based Nursing, 1*(2), 120-128.

Dobbins, M., Ciliska, D., Cockerill, R., DiCenso, A. (2002). A framework for dissemination and utilization of research evidence for health care policy and practice. *The Online Journal of Knowledge Synthesis for Nursing,* 9.

Dobbins, M., Cockerill, R., Barnsley, J., & Ciliska, D. (2001). Factors of the innovation, organization, environment, and individual that predict the influence of five systematic reviews had on public health decisions. *International Journal of Technology Assessment in Health Care, 17*(4), 467-478.

Dopson, S., FitzGerald, L., Gerlie, E., Gabbay, J., & Locock, L. (2002). No magic targets! Changing clinical practice to become more evidence based. *Health Care Management Review, 27*(3), 35–47.

Cochrane Effective Practice and Organisation of Care Group (EPOC). (1998). EPOC methods paper including Interrupted Time Series Designs in a EPOC review. Retrieved from http://epoc.cochrane.org/sites/epoc. cochrane.org/files/ uploads/inttime.pdf

Estabrooks, C.A., Floyd, J.A., Scott-Findlay, S., O'Leary, K.A. & Gushta, M. (2003). Individual determinants of research utilization: A systematic review. *Journal of Advanced Nursing*, *43*(5), 506-520.

Estabrooks, C.A. (1999). The conceptual structure of research utilization. *Research in Nursing & Health,* 22, 203-216.

Farmer, A.P., Legare, F., Turcot, L., Grimshaw, J., Harvey, E., McGowan, J.L., & Wolf, F. (2008). Printed educational materials: effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews, 3.* doi:10.1002 /14651858.CD004398.pub2.

Forsetlund, L., Bjorndal, A., Rashidian, A., Jamtvedt, G., O'Brien, M.A., Wolf, F., . . . Oxman, A.D. (2009). Continuing education meetings and workshops: effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews*, 2.

Freemantle, N., Harvey, E.L., Wolf, F., Grimshaw, J.M., Grilli, R., & Bero, L.A. (1997). Printed educational materials: effects on professional practice and health care outcomes. *The Cochrane Library, 3*.

Hawkins, R.P., Kreuter, M., Resnicow, K., Fishbein, M., Dijkstra, A. (2008). Understanding tailoring in communicating about health. *Health Education Research,* 23, 454-466.

Graham, I., Logan, J., Harrison, M., Straus, S., Tetro, J., Caswell, W. & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *The Journal of Continuing Education in the Health Professions, 26,* 13-24.

Grimshaw, J.M., Shirran, L., Thomas, R., Mowatt, G., Fraser, C., Bero, L, et al. (2001). Changing provider behaviour: An overview of systematic reviews of interventions. *Medical Care, 39*(8):II-2 –45.

Grimshaw, J., Eccles, M., Thomas, R., MacLennan, G., Ramsay, C., Fraser, C. & Vale, L. (2006). Toward evidence-based quality improvement: Evidence (and its limitations) of the effectiveness of guideline dissemination and implementation strategies 1966-1998. *Journal of General Internal Medicine,* 21: Suppl 2: S14-20. doi:10.1111/j.1525-1497.2006.00357.x

Hannes, K., Lockwood, C., Pearson, A. (2010). A comparative analysis of three online appraisal instruments' ability to assess validity in qualitative research. *Qualitative Health Research*, *20*(12), 1736-1743.

Hannes, K. & the Cochrane Qualitative Research Methods Group. (2009). *Chapter 6: Critical appraisal of qualitative research.* Retrieved from http://www.joanna briggs.edu.au/ cqrmg/documents/Cochrane_ Guidance/Chapter6_Guidance _Critical_Appraisal.pdf

Health Canada (2007). *National Forum on Health, 1994-1997.* Retrieved from http://www.hc-sc.gc.ca/hcs-sss/pubs/renewal-renouv/1997-nfoh-fnss-v2/legacy heritage5-eng.php

Higgins, J. P.T., & Green, S. (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2 [updated September 2009]. The Cochrane Collaboration, 2009. Available from www.cochrane-handbook.org.

Jamtvedt, G., Young, J.M., Kristoffersen, D.T., O'Brien, M.A., & Oxman, A.D. (2006). Audit and feedback: effects on professional practice and health care outcomes. *The Cochrane Library, 4.*

Joanna Briggs Institute. (2007). SUMARI: The Joanna Briggs Institute system for the unified management, assessment and review of information. Adelaide, Australia: Author. Retrieved from http://www.joannabriggs.edu.au/services/sumari.php

Kiefer, L., Frank, J., Di Ruggiero, E., Dobbins, M., Manuel, D., Gully, P.R. et al. (2005). Fostering evidence-based decision-making in Canada: Examining the need for a Canadian population and public health evidence centre and research network. *Canadian Journal of Public Health, 96*(3).

Kreuter, M.W. & Wray, R.J. (2003). Tailored and targeted health communication: strategies for enhancing information relevance. *American Journal of Health Behaviour,* Suppl 3, 227-232 .

Lavis, J.N., G. Permanand, A.D. Oxman, S. Lewin, & A. Fretheim. (2009). SUPPORT Tools for Evidence-Informed Health Policymaking (STP) 13: Preparing and Using Policy Briefs to Support Evidence-Informed Policymaking. *Health Research Policy and Systems, 7*(suppl. 1):S13.

Lavis J.N., Robertson, D., Woodside, J., McLeod, C., Abelson, J. (2003). How can research organizations more effectively transfer research knowledge to decision makers? *The Milbank Quarterly*, *81,* 221-248.

Lipsey, M.W. (1993). Theory as method: Small theories of treatments. *New Directions for Program Evaluation*, 57, 5-38.

Logan, J., & Graham, I. (1998). Toward a comprehensive interdisciplinary model of health care research use. *Science Communication*, 20, 227–246.

Lomas, J. (2000). Using 'linkage and exchange' to move research into policy at a Canadian foundation. *Health Affairs, 19*(3), 236-240.

Madon, T., Hofman, K. J. & Kupfer, L. (2007). Public health. *Implementation science, 318*, 1728-1729.

Mansouri, M., Lockyer, J. (2007). A meta-analysis of continuing medical education effectiveness. *The Journal of Continuing Education in the Health Professions*, 27, 6-15.

Marinopoulos, S.S., Dorman, T., Ratanawongsa, N., Wilson, L.M., Ashar, B.H., Magaziner, J.L., et al. (2007). Effectiveness of continuing medical education. *Evidence Report/Technology Assessment,* 149, 1-29.

McKibbon, K. A., Lokker, C., Wilczynski, N. L., Ciliska, D., Dobbins, M., Davis, D. A., Straus, S., E. (2010). A cross-sectional study of the number and frequency of terms used to refer to knowledge translation in a body of health literature in 2006: a Tower of Babel? *Implementation Science, 5,*16-27.

Meijers, J.M.M., Janssen, M.A.P., Cummings, G.G., Wallin, L., Estabrooks, C.A. & Halfens, R. (2006). Assessing the relationships between contextual factors and research utilization in nursing: Systematic literature review. *Journal of Advanced Practice Nursing, 55*(5), 622-635.

Michie, S., Stralen, M.M. & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions.

Mitton, C., Adair, CE., McKenzie, E., Patten, SB. & Perry, BW. (2007). Knowledge transfer and exchange: Review and synthesis of the literature. *The Milbank Quarterly, 85*(4), 729-768.

National Advisory Committee on SARS and Public Health, (2003). *Learning from SARS: Renewal of public health in Canada (the Naylor report).* Retrieved from Public Health Agency of Canada web site: http://www.phac-aspc.gc.ca/publicat/sars-sras/naylor/

National Collaborating Centre for Methods and Tools. (2009). *Five-year strategic plan: 2010-2015.*

Ornstein, S., Jenkins, R.G., Nietert, P.J., Feifer, C., Roylance, L.F., Nemeth, L., et al. (2004). A multimethod quality improvement intervention to improve preventative cardiovascular care: A cluster randomized trial. *Annals of Internal Medicine,* 141, 523-532.

Orton, L., Lloyd-Williams, F., Taylor-Robinson, D., O'Flaherty, M., & Capewell, S. (2010). Systematic review: the use of research evidence by public health policy-makers. *Journal of Epidemiology and Community Health, 64*(Suppl 1). doi:10.1136/jech.2010.120956.52

Oxman, A.D., Thomson, M.A., Davis, D.A. (1995). No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. Canadian Medical Association Journal, *153*(10),1423-1431.

Perrier, L., Mrklas, K., Lavis, J.N. & Straus, S.E. (2011). Interventions encouraging the use of systematic reviews by health policymakers and managers: A systematic review. *Implementation Science, 6*(43), doi:10.1186/1748-5908-6-43.

Primary Health Care Research & Information Service (2006). *Focus on knowledge brokering.* Retrieved from http://www.phcris.org.au/publications/ focuson/

Ramphele, M. (2006). *The importance of evidence based practice in social policy*. Presentation at the International Forum on the Social Science-Policy Nexus, Buenos Aires, Argentina; 20-24 February as cited in O'Shisana, J.L. (2006). Translating research into policy: the case of orphans and vulnerable children in South Africa. *Journal of Social Aspects of HIV/AIDS, 3*(2), 450-456.

Rogers, E.M. (1995). *Diffusion of innovation*. Retrieved from http://books.google.ca

Russell, D.J., Rivard, L., Walter, S.D., Rosenbaum, P.L., Roxborough, L., Cameron, D., . . .Avery, L.M. (2010). Using knowledge brokers to facilitate the uptake of pediatric measurement tools into clinical practice: a before-after intervention study. *Implementation Science, 5*(92).

Shea, B.J., Brimshaw, J.M., Wells, G.A., Boers, M., Anderson, N., Hamel, C., . . . Bouter, L.M. et al. (2007). Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology, 7*:10. doi:10.1186/1471-2288-7-10

Straus, SE., Tetroe, J. & Graham, E. (2009). Defining knowledge translation. *Canadian Medical Association Journal, 181*(34), 165-173.

Stetler, C.,B. (1994). Refinements of the Stetler/Marram model for application of research findings to practice. *Nursing Outlook,* 42, 15-25.

Squires, J.E., Estabrooks, C.A., Gustavsson, P. & Wallin, L. (2011). Individual determinants of research utilization by nurses: a systematic review update. *Implementation Science, 6(1).*

Squires, J.E., Estabrooks, C.A., O'Rourke, H.M., Gustavsson, P., Newburn-Cook, C.V., & Wallin, L. (2011). A systematic review of the psychometric properties of self-report research utilization measures used in healthcare. *Implementation Science, 6*(83). doi:10.1186/1748-5908-6-83

Squires, J.E., Hutchinson, A.M., Bostrom, A., O'Rourke, H.M., Cobban, S.J. & Estabrooks, C.A. (2011). To what extent do nurses use research in clinical practice? A systematic review. *Implementation Science, 6*(21).

Sudsawad, P. (2007). A conceptual framework to increase usability of outcome research for evidence-based practice. *American Journal of Occupation Therapy*, *59*(3), 351-355.

Thomas, B. H., Ciliska, D., Dobbins, M., & Mucucci, S. (2004). A process for systematically reviewing the literature; Providing the research evidence for public health nursing interventions. *Worldviews on Evidence-Based Nursing, 1*(3), 176-184.

Thomson O'Brien, M.A., Freemantle, N., Oxman, A.D., Wolf, F., Davis, D.A., & Herrin, J. (2002a). Continuing education meetings and workshops: effects on professional practice and health care outcomes (Cochrane Review). *The Cochrane Library*, *4*.

Thomson O'Brien, M.A., Oxman, D.A., Haynes, R.B., Freemantle, N., Harvey, E.L., (2002b). Educational outreach visits: effects on professional practice and health care outcomes (Cochrane Review). *The Cochrane Library*, *4*.

Thomson O'Brien, M.A., Oxman, A.D., Davis, D.A., Haynes, R.B., Freemantle, N., et al. (2002c). Audit and feedback: effects on professional practice and healthcare outcomes (Cochrane Review). *The Cochrane Library*, *4*.

Torrey, W.C., Drake, R.E., Dixon, L., Burns, B.J., Flynn, L., Rush, A.J., et al. (2001). Implementing evidence based practices for persons with severe mental illnesses. *Psychiatric Services*, 52, 45–50.

U.S. Department of Health and Human Services. (2000). *Healthy People 2010*. Available from http://www.health.gov/healthypeople

Wang, W., Saldana, L., Brown, C.H. & Chamberlain, P. (2010). Factors that influenced county system leaders to implement an evidence-based program: a baseline survey within a randomized controlled trial. *Implementation Science, (5), 72.*

Waters, E. (2009) Evidence for public health decision-making: towards reliable synthesis. *Bulletin of the World Health Organization, 87*(3), 164-

Waters, E., Armstrong, R., Swinburn, B., Moore, L., Dobbins, M., Anderson, L., Petticrew, M.,...Carter, R., et al. (2011). An exploratory cluster randomised controlled trial of knowledge translation strategies to support evidence-informed decision-making in local governments (The KT4LG study). *Biomed Central Public Health, 11*(34).

World Health Organization (2008). *Noncommunicable diseases now biggest killers.* Retrieved from http://www.who.int/mediacentre/news /releases/2008/pr14/en/index.html.

World Health Statistics (2008). *Part 1: Ten highlights in health statistics*. Retrieved from http:www.who.int/whosis/whostat/2008/en/index.html

Appendix A: Definition of Terms

Audit and Feedback	Audit and feedback is based on the belief that healthcare professionals would be prompted to modify their practice if given feedback that their practice was inconsistent with that of their peers, recent research or best practice guidelines (Jamtvedt et al., 2006).
Champions	Champions are thought of to influence those they are working with. Their active support for and involvement in a particular initiative is a powerful factor that is believed to cause change in a behaviour or practice among peers or colleagues (Dopson, 2002).
Knowledge Broker	Knowledge brokers (KB) work one-on-one with decision makers to facilitate evidence-informed decision making (Dobbins, 2009). A KB aims to connect research producers and end users by developing a mutual understanding of goals and cultures, collaborates with end users to identify problems for which solutions are required, and facilitates the identification, access, assessment, interpretation, and translation of research evidence into local policy and practice (Dobbins, 2009b).
Reminders	Reminders are delivered to the health care professional in a variety of ways and acts to prompt the practitioner to deliver care in a way that is thought of to be evidence based or accepted practice (Dopson, 2002) . Reminders could be written or verbal, computerized messages, mailed post cards, telephone calls and so on.
Tailored and Targeted Messages	'Tailored' implies that the message is focused on the specific scope of decision making ability of the end user, while 'targeted' indicates that the content of the message is relevant and directly applicable to the decision currently faced by the intended audience or end user (Dobbins, 2009).

Appendix B: Search Strategy

Search strategy using highly discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
CINAHL (2000-Present)	1. clinical trials/ 2. control$.tw. 3. random$.tw. 4. comparative studies/ 5. experiment$.tw. 6. (time adj series). tw 7. impact.tw. 8. intervention$.tw. 9. evaluat$.tw. 10. effect?.tw. 11. exp pretest-posttest desgin/ 12. exp quasi-experimental studies/ 13. or/1-12 14. "cochrane database of systematic reviews".jn. 15. 13 not 14 16. author's strategy and 15 **AND** Community OR Public Health* **AND** Implementation Adoption Quality Improvement Dissemination Complex intervention Implementation (w/3) research Complex intervention Information Change Evaluation Utiliz/sation Instititionaliz/sation*	23430 (For high and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using highly discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
EMBASE (2000-Present)	1. Randomized controlled trial/ 2. random$.tw. 3. experiment$.tw. 4. (time adj series).tw. 5. (pre test or pretest or post test or posttest).tw. 6. impact.tw. 7. intervention$.tw. 8. chang$.tw. 9. evaluat$.tw. 10. effect?.tw. 11. compar$.tw. 12. control$.tw. 13. or/1-12 14. Nonhuman/ 15 13 not 14 16. author's strategy and 15 **AND** Community OR Public Health* **AND** Implementation Adoption Quality Improvement Dissemination Complex intervention Implementation (w/3) research Complex intervention Information Change Evaluation Utiliz/sation Instititionaliz/sation*	36469 (For high and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using highly discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
MEDLINE (2000-Present)	1. randomized controlled trial.pt. 2. random$.tw. 3. control$.tw. 4. intervention$.tw. 5. evaluat$.tw. 6. or/1-5 7. animal/ 8. human/ 9. 7 not (7 and 8) 10. 6 not 9 11. author's strategy and 10 **AND** Community OR Public Health* **AND** Implementation Adoption Quality Improvement Dissemination Complex intervention Implementation (w/3) research Complex intervention Information Change Evaluation Utiliz/sation Instititionaliz/sation*	30357 (For high and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using highly discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
The Cochrane Library Systematic Reviews (2000-Present)	Community OR Public Health* **AND** Implementation Adoption Quality Improvement Dissemination Complex intervention Implementation (w/3) research Complex intervention Information Change Evaluation Utiliz/sation Instititionaliz/sation*	2292 (For high and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using medium discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
CINAHL (2000-Present)	1. clinical trials/ 2. control$.tw. 3. random$.tw. 4. comparative studies/ 5. experiment$.tw. 6. (time adj series). tw 7. impact.tw. 8. intervention$.tw. 9. evaluat$.tw. 10. effect?.tw. 11. exp pretest-posttest desgin/ 12. exp quasi-experimental studies/ 13. or/1-12 14. "cochrane database of systematic reviews".jn. 15. 13 not 14 16. author's strategy and 15 **AND** Community OR Public Health* **AND** Change Organiz/sational innovation Innovation Best practice: Institutionali/sation Diffusion of innovation Translational research Policy Policies Continuing education Implementation (w/3) research Service innovation* Linkage and exchange*	23430 (For high and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using medium discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
EMBASE (2000-Present)	1. Randomized controlled trial/ 2. random$.tw. 3. experiment$.tw. 4. (time adj series).tw. 5. (pre test or pretest or post test or posttest).tw. 6. impact.tw. 7. intervention$.tw. 8. chang$.tw. 9. evaluat$.tw. 10. effect?.tw. 11. compar$.tw. 12. control$.tw. 13. or/1-12 14. Nonhuman/ 15. 13 not 14 16. author's strategy and 15 **AND** Community OR Public Health* **AND** Change Organiz/sational innovation Innovation Best practice: Institutionali/sation Diffusion of innovation Translational research Policy Policies Continuing education Implementation (w/3) research Service innovation* Linkage and exchange*	36469 (High and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using medium discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
MEDLINE (2000-Present)	1. randomized controlled trial.pt. 2. random$.tw. 3. control$.tw. 4. intervention$.tw. 5. evaluat$.tw. 6. or/1-5 7. animal/ 8. human/ 9. 7 not (7 and 8) 10. 6 not 9 11. author's strategy and 10 **AND** Community OR Public Health* **AND** Change Organiz/sational innovation Innovation Best practice: Institutionali/sation Diffusion of innovation Translational research Policy Policies Continuing education Implementation (w/3) research Service innovation* Linkage and exchange*	30357 (High and medium discriminatory terms combined)

Appendix B: Search Strategy

Search strategy using medium discriminatory KT terms

Electronic databases searched	Search terms used	Total hits
The Cochrane Library Systematic Reviews (2000-Present)	Community OR Public Health* **AND** Change Organiz/sational innovation Innovation Best practice: Institutionali/sation Diffusion of innovation Translational research Policy Policies Continuing education Implementation (w/3) research Service innovation* Linkage and exchange*	2292 (For high and medium discriminatory terms combined)

Appendix C: AMSTAR Critical Appraisal Instrument for Systematic Reviews

1. Was an 'a priori' design provided? The research question and inclusion criteria should be established before the conduct of the review.	□ Yes □ No □ Can't answer □ Not applicable
2. Was there duplicate study selection and data extraction? There should be at least two independent data extractors and a consensus procedure for disagreements should be in place.	□ Yes □ No □ Can't answer □ Not applicable
3. Was a comprehensive literature search performed? At least two electronic sources should be searched. The report must include years and databases used (e.g. Central, EMBASE, and MEDLINE). Key words and/or MESH terms must be stated and where feasible the search strategy should be provided. All searches should be supplemented by consulting current contents, reviews, textbooks, specialized registers, or experts in the particular field of study, and by reviewing the references in the studies found.	□ Yes □ No □ Can't answer □ Not applicable
4. Was the status of publication (i.e. grey literature) used as an inclusion criterion? The authors should state that they searched for reports regardless of their publication type. The authors should state whether or not they excluded any reports (from the systematic review), based on their publication status, language etc.	□ Yes □ No □ Can't answer □ Not applicable
5. Was a list of studies (included and excluded) provided? A list of included and excluded studies should be provided.	□ Yes □ No □ Can't answer □ Not applicable
6. Were the characteristics of the included studies provided? In an aggregated form such as a table, data from the original studies should be provided on the participants, interventions and outcomes. The ranges of characteristics in all the studies analyzed e.g. age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases should be reported.	□ Yes □ No □ Can't answer □ Not applicable

Shea, B.J., Brimshaw, J.M., Wells, G.A., Boers, M., Anderson, N., Hamel, C...Bouter, L.M. et al. (2007). Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology, 7*:10 doi:10.1186/1471-2288-7-10

Appendix C: AMSTAR Critical Appraisal Instrument for Systematic Reviews (Continued)

7. Was the scientific quality of the included studies assessed and documented? 'A priori' methods of assessment should be provided (e.g., for effectiveness studies if the author(s) chose to include only randomized, double-blind, placebo controlled studies, or allocation concealment as inclusion criteria); for other types of studies alternative items will be relevant.	□ Yes □ No □ Can't answer □ Not applicable
8. Was the scientific quality of the included studies used appropriately in formulating conclusions? The results of the methodological rigor and scientific quality should be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations.	□ Yes □ No □ Can't answer □ Not applicable
9. Were the methods used to combine the findings of studies appropriate? For the pooled results, a test should be done to ensure the studies were combinable, to assess their homogeneity (i.e. Chi-squared test for homogeneity, I^2). If heterogeneity exists a random effects model should be used and/or the clinical appropriateness of combining should be taken into consideration (i.e. is it sensible to combine?).	□ Yes □ No □ Can't answer □ Not applicable
10. Was the likelihood of publication bias assessed? An assessment of publication bias should include a combination of graphical aids (e.g., funnel plot, other available tests) and/or statistical tests (e.g., Egger regression test).	□ Yes □ No □ Can't answer □ Not applicable
11. Was the conflict of interest stated? Potential sources of support should be clearly acknowledged in both the systematic review and the included studies.	□ Yes □ No □ Can't answer □ Not applicable

Shea, B.J., Brimshaw, J.M., Wells, G.A., Boers, M., Anderson, N., Hamel, C...Bouter, L.M. et al. (2007). Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Medical Research Methodology, 7*:10 doi:10.1186/1471-2288-7-10

Appendix D: Cochrane Risk of Bias Tool for Randomized Controlled Trials

Domain	**Description**	**Review authors' judgement**
Sequence generation	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Was the allocation sequence adequately generated? Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)
Allocation concealment	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Was allocation adequately concealed? Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)
Blinding of participants, personnel and outcome assessors *Assessments made for each main outcome (or class of outcomes).*	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Was knowledge of the allocated intervention adequately prevented during the study? Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)
Incomplete outcome data *Assessments made for each main outcome (or class of outcomes).*	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Were incomplete outcome data adequately addressed? Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2 [updated September 2009]

Appendix D: Cochrane Risk of Bias Tool for Randomized Controlled Trials (Continued)

Selective outcome reporting	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Are reports of the study free of suggestion of selective outcome reporting? Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)
Other sources of bias	State how the study either appears to be free of other sources of bias or state other potential sources of bias related to the specific study design used or other problems.	Is there bias due to problems not covered elsewhere in the table. Yes (low risk of bias) No (high risk of bias) Unclear (uncertain risk of bias)

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.0.2 [updated September 2009]

Appendix E: Risk of Bias Tool for Interrupted Time Series Analysis

Domain	**Criteria**
Was the intervention independent of other changes?	Score "Yes" if there are compelling arguments that the intervention occurred independently of other changes over time and the outcome was not influenced by other confounding variables/historic events during study period. If Events/variables identified, note what they are. Score "NO" if reported that intervention was not independent of other changes in time.
Was the shape of the intervention effect pre-specified?	Score "Yes" if point of analysis is the point of intervention OR a rational explanation for the shape of intervention effect was given by the author(s). Where appropriate, this should include an explanation if the point of analysis is NOT the point of intervention; Score "No" if it is clear that the condition above is not met
Was the intervention unlikely to affect data collection?	Score "Yes" if reported that intervention itself was unlikely to affect data collection (for example, sources and methods of data collection were the same before and after the intervention); Score "No" if the intervention itself was likely to affect data collection (for example, any change in source or method of data collection reported).
Was knowledge of the allocated interventions adequately prevented during the study?	Score "Yes" if the authors state explicitly that the primary outcome variables were assessed blindly, or the outcomes are objective, e.g. length of hospital stay. Primary outcomes are those variables that correspond to the primary hypothesis or question as defined by the authors. Score "No" if the outcomes were not assessed blindly. Score "unclear" if not specified in the paper.
Were incomplete outcome data adequately addressed?	Score "Yes" if missing outcome measures were unlikely to bias the results (e.g. the proportion of missing data was similar in the pre- and post-intervention periods or the proportion of missing data was less than the effect size i.e. unlikely to overturn the study result). Score "No" if missing outcome data was likely to bias the results. Score "Unclear" if not specified in the paper (Do not assume 100% follow up unless stated explicitly).

Cochrane Effective Practice and Organisation of Care Group (EPOC). (1998). EPOC methods paper including Interrupted Time Series Designs in a EPOC review. Retrieved January 5, 2010 from http://epoc.cochrane.org/sites/ epoc.cochrane.org/files/uploads/inttime.pdf

Appendix E: Risk of Bias Tool for Interrupted Time Series Analysis (Continued)

Domain	**Criteria**
Was the study free from selective outcome reporting?	Score "Yes" if there is no evidence that outcomes were selectively reported (e.g. all relevant outcomes in the methods section are reported in the results section). Score "No" if some important outcomes are subsequently omitted from the results. Score "unclear" if not specified in the paper.
Was the study free from other risks of bias?	Score "Yes" if there is no evidence of other risk of biases. e.g. should consider if seasonality is an issue (i.e. if January to June comprises the pre-intervention period and July to December the post, could the "seasons' have caused a spurious effect).

Cochrane Effective Practice and Organisation of Care Group (EPOC). (1998). EPOC methods paper including Interrupted Time Series Designs in a EPOC review. Retrieved January 5, 2010 from http://epoc.cochrane.org/sites/ epoc.cochrane.org/files/uploads/inttime.pdf

Appendix F: Characteristics of Included Studies

Systematic Review

Systematic Review	**Authors**: Stone, E. G., Morton, S. C., Hulscher, M. E., Maglione, M. A., Roth, E. A., Grimshaw, J. M., et al. **Date**: 2002 **Country**: United States
Objective	To quantitatively assess the relative effectiveness of previously studied approaches for improving adherence to adult immunization and cancer screening guidelines.
Methods	**Design**: Systematic review and Meta-Analysis **Types of participants:** Nurses, physicians, organizations **Types of interventions:** Interventions to increase use of immunizations for influenza and pneumococcal pneumonia and screening for colon, breast, and cervical cancer in adults **Types of studies:** Randomized controlled trials, controlled clinical trials, controlled before and after studies, interrupted time series conducted between 1979-1999 **Types of outcome measures:** Proportion of patients who received the service before and after the intervention **Search Strategy:** Three databases were searched to identify articles on five preventive services: 1) the Cochrane Effective Practice and Organization of Care (EPOC) 2) previous systematic reviews; and 3) the Health Care Quality Improvement Projects (HCQIP) database, which contains narrative project documents (NPDs) and is maintained by the U.S. Centers for Medicare & Medicaid Services

Appendix F: Characteristics of Included Studies

Systematic Review

Stone et al. (2002) Continued	
Methods (continued)	**Data Collection:** Article selection, quality assessment, and data abstraction were done in standard fashion by using two trained physician reviewers working independently; disagreements were resolved by consensus or third-party adjudication. **Quality Assessment**: Information was extracted on study design, dropout rate and agreement between the unit of randomization and the unit of analysis. Additional criteria was not assessed. **Data Analysis:** Meta-regression analysis was conducted to determine the absolute and relative effectiveness of each different intervention components; adjusted for other intervention components, and controlling for measured and unmeasured study differences. Multivariate models produced an adjusted estimate of the odds ratio for receiving a screening services if one is subject to an intervention component to the odds if one belongs to the control or usual care group. Only 4 studies dealt with interventions to improve the use of colon visualization, and this was an insufficient number to include in the meta-analysis. Nine studies assessed the effect of mass mailings which were excluded, because the sample sizes involved in these studies were of a magnitude much greater than that of the other studies which would have disproportionately affected the results.
Characteristics of Included Single Studies	**Total number of included studies**: N=108 **Characteristics**: Of the 108 studies in the analysis, 95 were randomized clinical trials and 13 were controlled clinical trials. Eighty-one studies contained a usual care or control group and were eligible for the meta-regression. Of these 81 studies, 25 allocated at the provider, organization, or community level and were adjusted for in the sensitivity analysis. Seventy of the 81 studies were randomized trials, of which 22 allocated at the provider, organization, or community level.

Appendix F: Characteristics of Included Studies

Systematic Review

Stone et al. (2002) Continued	
Characteristics of Included Single Studies (Continued)	**Description of the Interventions included in meta analysis**: Intervention components to increase use of services included the following: Provider Reminders: generated manually or by computer , delivered to providers verbally, on paper, or on a computer screen Provider Feedback: Summaries of rates of performance of indicated prevention activities Provider Education: means of dissemination include mass mailings, conferences, workshops, training sessions, lectures, and in-person detailing or individual educational sessions Financial Incentives: direct or indirect financial rewards tied to a specific action of a provider Organizational Change: changes in the work processes in a medical care organization that aim to improve performance of preventive services (addition or redesign of jobs, changes in clinical procedures, or changes in facilities or infrastructure) **Providers**: Unstated **Sites**: Mixed including rural, urban, academic, non academic **Duration of the Interventions**: Varied however unstated **Frequency of the Interventions**: Varied however unstated **Follow up**: Varied however unstated
Outcomes	Change in Practice

Appendix F: Characteristics of Included Studies

Systematic Review

Stone et al. (2002) Continued	
Outcome Measurement Tool	Proportion of patients who received the service before and after the intervention
Study Limitations	**Study Authors** • Quantity and quality of single studies available • Difficult to assess which intervention approaches work best due to the diverse types of interventions these studies used • Lack of information related to intervention cost effectiveness • Majority of studies did not correct for clustering of patients within organizations or communities allocated to intervention or control • Many of the studies did not include the necessary information for inferential statistical analysis • Not able to perform quantitative analyses on cost effectiveness **Review Authors** • Study authors appropriately conducted random effects but did not conduct a test of heterogeneity • Minimally reported on quality of single studies • Did not report the duration or intensity of interventions in single studies

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study	**Authors**: Barwick, M.A., Peters, J. Boydell, K. **Date**: 2009 **Country**: Canada
Objective	To examine whether practitioners in a community of practice (CoP) changed their practice more readily and demonstrated greater knowledge of the Child and Adolescent Functional Assessment Scale (CAFAS) than practitioners given access to the implementation supports typically available
Methods	**Design**: Randomized controlled trial **Recruitment**: Fourteen Children's Mental Health service provider organizations newly added to the provincial CAFAS user group were invited to participate in the study. Participants were reimbursed for their travel and funds were provided to the participating organizations to secure clinical back-up to cover clinicians' absences. **Inclusion/exclusion**: Children's mental health practitioners working in service provider organizations who agreed to participate in the study. All clinicians were eligible to participate in the study after they were trained in 2-day reliability and 1-day software orientation training and achieved interrater reliability on the CAFAS tool. **Allocation**: Clinicians from 6 consenting organizations were randomly assigned, clustered by organization, to either the CoP or practice as usual PaU support conditions.
Participants	**Total Sample**: N= 34 participants completed baseline measurements **Intervention group**: Communities of practice (CoP) n= 17 **Control group**: Practice as usual practice (PaU) n= 17

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Barwick et al. (2009) Continued	
Participants (continued)	**Characteristics**: Participants were child and youth mental health practitioners working in publicly funded community based service provider organizations in Ontario. Participants were mostly female (89.2%), and had on average 9 years of experiences as a clinician (7 years among PaU group; 10.8 years among CoP group). Four participants had graduate level education, 8 had bachelors level training, 14 had diplomas or certifications in social work, social service work, child and youth care, or early childhood education, and there was one registered nurse (7 participants did not provide level of education data). **Loss to follow-up**: 14 lost to follow up (6 in study group; 8 in control) **Study duration**: 1 year 2006-2007
Intervention	**Interventions:** Community of practice**-**Established group of people sharing knowledge, learning together, and creating common practices. **Description of Intervention**: Session 1: The facilitator explained the purpose of the CoP is to support and develop the practice surrounding the use of the CAFAS tool. Participants were oriented to the various roles that help set-up, develop, nurture, and sustain the community, and set the stage for its sustainability. Members worked together and participated actively. There was also a key role for a content expert, who acted as a resource to the community when needed. Sessions 2-6: Group invited to shape the agenda for the meetings. Conversation built in which advice, opinions, and information were offered, again situated in practice. Productive inquiry initiated the actions of knowledge access, knowledge exchange, and knowledge creation. The knowledge needed and shared was triggered by a real situation connected to practice.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Barwick et al. (2009) Continued	
Intervention	**Description of Control group**: Practitioners in the PaU group were given access to the implementation supports typically available. **Intervention Duration:** 11 months **Intervention Frequency:** CoP practitioners met as a 'community' of new CAFAS users 6 times over an 11 month period. **Provider(s)**:Meetings were hosted and facilitated by the CAFAS Trainer **Site:** Meetings were held in the same location **Follow up**: End of intervention (11 months) **Theoretical Framework:** Structure was developed according to certain key principles of Community of Practice models
Outcomes	Change in Knowledge Change in Practice

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Barwick et al. (2009) Continued	
Outcome Measurement Tool	**Knowledge**: CAFAS knowledge questionnaire- (Content Knowledge) - 20 true/false questions measuring specific knowledge related to clinical use of the CAFAS scale reduced to a total CAFAS knowledge score. Total scores ranged from 0 to 20. Validity and reliability not reported. **Practice**: 20-item questionnaire regarding respondents self reported use of CAFAS implementation supports reduced to a total CAFAS supports score. Responses were 'yes', 'no', or 'don't know/does not apply' Validity and reliability not reported. **Practice**: 10-question Likert scale questionnaire to assess the degree of self-reported change reduced to a total practice change score. Items were rated as 'very much', 'somewhat', 'very little' or 'not at all'. Validity and reliability not reported. **Practice**: Total number of times clinicians rated the CAFAS in practice. Validity and reliability not reported
Study limitations (Items mentioned by review authors not already identified in risk of bias assessment)	**Study Authors:** • Small sample size followed over a short duration • Frequency of CAFAS ratings does not take into account variation in the number of patients entering into treatment in each organization • CoP clinicians were provided with financial support **Review Authors**: • Convenience sample of organizations • Baseline measurements were taken after session 1 • Low exposure to CoP sessions-average participation 3.7 out of 6 sessions

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study	**Authors**: Di Noia, J., Schwinn, T.M., Dastur, Z.A., Schinke, S.P. **Date**: 2003 **Country**: United States
Objective	To evaluate the effectiveness of three dissemination strategies (Pamphlets, CD-ROM, Internet) related to prevention program materials.
Methods	**Design**: Randomized controlled trial **Recruitment:** Three adolescent substance abuse prevention programs were identified and illustrative dissemination materials were compiled for each. These materials were disseminated to school personnel, community providers, and policy makers. First by mailed letter invitation, then by telephone follow-up, sites were offered the opportunity to participate in the study. **Inclusion/Exclusion:** Sites included schools, community agencies, policy making bodies and youth services agencies. Sites agreeing to participate were asked to identify professionals on staff to complete assessments at planned intervals and to review materials for three youth-oriented substance abuse prevention programs. **Allocation:** Grouped by site, consenting professionals were stratified and matched on their constituency (school, agency, policy-making body) and geographic location. Matched triads of sites were randomly assigned to one of three arms: pamphlet, CD-ROM, or Internet.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Di Noia et al. (2003) Continued	
Participants	**Total Sample**: N=188 professionals **Intervention groups** : Pamphlet n=55 CD-ROM n=64 Internet n=69 **Characteristics**: The participants were professionals employed in schools, community agencies, and policy-making bodies. Schools were defined as public and independent educational facilities at the middle and junior high levels. Community agencies were defined as private non-profit organizations that provide youth with human services including school dropout, delinquency, and pregnancy prevention; day treatment, juvenile probation and parole; educational tutoring; and recreational, neighbourhood, and club activities. Policy-making organizations were government legislative, analytic, funding, and regulatory bodies that were at least in part dedicated to the provision or recommendation of drug abuse prevention services for youth. Professionals included teachers, social workers, and other management and executive-level personnel who exercised decision-making power over the selection and application of adolescent drug abuse prevention programs. Respondents from target constituencies tended to be female, between the ages of 30 and 49 years, white, and well educated with close to half of respondents (48%) holding graduate degrees. **Loss to follow-up**: Unstated **Study Duration:** 2 years

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Di Noia et al. (2003) Continued	
Intervention	**Interventions:** Printed materials and information in CD-ROM or internet format tailored to prevention needs **Description of Intervention**: Information was synthesized about three youth-oriented substance abuse prevention programs and a common presentation format for delivering this content via pamphlet, CD-ROM, and Internet was developed. Materials described the rationale, strategies, and costs to prevent drug abuse, and the roles of schools, professionals, and community groups, and relevant private and government bodies in addressing this problem. Materials were tailored to be responsive to their differing prevention needs. Constituency-specific content was delivered to respondents in the CD-ROM and Internet arms. Following receipt of completed pre-tests, professionals in the respective study arms were sent the pamphlet, CD-ROM, or logon name, password, and instructions for Internet access. **Description of Control:** No control group **Intervention Duration**: Participants had 6 months to review materials before first follow up measurement took place **Intervention Frequency**: Independent study of materials **Provider(s):** Researchers disseminated materials **Site**: Unstated **Follow up:** 6 and 12 months after receiving dissemination materials, participants completed post-test and follow-up measurements. **Theoretical Framework:** Unstated
Outcomes	Change in Knowledge Change in Practice

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Di Noia et al. (2003) Continued	
Outcome Measurement Tool	**Knowledge:** Individual-item measures with Likert-scaled response options to determine where to locate drug abuse prevention findings and material. Lower scores indicative of more favourable ratings. Validity and reliability not reported. ~~**Behaviour**~~**Practice**: Frequency with which respondents searched for prevention program materials was measured. Lower scores indicative of more favourable ratings. Validity and reliability no reported.
Study Limitations (Items mentioned by review authors not already identified in risk of bias assessment)	**Study authors:** • Limited generalizability due to small sample • Unable to permit subgroup analyses of interactions among channel, constituency and program • Interventions were slightly outdated • The use of self reported single-item outcome measures • Brief follow up periods **Review authors:** • Convenience sample • Difficult to assess exposure to interventions due to the nature of independent study of materials • Group of participants were well educated (half masters prepared) limiting generalizability of findings • Could not use measure "Likelihood of requesting/implementing programs as a concrete measure of behaviour change

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study	**Authors**: Dobbins, M., Hanna, S.E., Ciliska, D., Manske, S., Cameron, R., Mercer, S.L., O'Mara, L., DeKorby, K., Robeson, P. **Date**: 2009 **Country**: Canada
Objective	To evaluate the effectiveness of three knowledge translation and exchange strategies in the incorporation of research evidence into public health policies and programs.
Methods	**Design**: Randomized controlled trial **Recruitment:** After consent obtained from senior person in public health departments, name of person most directly responsible for making decisions about healthy body weight promotion identified and contacted via letter and follow up phone call **Inclusion/exclusion:** All public health departments in Canada were eligible to participate identified through provincial databases. **Allocation**: Participating health departments were stratified according to size of population served and randomly allocated to one of three intervention groups in equal numbers within strata by computer generated pseudorandom draws using standard algorithms
Participants	**Total Sample**: N= 108 public health departments **Intervention groups**: Targeted and Tailored Messaging (TM) n=36 Targeted and tailored messaging plus access to registry Knowledge Broker (KB) n=36 Services of a knowledge broker plus access to registry and targeted and tailored messaging **Control group:** Health Evidence (HE) n=36 Access to healthevidence.ca registry

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Dobbins et al. (2000) Continued	
Participants (continued)	**Characteristics**: Participants were from participating regional and local public health departments in Canada and were directly responsible for making program decisions related to healthy body weight promotion in children. This included program managers and/or coordinators in Ontario, and program directors in the rest of Canada. Participation by province and territory ranged from 29% to 100% with the sample consisting primarily of health departments serving both urban and rural populations (46%). **Loss to follow-up**: Intervention: (TM) n=6 (KB) n=7 Control: (HE) n=7 Follow-up data were collected from 88 of 108 (81.5%) participating public health departments **Study duration:** 2 years Baseline assessment was completed September-November 2004, with the intervention taking place during the calendar year of 2005 when all interventions were introduced simultaneously. Post intervention assessment was completed January-March 2006.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Dobbins et al. (2000) Continued	
Intervention	**Description of Intervention:** **TM group**: Tailored, targeted messages plus access to health-evidence.ca Over seven successive weeks, on the same day each week and the same time of day, participants in the TM group were sent an email indicating that a systematic review related to healthy body weight promotion in children was available in full text at the link provided. Participants received access to the PDF version of the systematic review, the published abstract of the review, as well as the short summary written. The text of the message was worded to say, 'this message is number XX in a series of seven emails you will receive on healthy body weight promotion in children as part of the KTE strategy you are being exposed to in this randomized controlled trial'. **KB group**: Included both the HE and TM components and a KB who worked one on one with decision makers in the public health departments. The KBs were Master's prepared, had extensive knowledge and expertise in public health decision making, as well as an understanding of the research process. Specific tasks conducted by the KB included: ensuring relevant research evidence related to healthy body weight promotion was transferred to the public health decision makers in ways that were most useful to them, assisting them to develop the skill and capacity for evidence-informed decision making, and assisting them in translating evidence into local practice. Approximately twenty percent of KB time was spent facilitating knowledge and skill development either through face-to-face interaction such as workshops or online strategies such as webinars, interactive web enabled meetings, or conferences. Eighty percent of the brokers' time was spent preparing for and directly interacting with participants.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Dobbins et al. (2000) Continued	
Intervention (continued)	**Description of Control**: HE group: Least interactive KTE strategy. HE group had access to health-evidence.ca which is a repository of systematic reviews evaluating any public health intervention. All participants in the study received electronic communication about the availability of this site. Upon searching this site for reviews evaluating strategies to promote healthy body weight in children, those in the HE group would have become aware of the title, citation, and assessment of the methodological quality of seven systematic reviews evaluating the effectiveness of interventions to promote healthy body weight in children. Participants in the HE group also had access to the published abstracts, and the full text articles and a short summary for each of the systematic reviews, written by the research team, with key findings and recommendations for public health policy and practice directly applicable to the types of decisions for which the participants were responsible. **Duration of Intervention:** 1 year **Frequency of Intervention:** Varied **Providers:** Researchers, Professionals **Site:** Workplace **Follow up**: End of intervention **Theoretical Framework**: Framework for Research Dissemination and Utilization
Outcomes	Change in Practice

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Dobbins et al. (2009) Continued	
Outcome Measurement Tool	Telephone-administered survey (knowledge transfer and exchange data collection tool). Reported reliability 0.65 cronbach alpha. **Practice**: Global Evidence-Informed Decision Making- Mean self report score on the extent to which research evidence was considered in a recent program planning decision in the previous 12 months. Responses ranging from one (not at all) to seven (completely). **Practice**: Public Health Policies and Programs- Respondents asked whether the public health policies and programs were being implemented by their health department (yes/no). The total number was summed.
Study Limitations (Items mentioned by review authors not already identified in risk of bias assessment)	**Study authors:** • Self-reported outcome measures • Participants may have not been aware of all public health policies and programs provided by their organization leading to both under and over reporting of this outcome • Variable exposure to intervention- Up to 30% of participants did not engage with the KB at~~al~~ all or to a limited extent • Participants who completed baseline measurements were different in follow up surveys in 30% of departments **Review authors:** • Questionnaire only reported as satisfactory Cronbach alpha of 0.65 • Not described how exposure to knowledge broker was estimated • Using two different knowledge brokers could have led to differences between groups using that intervention

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study	**Authors**: Forsetlund, L. Bradley, P., Forsen, L., Nordheim, L., Jamtvedt, G., Bjørndal, A. **Date**: 2003 **Country**: Norway
Objective	The aim of this study was to evaluate whether a tailored theory-based and multifaceted intervention targeted at the whole process of evidence-based practice increased the explicit integration of research in public health physicians' decision-making
Methods	**Design**: Randomized controlled trial **Recruitment:** The invitation letters explained that project participants would have free access to a library service. In return, they would be asked to return questionnaires and examples of written reports to be used for programme evaluation. Participants were also informed that some would be asked to co-operate further during the project period. Recruitment was stopped when 73 had been allocated to the intervention group and 75 to the control group, fulfilling the number of the sample size calculations. **Inclusion/exclusion**: All public health physicians working in municipalities in Norway with more than 3000 inhabitants (N = 332) were invited to participate in the project. **Allocation:** Public health physicians were enrolled by the primary author upon receipt of the consenting letter. Enrolled physicians were subsequently randomized to one of two groups by an independent researcher using computer software.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Forsetlund et al. (2003) Continued	
Participants	**Total Sample**: N=148 **Intervention group**: n=73 **Control group** n=75 **Characteristics**: Participants were public health physicians working in municipalities in Norway. Public health physicians in Norway are geographically scattered; one physician in each of the country's 435 municipalities. The sample was physicians who were predominately male, were on average 47 years of age and had been working in the field on average 12 years in the intervention group vs 9.5 years in the control group, working experience in rural and urban settings. More physicians in the intervention group had previously attended sessions in critical appraisal. **Loss to follow-up**: Analysed in intervention group: Analysed in control group: Questionnaire 58 (79%) Questionnaire 61 (81%) Reports 17 (23%) Reports 25 (33%) **Study Duration**: January 1999 to January 2001.
Intervention	**Interventions:** workshop, information service, discussion list, access to databases **Description of Intervention:** The intervention program was intended to lead the participants from the first knowledge stage to the confirmation stage when adoption was to occur based on innovation-diffusion process. **Workshop**: Interactive small-group setting involving small group problem-based activities and discussion. Involved posing and formulating questions, searching skills, critical appraisal and practical application of research evidence in practice. **Goal-Setting Contract**: Physicians were asked to state three things that they would change when returning to practice.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Forsetlund et al. (2003) Continued	
Intervention	**Information Services (including library access)**: Included on-going support, access to several databases and consisted of: a question and answer service where upon submitting a questions physicians would receive references or reports based on relevant studies found; access to course material and how to practice evidence-based public health; and links to other sources of information on evidence-based practice. **Discussion List**: Discussion stimulated by giving general reminders, providing and asking for feedback and allocating peer discussion. Providers announced when reports had been written and critically appraised selected articles. Participants were reminded of ongoing support services. **Newsletters**: Three newsletters reported on principles of evidence-based health care and project activities, including feedback on database use. **Description of Control**: Participants in the control group received free access to library services for one year. **Intervention Duration**: April 1999 until the end of January 2001 **Intervention Frequency:** 11 courses on evidence-based public health varying from 1-5 days to maximise attendance 3 newsletters **Provider**: Two public health physicians and two librarians **Site**: Web-based and workshop format **Follow up**: Follow-up measurements were started immediately at the end of the intervention **Theoretical Framework**: Rogers' model of innovation diffusion

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Forsetlund et al. (2003) Continued	
Outcomes	Change in Knowledge Change in Practice
Measurement (Screening) Tool	Baseline scores included in analysis. **Knowledge:** Questionnaire measured self-perceived concept knowledge (scale 0 to 2) and self perceived source knowledge (scale 0 to 3). An additional question was added to concept knowledge, scored as either 0 or 1. Concept knowledge was knowledge of importance to critical appraisal and source knowledge was information about sources for evidence based practice. Content Knowledge: Mean of additive score of 0 = 'unknown', 1 ='known', 2 = 'so known that I can explain to others' + an extra point (1) if correctly answering "Method chapter" as to what is the most important chapter for deciding scientific quality of an article. Source Knowledge: Mean of additive score of 0 = 'unknown', 1 = 'known, but not used', 2 = 'read', 3 = 'used in a public health decision-making situation'. Scores were summed and means for individual overall scores computed. Higher scores indicative of more favourable ratings. The analysis of internal consistency of scale items based on the 55 pilot test data yielded a Cronbach's alpha score ranging from 0.83 to 0.87. **Practice:** Analysis of the contents of local health service reports for use of research. Respondents sent in relevant documents analyzed by two assessors. Scores for reports were recoded and reported as 'used' or 'not used' research. The weighted Kappa scores for interrater agreement on use of research information for reports were 0.50, 0.91 and 0.87 at pretest respectively and 0.89, 0.75 and 0.74 at post-test.

Appendix F: Characteristics of Included Studies

Randomized Controlled Trials (4)

Study: Forsetlund et al. (2003) Continued	
Study Limitations (Items mentioned by review authors not already identified in risk of bias assessment)	**Study authors:** • Low statistical power • Unreliability of measures and treatment implementation • Low response rate for post-tests • Increased effort to obtain more documents could have been made during data collection • Possible that intervention was not adequately implemented in terms of teaching methods and duration • 1.5 years may have been too short a time perspective • Risk of co-intervention-In the time period evidence based practice was discussed in other public health settings influencing the general level of knowledge • Experiment group could guess the hypothesis to a greater extent than control • Sample contained innovators or early adopters **Review authors:** • Per communication with author measure of change in practice only collected at post-test (telephone survey/postal survey/self reported searching of Cochrane and Medline) • Per communication with author, hypothetical assignment was not included as a measure of practice, decision to adopt included items measuring intention

Appendix F: Characteristics of Included Studies

Time Series Analysis (1)

Study	**Authors**: Hanbury, A., Wallace, L., Clark, M. **Date**: 2009 **Country**: England
Objective	To test the effectiveness of a Theory of Planned Behaviour intervention implemented among community mental health professionals to improve adherence to a national suicide prevention guideline.
Methods	**Design**: Interrupted Time series design **Recruitment:** All community mental health professionals in the intervention site were invited to participant. The intervention site was an NHS Trust in the West Midlands. Audit data was collected from an alternative control site where no intervention occurred. **Inclusion/exclusion:** Unstated **Allocation**: N/A
Participants	**Total Sample**: N=93 community mental health professionals **Intervention group**: n =49 attended educational session **Control group**: n= unclear **Characteristics**: Community mental health professionals in the West Midlands. Demographic data not reported. **Loss to follow-up**: 28 lost to follow up (21 returned questionnaire post educational session) **Study duration**: 2002-2006

Appendix F: Characteristics of Included Studies

Time Series Analysis (1)

Study: Hanbury et al. (2009) Continued	
Intervention	**Intervention:** Educational session (comprised of didactic presentation, peer discussion, group work on real life vignettes) **Description of Intervention**: Educational session comprised three components designed to target normative beliefs. **First component**: a presentation that contained factual statements, statistics and graphs taken from key Department of Health publications highlighting and supporting the guideline evidence base. The presentation was designed to convey positive normative beliefs that all staff adhere to the guideline and expect other staff to adhere. **Second component**: group discussion facilitated to ensure that positive normative beliefs were emphasized and any negative normative beliefs challenged. **Third component:** comprised group work on two real life vignettes developed in consultation with the professional head of nursing: one depicting an episode of care in which the guideline had been adhered to and a near-miss for a service-user avoided, and one in which the guideline had not been adhered to and there had been a negative outcome. **Providers**: Training co-ordinators **Site**: Conducted at each community mental health teams' base **Length of Intervention**: Unclear-appears to be one day **Follow up**: Intervention delivered from November, 2004 to February 2005 (Phase 2); adherence data collected until May 2006 (Phase 3) **Description of Control**: Practice as usual **Theoretical Framework**: Theory of Planned Behaviour

Appendix F: Characteristics of Included Studies

Time Series Analysis (1)

Study: Hanbury et al. (2009) Continued	
Outcomes	Change in Practice
Outcome Measurement Tool	**Practice**: Monthly percentage adherence recorded in the intervention and control site
Study Limitations (Items mentioned by review authors not already identified in risk of bias assessment)	**Study Authors:** • Some discontinuity occurred between those who returned the questionnaire and those who attended the intervention • Staff turnover was a problem at the intervention site • Through using the audit adherence data aggregated across the mental health directorate it was not being possible to break the data down to the level of the individual health professionals • The timing of the local event made it difficult to isolate the effects of this from the intervention **Review Authors:** • How sites were picked is not addressed • Unclear who control group participants were • Procedure for outcome measurement not stated • Could not use data related to questionnaire because measured "intention"

Appendix G: Risk of Bias Assessment

AMSTAR Critical Appraisal Instrument for Systematic Review (1)

Study: Stone et al. (2002)				
Criteria	**Yes**	**No**	**Can't answer**	**N/A**
1) Was an 'a priori' design provided? The research question and inclusion criteria should be established before the conduct of the review. Comments:	√			
2) Was there duplicate study selection and data extraction? There should be at least two independent data extractors and a consensus procedure for disagreements should be in place. Comments:	√			
3) Was a comprehensive literature search performed? At least two electronic sources should be searched. The report must include years and databases used (e.g. Central, EMBASE, and MEDLINE). Key words and/or MESH terms must be stated and where feasible the search strategy should be provided. All searches should be supplemented by consulting current contents, reviews, textbooks, specialized registers, or experts in the particular field of study, and by reviewing the references in the studies found. Comments: Although at least two electronic sources were searched key words and/or MESH terms were not stated and searches were not supplemented. No mention of reference list screening.		√		
4) Was the status of publication (i.e. grey literature) used as an inclusion criterion? The authors should state that they searched for reports regardless of their publication type. The authors should state whether or not they excluded any reports (from the systematic review), based on their publication status, language etc. Comments:	√			

Appendix G: Risk of Bias Assessment

AMSTAR Critical Appraisal Instrument for Systematic Review

Study: Stone 2002 (Continued)	**Yes**	**No**	**Can't answer**	**N/A**
5) Was a list of studies (included and excluded) provided? A list of included and excluded studies should be provided. Comments:	√			
6) Were the characteristics of the included studies provided? In an aggregated form such as a table, data from the original studies should be provided on the participants, interventions and outcomes. The ranges of characteristics in all the studies analyzed e.g. age, race, sex, relevant socioeconomic data, disease status, duration, severity, or other diseases should be reported. Comments:	√			
7) Was the scientific quality of the included studies assessed and documented? 'A priori' methods of assessment should be provided (e.g., for effectiveness studies if the author(s) chose to include only randomized, double-blind, placebo controlled studies, or allocation concealment as inclusion criteria); for other types of studies alternative items will be relevant. Comments:	√			
8) Was the scientific quality of the included studies used appropriately in formulating conclusions? The results of the methodological rigor and scientific quality should be considered in the analysis and the conclusions of the review, and explicitly stated in formulating recommendations. Comments: Quality appraisal of included studies was minimal		√		

Appendix G: Risk of Bias Assessment

AMSTAR Critical Appraisal Instrument for Systematic Review (Continued)

Study: Stone 2002 (Continued)	**Yes**	**No**	**Can't answer**	**N/A**
9) Were the methods used to combine the findings of studies appropriate? For the pooled results, a test should be done to ensure the studies were combinable, to assess their homogeneity (i.e. Chisquared test for homogeneity, I2). If heterogeneity exists a random effects model should be used and/or the clinical appropriateness of combining should be taken into consideration (i.e. is it sensible to combine?). Comments: Assessment of heterogeneity not reported however reviewers use random effects		√		
10) Was the likelihood of publication bias assessed? An assessment of publication bias should include a combination of graphical aids (e.g., funnel plot, other available tests) and/or statistical tests (e.g., Egger regression test). Comments:	√			
11) Was the conflict of interest stated? Potential sources of support should be clearly acknowledged in both the systematic review and the included studies. Comments:	√			
TOTAL	8	3		

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Barwick 2009		
Entry	**Judgment**	**Support for Judgment**
Random sequence generation (selection bias)	Unclear (Uncertain risk of bias)	Comment: The process by which the randomization occurred is not reported. Clinicians from 6 consenting organizations were randomly assigned, clustered by organization to either the intervention or control conditions (p. 20).
Allocation concealment (selection bias)	Unclear (Uncertain risk of bias)	Comment: Although organizations were cluster randomized, there was insufficient information to permit judgment of 'Yes' or 'No.'
Blinding (participants)	No (High risk of bias)	Comment: Blinding not done as per communication with author. Study was practice based related to real world practice change
Blinding (providers)	No (High risk of bias)	Comment: Blinding not done as per communication with author.
Blinding (data collectors/outcome adjudicators)	No (High risk of bias)	Comment: Blinding not done as per communication with author.
Blinding (data analysts)	No (High risk of bias)	Comment: Blinding not done as per communication with author.
Incomplete outcome data addressed?	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Barwick 2009 (Continued)		
Entry	**Judgment**	**Support for Judgment**
Free of selective reporting?	Yes (Low risk of bias)	Comment: All outcomes identified a priori were reported on.
Free of other bias?	No (High risk of bias)	• Risk of Co-Intervention: Other interventions to increase knowledge of EBP that the researchers were unaware of could have been occurring. • Not all measurement tools were shown to be valid or reliable. • Unclear if groups had similar baseline characteristics. • Unclear if groups were similar in measurement of the outcome at baseline.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Di Noia 2003		
Entry	**Judgment**	**Support for Judgment**
Random sequence generation (selection bias)	Unclear (Uncertain risk of bias)	Comment: The process by which the randomization occurred is not reported. Quote: "Randomly matched triads of sites. Random assignment."
Allocation concealment (selection bias)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'.
Blinding (participants)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because of the nature of the intervention.
Blinding (providers)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because those developing the intervention materials would have knowledge of the intervention groups.
Blinding (data collectors/outcome adjudicators)	Yes (Low risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely done because the outcome measurement was a survey completed by participants and therefore not likely to be influenced by lack of blinding.
Blinding (data analysts)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Di Noia 2003 (Continued)		
Entry	**Judgment**	**Support for Judgment**
Incomplete outcome data addressed?	No (High risk of bias)	Comment: Intention to treat analysis not completed.
Free of selective reporting?	Yes (Low risk of bias)	Comment: All outcomes identified a priori were reported on.
Free of other bias?	No (High risk of bias)	• Not all confounders considered at baseline measurement (years of experience/current position). • Risk of Co-Intervention: Other interventions to increase knowledge of EBP that the researchers were unaware of could have been occurring. • Data collection tools were not demonstrated to be valid or reliable.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Dobbins 2009		
Entry	**Judgment**	**Support for Judgment**
Random sequence generation (selection bias)	Yes (Low risk of bias)	Comment: Although this sequence is not truly random, risk of introducing bias using these methods is low. Quote: " health departments were randomly allocated to groups in equal numbers within strata by computer-generated pseudorandom draws using standard algorithms" (p. 3).
Allocation concealment (selection bias)	Yes (Low risk of bias)	Comment: Unlikely to foresee allocation assignment through the use of computer generated draws.
Blinding (participants)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because of the nature of the intervention.
Blinding (providers)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because those delivering the interventions would have knowledge of the intervention groups.
Blinding (data collectors/outcome adjudicators)	Yes (Low risk of bias)	Comment: Data collectors were not aware of the groups to which participants had been allocated.
Blinding (data analysts)	Yes (Low risk of bias)	Comment: Statistician did not have access to participant information and was not aware in the results set of who had been allocated to which groups.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Dobbins 2009 (Continued)		
Entry	**Judgment**	**Support for Judgment**
Incomplete outcome data addressed?	Yes (Low risk of bias)	Comment: Analysis was based on the initial treatment intent. Quote: "Allows for flexible handling of missing data."(p. 7).
Free of selective reporting?	Yes (Low risk of bias)	Comment: All outcomes identified a priori were reported on.
Free of other bias?	No (High risk of bias)	• Risk of Co-Intervention: Other interventions to increase knowledge of EBP that the researchers were unaware of could have been occurring. • Not all measurement tools were shown to be valid or reliable.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Forsetlund 2003		
Entry	**Judgment**	**Support for Judgment**
Random sequence generation (selection bias)	Yes (Low risk of bias)	Quote: "Enrolled physicians were subsequently randomized to one of two groups by an independent researcher using computer software" (p.5).
Allocation concealment (selection bias)	Yes (Low risk of bias)	Comment: Computer software was used.
Blinding (participants)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because of the nature of the intervention ,
Blinding (providers)	Unclear (Uncertain risk of bias)	Quote: Insufficient information to permit judgment of 'Yes' or 'No'. Likely not done because of the nature of the intervention
Blinding (data collectors/outcome adjudicators)	Yes (Low risk of bias)	Quote: "Registrar of questionnaire data was blinded to group allocation." "Researchers who scored the other study outcomes were blinded to the allocation of participants and whether the results were pre or post tests" (p.5).
Blinding (data analysts)	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of 'Yes' or 'No'.

Appendix G: Risk of Bias Assessment

Cochrane's Risk of Bias assessment of Randomized Controlled Trials (4)

Study: Forsetlund 2003 (Continued)		
Entry	**Judgment**	**Support for Judgment**
Incomplete outcome data addressed?	Yes (Low risk of bias)	Quote: "Data for all responding participants were analyzed on an intention to treat basis, in the sense that even responders who had not received the intervention in full were included in the analysis" (p.5).
Free of selective reporting?	Yes (Low risk of bias)	Comment: All outcomes identified a priori were reported on.
Free of other bias?	No (High risk of bias)	• Baseline characteristics revealed a possible imbalance for some variables (sex, number of years as a public health physician, specialist status, previous exposure to courses in critical appraisal and number of reports written). • Unclear if groups were similar in measurement of the outcome at baseline. • Participants were asked to sign a contract about what they would change in their practice prior to follow up. • Risk of Co-Intervention: In the time period evidence based practice was discussed in other public health settings which could have influenced the general level of knowledge. • Not all measurement tools were shown to be valid or reliable.

Appendix G: Risk of Bias Assessment

EPOC Risk of Bias for Interrupted Time Series Design (1)

Study: Hanbury 2009		
Entry	**Judgment**	**Support for Judgment**
Was the intervention independent of other changes? (Protection against secular changes)	Yes (Low risk of bias)	Comment: Used control site; recorded and accounted for other events in the analysis including the introduction of guideline by Health Care Commission and at the intervention site only a change in system for monitoring service-user-discharges.
Was the shape of the intervention effect pre-specified?	Yes (Low risk of bias)	Comment: The point of analysis is the point of intervention. Two extraneous events were also analysed and the point of their occurrence clearly identified.
Was the intervention unlikely to affect data collection?	No (High risk of bias)	Comment: Used different data collection methods at Phase 1 and Phase 3. Phase 1 used interviews and Phase 3 used chart audits.
Was knowledge of the allocated interventions adequately prevented during the study?	Yes (Low risk of bias)	Comment: Outcome measures were objective.
Were incomplete outcome data adequately addressed?	Unclear (Uncertain risk of bias)	Comment: Insufficient information to permit judgment of ‘Yes’ or ‘No’.

Appendix I: Risk of Bias Tables for Interrupted Time Series Design (1)

Study: Hanbury 2009 (Continued)		
Entry	**Judgment**	**Support for Judgment**
Was the study free from selective outcome reporting?	Yes (Low risk of bias)	Comment: All outcomes identified a priori were reported on.
Was the study free from other risks of bias?	No (High risk of bias)	• No random allocation • Only 1 control and 1 intervention site • Researcher developed tool was used to measure outcomes. • Baseline characteristics of the intervention and control group were not reported • Unclear if outcomes assessed blindly

Appendix H: Outcomes Tables

Change in Practice -Systematic Review (1)

Study	Measurement period	Study Population	Intervention Component	Preventative Care Activity	Adjusted Odds Ratio (95% CI)	Comments
Stone 2002	End of intervention	Health professionals who utilize Adult Immunization and Cancer Screening Services for their clients	Provider reminders	Immunizations	3.80 (3.31–4.37)	The reference group is a usual care or control group.
				Mammography	1.63 (1.39–1.92)	
				Cervical Cytology	1.37 (1.25–1.51)	
				Colon Cancer Screening	1.46 (1.15–1.85)	
			Provider Feedback	Immunizations	1.23 (0.96–1.58)	
				Mammography	1.76 (1.44–2.15)	
				Cervical Cytology	1.10 (0.93–1.31)	
				Colon Cancer Screening	1.18 (0.98–1.43)	
			Provider Education	Immunizations	3.21 (2.24–4.61)	
				Mammography	1.99 (1.58–2.51)	
				Cervical Cytology	1.72 (1.39–2.13)	
				Colon Cancer Screening	1.38 (0.84–2.25)	

Appendix H: Outcomes Tables

Change in Practice (Continued)

Study	Measurement period	Study Population	Intervention Component	Preventative Care Activity	Adjusted Odds Ratio (95% CI)	Comments
Stone 2002 Continued	End of intervention	Health professionals who utilize Adult Immunization and Cancer Screening Services for their clients	Provider Financial Incentive	Immunizations	1.26 (0.83–1.90)	
			Organizational Change	Immunizations (29 studies)	16.0 (11.2–22.8)	
				Mammography (33 studies)	2.47 (1.97–3.10)	
				Cervical Cytology (27 studies)	3.03 (2.56–3.58)	
				Colon Cancer Screening (19 studies)	17.6 (12.3–25.2)	

Appendix H: Outcomes Tables

Change in Knowledge-Randomized Controlled trials (3)

Study	Measurement Period	Study Population	Groups	Baseline	Follow Up	Overall Effect	Measurement
Barwick 2009	Baseline End of intervention (11 months)	34 Child & youth mental health practitioners	I: Communities of Practice n=17	Mean Score: 12.1	Mean Score: 14.1	F= 2.37 p=0.14	CAFAS knowledge questionnaire (content knowledge): 20 true/false questions reduced to a total score. Total scores ranged from 0 to 20.
			C: Usual Practice n=17	10.4	10.8		
Di Noia 2003	Baseline Follow up (6 months)	188 school personnel, community providers, and policy makers	I: Pamphlet n=55	Mean Scores: 0.94	Mean Scores: 1.04	F =25.67 p<0.05	Individual-item measures with Likert-scaled response options to determine if respondents knew where to locate drug abuse prevention findings and materials. Lower scores are indicative of more favourable ratings.
			I: CD-ROM n=64	0.96	0.75		
			I: Internet n=69	0.73	0.63		
Forsetlund 2003	Baseline End of intervention (1.5 years)	148 public health physicians	I: Workshop, information service, discussion list, free access to databases n=73	Mean Scores SK:1.1 CK:1.3		Mean Difference SK: 0.4 t=4.3 95% CI (0.2-0.6) p=0.00 CK: 0.2 t=2.6 95% CI (0.0-0.3) p=0.01	Baseline scores included in analysis. Scores were summed and means for individual overall scores computed. Respondents graded self-perceived knowledge (SK) and knowledge about terms of importance to critical appraisal (CK) on scales ranging from 0 to 2 for CK and from 0 to 3 for SK. An additional question was added to concept knowledge, scored as either 0 or 1. Higher scores indicative of more favourable ratings.
			C: Access to free library services for one year n=75	SK:0.7 CK:1.1			

Appendix H: Outcomes Tables

Change in Practice-Randomized controlled trials (4)

Study	Measurement Period	Study Population	Groups	Baseline	Follow Up	Overall Effect	Comments
Barwick 2009	Baseline End of intervention (12 months)	34 Child & youth mental health practitioners	I: Communities of Practice n=17	Mean Scores Use: 4.88 Change: 3.00 Rating: NR	Mean Scores Use: 6.55 Change: 8.81 Rating: 152	Use: F=0.02 p=0.87 Change: F=0.20 p=0.65 Rating: NR	**Use**- 20-item questionnaire of self reported use of CAFAS implementation supports reduced to a total score. Responses were 'yes', 'no', or 'don't know/does not apply'. **Change**-10-question Likert scale of self-reported change reduced to a total practice change score. Items were rated as 'very much', 'somewhat', 'very little', or 'not at all'. **Rating**: Total number of times clinicians rated the CAFAS in practice.
			C: Usual Practice n=17	Use: 4.88 Change: 1.33 Rating: NR	Use: 4.22 Change: 1.80 Rating: 65		

Appendix H: Outcomes Tables

Change in Practice-Randomized controlled trials (4)

Study	Measurement Period	Study Population	Groups	Baseline	Follow Up	Overall Effect	Comments
Dobbins 2009	Baseline (2004) End of Intervention (2006)	108 public health departments in Canada	I: Tailored and targeted messaging n=36	Mean Scores GIDM 5.61 HPP 5.49	Mean Scores GIDM 5.75 HPP 7.89	GIDM $p < 0.45$ HPP $p < 0.01$	**GIDM**-Global Evidence-Informed Decision Making- Mean self report score on the extent to which research evidence was considered in a recent program planning decision in the previous 12 months. Responses ranged from: 1= not at all to 7= completely/ **HPP**-Public Health Policies and Programs Respondents asked whether the public health policies and programs were being implemented by their health department (yes/no). A 'yes' was coded as 01 and a 'no' was coded as a '02'. Total number was summed and compared across groups from baseline to post intervention.
			I: Services of a knowledge broker n=36	GIDM 5.45 HPP 6.53	GIDM 6.08 HPP 6.03		
			C:Access to health evidence.ca registry n=36	GIDM 5.43 HPP 6.50	GIDM 6.17 HPP 6.22		

Appendix H: Outcomes Tables

Change in Practice-Randomized controlled trials (4)

Study	Measurement Period	Study Population	Groups	Baseline	Follow Up	Overall Effect	Comments
Di Noia 2003	Baseline Follow up (6 months)	188 school personnel, community providers, and policy makers	I: Pamphlet n=55	Mean Score 1.56	Mean Score 1.60	NS	Frequency of searching for information Statistical test not reported. Lower scores are indicative of more favourable ratings. Internet was most effective intervention.
			I: CD-ROM n=64	1.53	1.48		
			I: Internet n=69	1.62	1.51		
Forsetlund 2003	Baseline End of intervention	148 public health physicians	I: Workshop, information service, discussion list, free access to databases n=73 C: Free access to library services n=75	Use of Research Percentage 0% 0%	Use of Research Percentage 0% 1.3%	NR	Statistical test not reported. Analysis of the contents of local health service reports for use of research. Respondents sent in relevant documents analyzed by researchers. Scores for reports were recoded and reported as 'used' or 'not used' research.

Appendix H: Outcomes Tables

Change in Practice-Time Series Analysis (1)

Study	Measurement Period	Study Population	Groups	Time (Month/ Year)	Intervention	Control	Overall Effect	Measurement
Hanbury 2009	Baseline (2004)	93 community mental health professionals	I: Educational session (didactic presentation, peer discussion, group work on real life vignettes) n=49 C: Usual Practice n=unstated	05/03 06/03 07/03 08/03 09/03 10/03 11/03 12/03 01/04 02/04 03/04 **04/04** 05/04 06/04 07/04 08/04 09/04 10/04 ***11/04*** ***12/04*** ***01/05*** ***02/05*** 03/05 04/05 05/05	10 23 13 27 42 35 15 13 24 17 37 55 46 17 57 62 63 65 83 63 85 91 62 72 72	58 75 65 78 72 62 65 37 51 60 74 72 86 70 81 85 76 82 77 71 67 83 74 69 69	Intervention: NR National Event: (t=3.28, P=0.0001)	Monthly percentage adherence National event was modeled for the control and intervention site

Note: National event occurred 04/04 highlighted in bold. Intervention was delivered 11/04 to 02/05 highlighted in bold italics.