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Developing a framework for transferring knowledge into action: a thematic analysis of the literature

Vicky Ward, Allan House, and Susan Hamer

Abstract

Objectives—Although there is widespread agreement about the importance of transferring knowledge into action, we still lack high quality information about what works, in which settings and with whom. Whilst there are a large number of models and theories for knowledge transfer interventions, they are untested meaning that their applicability and relevance is largely unknown. This paper describes the development of a conceptual framework of translating knowledge into action and discusses how it can be used for developing a useful model of the knowledge transfer process.

Methods—A narrative review of the knowledge transfer literature identified 28 different models which explained all or part of the knowledge transfer process. The models were subjected to a thematic analysis to identify individual components and the types of processes used when transferring knowledge into action. The results were used to build a conceptual framework of the process.

Results—Five common components of the knowledge transfer process were identified: problem identification and communication; knowledge/research development and selection; analysis of context; knowledge transfer activities or interventions; and knowledge/research utilization. We also identified three types of knowledge transfer processes: a linear process; a cyclical process; and a dynamic multidirectional process. From these results a conceptual framework of knowledge transfer was developed. The framework illustrates the five common components of the knowledge transfer process and shows that they are connected via a complex, multidirectional set of interactions. As such the framework allows for the individual components to occur simultaneously or in any given order and to occur more than once during the knowledge transfer process.

Conclusion—Our framework provides a foundation for gathering evidence from case studies of knowledge transfer interventions. We propose that future empirical work is designed to test and refine the relevant importance and applicability of each of the components in order to build more useful models of knowledge transfer which can serve as a practical checklist for planning or evaluating knowledge transfer activities.

Introduction

Failing to translate research knowledge into action in health care contributes to health inequities and wastes costly and time-consuming research¹⁻³. The gap between what is known and what is done leads not only to the under-use of effective treatments, but also to the incorrect use of treatments and the over-use of unhelpful or unproven treatments, all of which lead to negative outcomes for patients. The realisation that failing to use research findings in health care has a negative impact on patient care has led to an increased emphasis on transferring knowledge into action. This process is commonly referred to as ‘knowledge transfer’ or ‘knowledge translation’, and is broadly understood to encompass the exchange, synthesis and application of research results and other evidence between academic and practice settings².

There have been a number of high-profile reports which have stressed the importance of knowledge transfer, particularly within health care. For instance, the World Health Organization¹ has called for a closer working relationship between the producers and users of research to ensure that research is used to improve health whilst Lord Darzi's report on England's National Health Service⁴ has emphasized the importance of doing more to encourage the uptake of medical research and evidence-based technologies.

Although there is widespread agreement about the importance of transferring knowledge into action the research and practice landscapes are less well developed. The systematic use and evaluation of knowledge transfer methods such as targeted dissemination, involving users in the research process, developing networks between researchers and users and the use of knowledge brokers are rarely reported in the literature and a recent review identified only eighteen studies which described the implementation of a specific knowledge transfer mechanism⁵. As a result, the evidence for knowledge transfer interventions is sparse and largely based on anecdote and descriptions of the processes involved in knowledge transfer interventions are vague.

Instead of focusing on the evaluation of knowledge transfer interventions, literature to date has tended to focus on theories, models or frameworks of the knowledge transfer process. Recent reviews have identified as many as 63 different theories or models of knowledge transfer across fields as diverse as health care, social care and management^{5, 6}. Whilst clearly articulated models or frameworks could form the basis for describing knowledge transfer processes in more detail and evaluating interventions more robustly, the sheer quantity and diversity of the literature makes it difficult for researchers and managers to choose which model to use⁷. In addition, many of the models remain largely unrefined and untested meaning that their suitability as tools for designing and evaluating interventions is unknown. The exception to this is Graham et al's 'knowledge to action' framework which has been tested as a model for planning and evaluating knowledge transfer strategies⁷. However, the model was developed from a review of planned action theories and to date has not been refined or developed following its use in practice. Its adequacy as an explanation of the knowledge transfer process is also largely unknown.

Studies in other related areas such as research utilization and behaviour change have also failed to adequately explain the processes involved in transferring research and other evidence between academic and practice settings. Instead of focusing on broad explanations of the journey from knowledge to action, research has tended to assume that it is driven by a relatively narrow range of determinants. These include characteristics of the knowledge such as rigour and credibility, characteristics of the organisation such as size and innovativeness and characteristics of the intervention such as timing and intensity⁸. Many of these have been drawn from previous models or frameworks of knowledge transfer and diffusion, such as Rogers' theory of the diffusion of innovations⁹. However, these studies have shown that no single approach is effective in all circumstances, suggesting that the rate at which knowledge is translated into action cannot be directly attributed to any one factor.

One of the major difficulties with deterministic approaches to knowledge transfer is that they presume that both the knowledge itself and the contexts in which it is implemented are uniform and tend not to acknowledge the complexity of the process. Alternative views see the spread of knowledge as a social activity which involves the activities of many communities, is influenced and molded by the belief systems and analytical or creative instincts of potential users, and encompasses the reinvention, proliferation and reimplementation of ideas, the fluid engagement of multiple entrepreneurs and an expanding and contracting network of stakeholders who converge and diverge^{9, 10}.

In order to advance the theory and practice of translating knowledge into action, future research will need to address the issues outlined above. This includes moving away from narrow descriptions of knowledge transfer towards a broader sociological explanation of the process, testing the adequacy of alternative models of knowledge transfer, and refining and testing tools for designing and evaluating interventions.

We are currently conducting research which aims to meet these criteria. Our study is based on the realist approach to evaluation and synthesis¹¹ and involves articulating the key components which are presumed to be involved in the knowledge transfer process, testing these against evidence from case studies and producing a revised framework which can be used to plan and evaluate knowledge transfer interventions. This paper documents the first phase of our research. Our purpose is to describe the development of a conceptual framework which articulates the broad areas which seem crucial to the process of translating knowledge into action and to present it as a resource for future empirical work on knowledge transfer.

Methods

We began by carrying out an initial scoping review of the literature which identified several challenges. First, the process of translating knowledge into action is described using a number of different terms, many of which are used interchangeably. Knowledge transfer, knowledge translation and knowledge exchange are perhaps the most common terms², but research utilization, knowledge uptake, innovation spread, and 'linkage and exchange' are also widely used. Although many of these terms have subtly different meanings, they are nonetheless recognised as being concerned with the process of transferring knowledge into action², meaning that our review needed to be based on a broad range of search terms.

Second, 'knowledge' is conceptualised in a range of different ways within the literature. In many cases research results are seen as the totality of the knowledge to be transferred whilst in others this definition is expanded to include a range of evidence such as best practice guidance. These views of knowledge can especially be seen within the literature on the implementation of 'evidence-based medicine'¹². At the other end of the scale, knowledge is understood to be the experiences or received wisdom of individuals. The capture and transfer of such tacit forms of knowledge are particularly recognised within the innovation literature¹⁰. Our review therefore needed to encompass models and techniques for transferring research, evidence and tacit knowledge into action.

Finally, the literature on knowledge transfer is spread across fields as diverse as health care, sociology, political studies and education. Although the majority of literature reviews are able to successfully limit the range and scope of databases to be searched, our review needed to identify literature from a broad range of disciplines which necessitated searching a wider range of sources. In order to manage the challenges outlined above, we decided to adopt a narrative approach¹³ which involved summarizing, thematically analyzing and synthesizing evidence from the literature. Our aim was to capture all of the main messages within the knowledge transfer field, thereby identifying the areas which seem crucial to the knowledge transfer process. Our approach was divided into four stages: searching for abstracts; selecting articles for detailed reading; identifying recurring themes from selected articles; and aggregating themes to produce a conceptual framework of the knowledge transfer process.

For the purpose of our review we defined knowledge transfer as the process of transferring knowledge into action where knowledge included tacit knowledge, new ideas or innovations as well as research and other evidence.

Search strategy

We developed our search strategy by reviewing 65 papers which focused on the process or practice of knowledge transfer. These papers were either recommended by experts in the field or found through a process of snowballing (i.e. references of references). They included literature reviews, opinion pieces, empirical studies and 'grey literature' such as evaluation reports. The papers used 58 different terms to describe the concept of knowledge transfer or to describe particular knowledge transfer mechanisms. We translated these terms into 37 different commands which were then used to search 14 different databases including Cambridge Scientific Abstracts, Web of Science, Medline and evidence-based medicine reviews. We restricted the search to the fields of health, medicine, sociology and education. The initial search, carried out in October 2007, generated 9522 results, which were then refined through a process of second-order searching. This involved excluding papers in the fields of agriculture, engineering, business, computing and the environment, excluding papers which focused on technology transfer, intellectual property and service user involvement, whilst including papers which included 14 of the most common search terms in the title or abstract. This process resulted in the identification of 488 papers which focused on transferring knowledge into action.

Selection of articles

We selected articles for detailed reading through a process of purposive sampling, beginning with reviews of the literature on knowledge transfer. As our review aimed to produce a framework containing the broad areas which seem crucial to the knowledge transfer process, we also selected articles which developed, evaluated or utilized models or theories explaining all or part of the process of transferring knowledge into action. Finally, we selected articles which specifically focused on research utilization strategies, as these appeared to be a particularly important aspect of the knowledge transfer process, but often treated separately. Selection in all three cases was carried out until saturation was reached as much of the literature duplicates the main messages. This process led to the selection of 162 papers. Alongside this process, we continued to search the databases for new articles and to review reference lists in the selected papers until March 2008.

Thematic analysis

A total of 193 papers and reports were read in detail. For each we used a standardized framework to summarize the objective or main focus of the paper (e.g. framework development, review of knowledge transfer theories, evaluation of knowledge transfer methods), the main results or points made in the paper (e.g. elements of the knowledge transfer process, success of knowledge transfer strategies) and made comments on the value, importance or originality of the paper.

Through the detailed reading of these papers, we identified 28 different models which explained all or part of the knowledge transfer process. As the aim of these models was to capture the main components of the knowledge transfer process, we therefore used them as a basis for identifying recurrent themes. This involved subjecting the models to a thematic analysis to identify the individual components of the knowledge transfer process and the type of processes used when transferring knowledge into action. We then used the results of this thematic analysis to build a conceptual framework of the knowledge transfer process. The 28 models are listed in Table 1.

Results & Discussion

Knowledge transfer components

Thematic analysis of the 28 models identified five common components of the knowledge transfer process:

1. problem identification and communication;
2. knowledge/research development and selection;
3. analysis of context;
4. knowledge transfer activities or interventions; and
5. knowledge/research utilization.

Nine of the models included the identification and communication of a particular problem or issue. This was expressed in a variety of ways including the communication of needs^{14, 15}, building a case for action¹⁶ and as part of a wider problem solving cycle^{17, 18}. Each model deals with the identification of a problem or issue slightly differently. Whilst Anderson et al.'s model of research transfer¹⁴ shows problems being identified through a system of communication and interaction between decision makers and researchers, Havelock et al.¹⁸ describe a process whereby needs are identified by the user and then communicated to the researcher through established communication channels. However, all of the models which accounted for the identification of a problem or issue showed this emerging from the world of the user/clinician rather than being imposed or assumed by researchers.

Twenty of the models included some consideration of the knowledge or research to be transferred. The majority focused on particular actions associated with this stage of the knowledge transfer process. These included producing¹⁵, synthesizing² and adapting¹⁹ research knowledge. Other models, particularly those which dealt with the way in which innovations spread, focused on the attributes of knowledge. These included the relative advantage and complexity of the knowledge and its compatibility with pre-existing beliefs, systems or organizational norms⁹. Whilst authors such as Lavis et al.¹⁹ assume that aligning research more closely with user needs will lead to its successful transfer, others suggest that it is the inherent characteristics of the knowledge itself which lead to its successful transfer into practice²⁰.

Twenty models also took account of the analysis of context as part of the knowledge transfer process and in many cases this was the central feature of the process. Some models exclusively focused on specific actions associated with the analysis of context. For example, the models developed by Graham et al.² and Tugwell et al.²¹ focus on assessing and prioritizing the barriers to successful knowledge transfer. Other models focused more closely on the organizational, individual, environmental or structural factors which determine the context of transferring knowledge into action. For Huberman, these factors included the motivations and background of user groups and the presence of systems for linkage between users and researchers¹⁵, whilst Greenhalgh et al.'s model includes factors such as the organization's readiness for change²².

Not surprisingly, the most common component of the knowledge transfer process was the knowledge transfer activity or intervention itself. Some consideration of the type of intervention and the range of actions associated with it was included in 26 of the models. The models identified two main types of activities or interventions: distribution-type interventions which involved targeted dissemination²³, marketing²² and the use of local champions²⁴; and linkage-type interventions which involved interaction²⁵, dialogue and the use of intermediaries²⁶. Whilst Walter et al.'s model²⁷ includes both types of interventions,

most models only focus on distribution or linkage interventions and we found that there was a slight preference for linkage-type interventions (seven models included linkage interventions, four included distribution). In addition to focusing on the type of intervention to be used, many of the models also focused on actions associated with the use of knowledge transfer interventions. These actions often formed a cycle of activity, focused around the intervention, including the selection, tailoring, implementation and evaluation of interventions²⁸.

The final component of the knowledge transfer process is the actual use of knowledge. This is often overlooked in discussions about the process of transferring knowledge into action as it is seen as the goal of the process. Whilst seven models treat utilization in this way, 12 specify this component in more depth by focusing either on the different types of knowledge use (conceptual use, direct use, political use or procedural use^{24, 25}) or the various actions associated with knowledge utilization. These included monitoring and sustaining knowledge use and assessing its impact².

Knowledge transfer processes

In addition to identifying five individual components of the knowledge transfer process, our thematic analysis of the literature also revealed that the components could be arranged into one of three knowledge transfer processes. These were identified as:

1. a linear process;
2. a cyclical process; or
3. a dynamic multidirectional process.

The linear models of knowledge transfer all involved a stepwise progression between individual components with an identifiable start and end-point. This is the case with Davis et al's model²⁹ which shows a progression from raising awareness of evidence through to ensuring practical adherence to the evidence. This can be seen in Table 2.

The interaction between individual components of linear models can be unidirectional, as suggested in Table 2, or bidirectional. The latter allows for a certain degree of reinvention during the knowledge transfer process whilst still retaining a focus on the end-point. This is the case with Grol and Grimshaw's model¹², where continuous evaluation during the implementation phase of the knowledge transfer process is used to determine whether earlier phases such as the analysis of barriers need to be revisited and modified.

Models which show knowledge transfer as a cyclical process were found to be the most frequent. Individual components of the models are still linked via a stepwise progression, but the process is depicted as interactive and ongoing. This is the case with Graham et al's knowledge to action model² where aspects of the research, context, knowledge transfer intervention and evaluation lead to the identification of new problems. This can be seen in Figure 1.

The remaining models for transferring knowledge into action show knowledge transfer as a dynamic, interactive and multidirectional process which involves many different actors and activities. Individual components of the models are not linked in a linear fashion, but can occur simultaneously or in different sequences. This is represented well by Greenhalgh et al's model for the diffusion of innovations²² which can be seen in Figure 2.

Dynamic models of the knowledge transfer process tend to emphasise the personal nature of the process by focusing on the degree of linkage and exchange between the producers and users of research. The role, attitudes and relationships between individuals are often

expressly included as components in this type of model, as is the case with Jacobson et al's framework for knowledge translation³⁰ which includes the issue, the research, the researcher-user relationship and dissemination strategies.

Developing a knowledge transfer framework

Having identified five common components of the knowledge transfer process, we built these into one conceptual framework, shown in Figure 3. As it stands, our framework is both analytically and empirically 'empty'. In other words, it does not contain detail about the relative importance or applicability of each of the five components. It also contains no details about the practical actions which could be associated with each of the components. However, it does provide a foundation for gathering evidence from case studies which will enable us to confirm, refute or revise each of the components. For example, case study observations will allow us to show whether identifying a problem and formulating it into a clear question forms part of the knowledge transfer process and how this might work in practice.

Although our framework lacks detail about each of the five components, we have constructed it to reflect what we currently believe about the type of process involved in transferring knowledge into action. Similarly to other authors²³, we do not believe that knowledge transfer is a linear process, but rather that it is an interactive, multidirectional process. Our framework therefore allows for situations where, for instance, the unsuccessful utilization of knowledge transfer interventions might lead to a new consideration of the underlying issue or problem or where an assessment of local context might lead to the selection of the most appropriate knowledge or research. It also allows for individual components to occur simultaneously or in any given order and to occur more than once during the process.

Conclusion

The large number of models or frameworks for the process of transferring knowledge into action can cause confusion for researchers who are seeking to understand knowledge transfer processes or to plan knowledge transfer activities. However, we have shown that these models can be used as a basis for identifying five common components which are presumed to form part of an interactive and multidirectional knowledge transfer process: problem identification; knowledge development and selection; analysis of context; knowledge transfer interventions; and knowledge utilization.

Although we have been able to include these components in a conceptual framework of the knowledge transfer process, their relative importance and applicability is currently unknown. We therefore propose that future empirical work should be designed to test and refine each of the components in order to build more useful models of the knowledge transfer process. To this end, our current research is using the conceptual framework as a basis for gathering evidence from case studies with the aim of building a model which can serve as a practical basis for planning or evaluating knowledge transfer activities.

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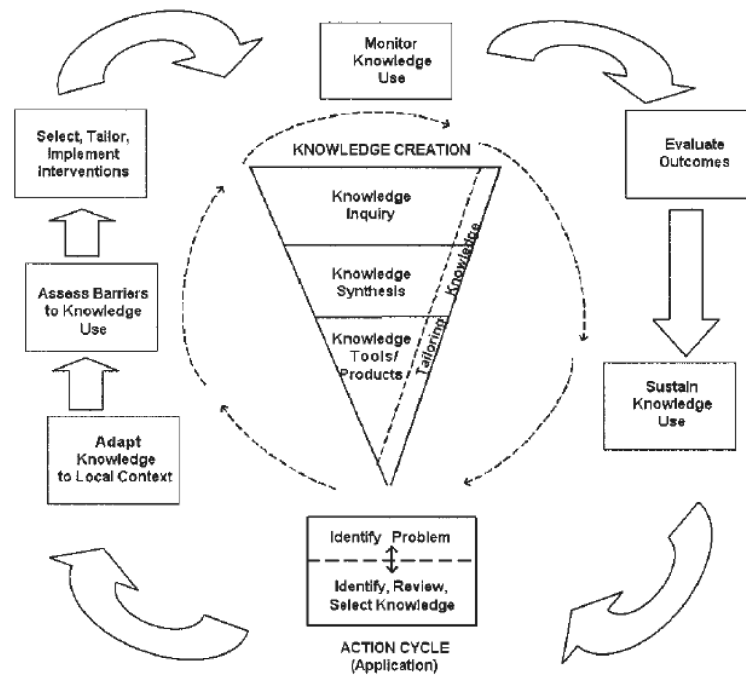


Figure 1. Reproduced with permission from Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: Time for a map? *Journal of Continuing Education in the Health Professions*. 2006;26(1):13-24

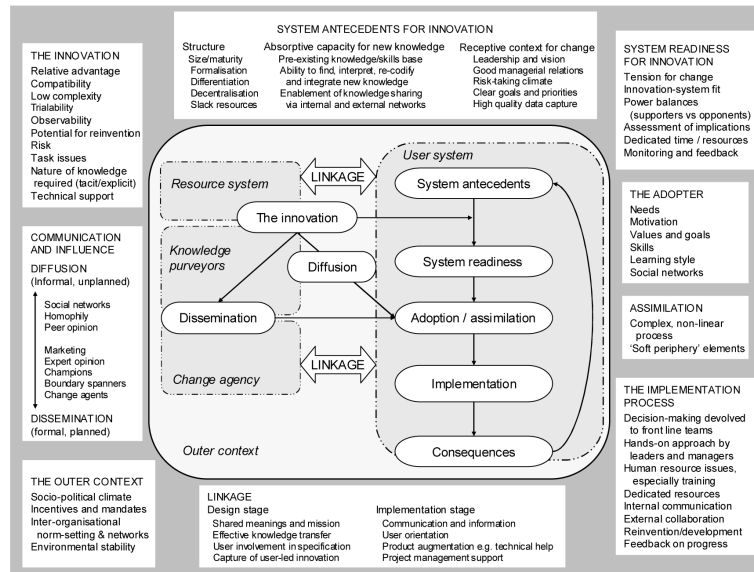


Figure 2. Reproduced with permission from Greenhalgh T, et al. Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly*. 2004;82(4): 581-629.

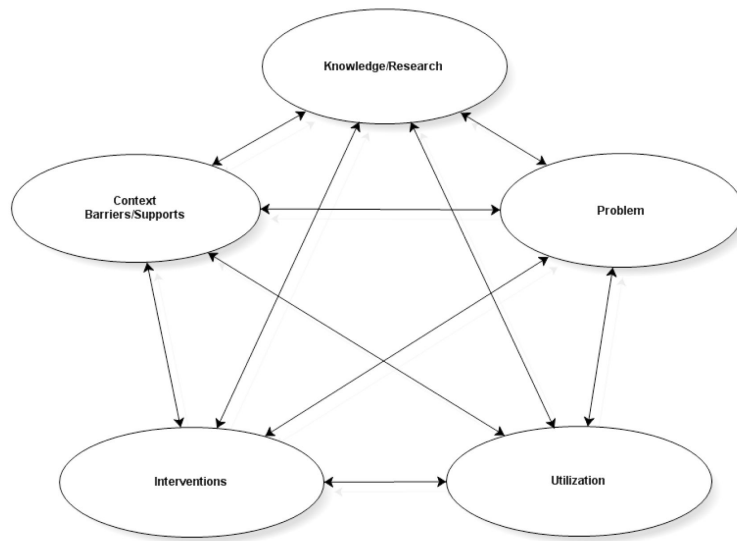


Figure 3.
Conceptual framework of the knowledge transfer process

Table 1

Details of the 28 models explaining the process of transferring knowledge into action

	Source	Details
1	Aita, M., M. C. Richer, et al. Illuminating the processes of knowledge transfer in nursing. <i>Worldviews on Evidence-Based Nursing</i> . 2007; 4(3): 146-155.	Two models are presented: the problem solving model and the linkage model
2	Anderson, M., et al., The use of research in local health service agencies. <i>Social Science & Medicine</i> . 1999; 49(8): 1007-1019.	A model for research transfer development
3	Berwick, D. M. Disseminating Innovations in Health Care. <i>Journal of the American Medical Association</i> . 2003; 289(15): 1969-1975.	Recommendations for health care executives who want to accelerate the rate of diffusion of innovations within their organizations
4	Chunharas, S. An interactive integrative approach to translating knowledge and building a "learning organization" in health services management. <i>Bulletin of the World Health Organization</i> , 2006; 84(8): 652-7.	Highlights various dimensions that determine the complexity of knowledge translation
5	Davis, D., M. Evans, et al. The case for knowledge translation: shortening the journey from evidence to effect. <i>British Medical Journal</i> . 2003; 327(7405): 33-35.	Pathman-PRECEED model for knowledge translation
6	Dobbins, M., D. Ciliska, et al. A framework for the dissemination and utilization of research for health-care policy and practice. <i>Online Journal of Knowledge Synthesis for Nursing</i> . 2002; 9(7).	A framework for research dissemination and utilization
7	Dobrow, M. J., V. Goel, et al. The impact of context on evidence utilization: A framework for expert groups developing health policy recommendations. <i>Social Science & Medicine</i> . 2006; 63(7): 1811-1824.	A conceptual framework for the consideration of evidence and context in the development of health policy recommendations.
8	Elliott, H. and Popay, J. How are policy makers using evidence? Models of research utilisation and local NHS policy making. <i>Journal of Epidemiology and Community Health</i> . 2000; 54(6): 461-468.	Three alternative models for research utilisation: problem solving model; interactive model; dialogical model
9	Graham, I. D., J. Logan, et al. Lost in knowledge translation: Time for a map? <i>Journal of Continuing Education in the Health Professions</i> . 2006; 26(1): 13-24.	Knowledge to action framework
10	Greenhalgh, T. and et al. Diffusion of innovations in service organizations: systematic review and recommendations. <i>Milbank Quarterly</i> . 2004; 82(4): 581-629.	A conceptual model for considering the determinants of diffusion, dissemination and implementation
11	Grol, R. and J. Grimshaw Evidence based implementation of evidence based medicine. <i>Joint Commission Journal on Quality Improvement</i> . 1999; 25(10): 503-513.	A framework for changing implementation behaviour
12	Havelock, R. G. et al. Planning for Innovation: A Comparative Study of the Literature on the Dissemination and Utilization of Scientific Knowledge. 1969	A framework based on the factors related to successful dissemination and utilization
13	Huberman, M., Research utilization: the state of the art. <i>Knowledge and policy</i> . 1994; 7(4): 13-33	A theory to practice model based on the relationship between diffuser and user
14	Jacobson, N., D. Butterill, et al. Development of a framework for knowledge translation: understanding user context. <i>Journal of Health Services Research and Policy</i> . 2003; 8(2): 94-99.	A framework for increasing familiarity between researchers and users
15	Kitson, A., J. Rycroft Malone, et al. Evaluating the successful implementation of evidence into practice using the PARIHS framework: theoretical and practical challenges. <i>Implementation Science</i> . 2008; 3(1).	A framework for promoting action on research implementation in health services (PARIHS)
16	Kramer, D. M. and Cole, D. C. Sustained, Intensive Engagement to Promote Health and Safety Knowledge Transfer to and Utilization by Workplaces. <i>Science Communication</i> . 2003; 25(1): 56-82.	A conceptual framework for research knowledge transfer and utilization
17	Kramer, D. M. and Wells, R. P. Achieving Buy-In: Building Networks to Facilitate Knowledge Transfer. <i>Science Communication</i> . 2005; 26(4): 428-444.	A conceptual framework for building interorganisational networks
18	Lavis, J. N. Research, public policymaking, and knowledge- translation processes: Canadian efforts to build bridges. <i>Journal of Continuing Education in the Health Professions</i> . 2006; 26(1): 37-45.	Identification of five knowledge transfer processes
19	Lavis, J. N., Robertson, D., et al. How Can Research Organizations More Effectively Transfer Research Knowledge to Decision Makers? <i>The Milbank Quarterly</i> . 2003; 81: 221	A framework for knowledge transfer
20	Lester, J. P. The utilization of policy analysis by state agency officials. <i>Science Communication</i> . 1993; 14(3): 267-290.	A conceptual model of knowledge utilization

	Source	Details
21	Logan, J & Graham, I, Toward a comprehensive interdisciplinary model of health care research use. <i>Science Communication</i> . 1998; 20(2): 227-246	The Ottawa model of healthcare research use)
22	Nieva, V., R. Murphy, et al. From Science to Service: A Framework for the Transfer of Patient Safety Research into Practice. <i>Advances in Patient Safety: From research to implementation</i> . Volume 2. 2005	A conceptual framework to help maximize and accelerate the transfer of research results
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25	Rogers, E.M <i>Diffusion of Innovations</i> , New York: Free Press, 2003	A theoretical model of the diffusion of innovations
26	Swinburn, B., T. Gill, et al. Obesity prevention: a proposed framework for translating evidence into action. <i>Obesity Reviews</i> . 2005; 6(1): 23-33.	A practical framework for translating evidence into action
27	Tugwell, P., V. Robinson, et al. Systematic reviews and knowledge translation. <i>Bulletin of the World Health Organization</i> . 2006; 84(8): 643-651.	A cascade for equity-oriented knowledge translation
28	Walter, I., S. Nutley, et al. What works to promote evidence-based practice? A cross-sector review. <i>Evidence & Policy</i> . 2005; 1: 335-364.	Identifies five key mechanisms for promoting the use of research in practice

Table 2

Reproduced with permission from Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, et al. The case for knowledge translation: shortening the journey from evidence to effect. *British Medical Journal*. 2003;327(7405):33-5.

Pathman-PRECEED model for knowledge translation

Perspective of target (policy maker, consumer or clinician)

Intervention	Awareness	Agreement	Adoption	Adherence
Predisposing	Distribution of printed information; journals; media campaigns; lectures, rounds; academic detailing			
Enabling		Opinion leaders; small group sessions for clinicians	Small group sessions for clinicians; patient education methods; clinical flowcharts or algorithms; academic detailing	
Reinforcing			Small group sessions for audit and feedback	Reminders (professional and patient), multiple interventions