Some Theoretical Underpinnings of Knowledge Translation

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Abstract

A careful analysis of the definition of knowledge translation highlights the importance of the judicious translation of research into practice and policy. There is, however, a considerable gap between research and practice. Closing the research-to-practice gap involves changing clinical practice, a complex and challenging endeavor. There is increasing recognition that efforts to change practice should be guided by conceptual models or frameworks to better understand the process of change. The authors conducted a focused literature search, developed inclusion criteria to identify planned action theories, and then extracted data from each theory to determine the origins, examine the meaning, judge the logical consistency, and define the degree of generalizability, parsimony, and testability. An analysis was conducted of the concepts found in each theory, and a set of action categories was developed that form the phases of planned action. Thirty-one planned action theories were identified that formed the basis of the analyses. An Access database was created, as well as a KT Theories User’s Guide that synthesizes all the planned change models and theories, identifies common elements of each, and provides information on their use. There are many planned change models and frameworks with many common elements and action categories. Whenever any planned change model is used, change agents should consider documenting their experiences with the model so as to advance understanding of how useful the model is and to provide information to others who are attempting a similar project.

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Before describing our investigation into the theoretical underpinnings of knowledge translation (KT), it is important to define what we mean by the term “knowledge translation.” This term has historically been used to describe a variety of activities, including applied health research, dissemination, linkage and exchange, and implementation research, among others. At the Canadian Institutes for Health Research, KT is defined 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 healthcare system.” KT occurs within a complex system of interactions among researchers and users. Given that the purpose of KT is ultimately to improve the health care system and the health of individuals, monitoring and evaluation of KT outcomes are implicit aspects of the process. By specifying the importance of synthesis and of the ethically sound application of knowledge, the definition also implies that some thought should be given to what knowledge should be translated (and to which audience), keeping in mind how the knowledge could be used. An important implication of this is that while we encourage researchers to translate the results of their studies, they, at the same time, need to be thoughtful about their message and who the appropriate audience is for this message.

What does this mean in practice? The primary implication is the need to ensure that research findings are based on the best available science and that there is sufficient evidence to confirm that the findings should be taken up. Promoting the use of research findings prematurely can risk causing more harm than benefit. Knowledge synthesis is one important way to ensure that the knowledge to be transferred is both valid and reliable. A further implication is that, even in cases where there is strong evidence of benefit, the strategies used to
implement the findings should be ethical. For example, in our society, the use of unduly coercive strategies to bring about behavior change may be effective, but they are unlikely to be considered acceptable. There are also opportunity costs associated with KT that need to be taken into account, and decisions regarding the trade-offs of cost versus benefit are ethical decisions that may vary from setting to setting. While the process of engaging in KT is important, we must be careful to avoid the “KT imperative” (to disseminate and implement all research findings at any cost) and, instead, ensure the judicious translation of research into practice and policy.

Why is KT important? Considerable resources are devoted to clinical and health services research and the production of new knowledge that could contribute to effective and efficient patient care. However, new research evidence will not change population outcomes unless health care systems, health care organizations, and health care professionals apply it in practice and in policy. Unfortunately, one of the most consistent findings in health services research is that the transfer of research findings into practice is unpredictable and can be a slow and hazardous process. Research has demonstrated repeatedly that there are many barriers to implementing research knowledge into practice. Whenever the transfer of knowledge to practice is inappropriately long, people are denied treatments of proven benefit and policy makers are left uninformed about results that could impact their decision-making. This lack of transfer has been termed the “knowledge transfer gap” and is considered by many to be one of the important challenges facing modern medicine.

There is clear evidence within the emergency medicine literature of this gap and that the uptake of research evidence within this field is inconsistent, even when implementation is attempted. Steill illustrated this point with the Ottawa Ankle Rules, a set of clinical decision rules summarized on a poster or laminated pocket card that were developed to aid emergency physicians in deciding when to use radiography for patients with injuries to the ankle without risk of missing clinically important fractures. While they have been widely disseminated, and a 2001 survey indicated that more than 90% of Canadian emergency physicians reported being aware of and familiar with the rules, a more recent survey reported that only 31% could correctly remember all of the components of the rules and only 42% based their decision-making primarily on the rules, even though 89.6% reported using the Ottawa Ankle Rules always or most of the time in appropriate circumstances. Lang et al. further cited two studies that suggest that some implementation strategies around the rules have failed to affect rates of radiograph ordering.

Clearly, changing clinical practice is complex and challenging. One important reason for the extent of the challenge is that evidence derived from clinical research is often only one component of clinical decision-making. Other important components include values (of both the patients and the practitioners) and the nature of the specific clinical characteristics of the individual patient and how these intercept with the clinical knowledge of the individual practitioner and the context in which he or she works. Studies investigating the factors known to influence the uptake of practice guidelines point to the importance of characteristics of the practice guideline, the potential adopters, and aspects of the practice setting or organizational context in which the change is to occur. Given the complexity of behavior change and the multiple factors that can influence it in positive and negative ways, there is growing recognition that implementation efforts could and should be guided by conceptual models or frameworks to understand the process of change and the critical elements that determine why a particular intervention might work in one setting and not another. A number of these implementation frameworks have been developed in health care as well as other settings. What can they tell us about how to move research into practice?

We undertook a critical analysis of conceptual models of implementation as a means of understanding the theoretical underpinnings of KT. The terms “conceptual models,” “conceptual frameworks,” and “conceptual systems” are often used synonymously and represent global ideas about a phenomenon. They are used to clarify, describe, and organize. Conceptual models have the basic purpose of focusing, ruling some things in as relevant, and ruling others out due to their lesser importance. The usefulness of conceptual models comes from the organization they provide for thinking, for observation, and for interpreting what is seen. They provide a systematic structure and a rationale for activities. In general, conceptual models are made up of concepts and propositions designed to focus the user on what is important to the issue.

There is often confusion or disagreement about the terms “conceptual model” and “theory.” A theory is an organized, heuristic, coherent, and systematic articulation of a set of statements related to significant questions that are communicated in a meaningful whole. It describes observations, summarizes current evidence, proposes explanations, and yields testable hypotheses. It is a symbolic depiction of aspects of reality that are discovered or invented for describing, explaining, predicting, and controlling a phenomenon. Differences between these two labels relate to the level of abstraction or the degree of evidence to support the development of the concepts and relationships proposed. We do not wish to enter this discussion here and so speak primarily of conceptual models or frameworks, because that is what most developers call their action plan for moving research findings into practice.

Conceptual models of implementation are essentially models or theories of change. Change models fall into two basic kinds: classical and planned. Classical models of change (sometimes referred to as descriptive or normative theories) are passive; they explain or describe how change occurs. An example of a classical theory of change is Rogers’ diffusion theory or Kuhn’s conceptualization of scientific revolutions. These theories describe change but were not specifically designed to be used to cause change. Other implementation models falling within this category would be the models or frameworks that have been proposed as ways of thinking about research KT, such as Lomas’ Coordinated Implementation Model or the multidimensional framework from Kitson et al. While classical models
of change can be quite informative and helpful for identifying the determinants of change, researchers, policy makers, and change agents tend to be more interested in planned change models that are specifically intended to be used to guide or cause change.\textsuperscript{19}

A planned (or prescriptive) change model is “a set of logically interrelated concepts that: explain, in a systematic way, the means by which planned change occurs; predict how various forces in an environment will react in specified change situations; and help planners or change agents control variables that increase or decrease the likelihood of the occurrence of change.”\textsuperscript{19} This type of theory helps people to cause (rather than observe) change in social groups varying in size and setting. Those who use planned change models may work with individuals, but their objective is to alter ways of doing things in social systems.

We undertook a focused literature search of the social sciences, education, management, and health sciences literature. The following electronic bibliographic databases were searched from 1980 to May 2005: sociological abstracts, SOCIOFILE, Applied Social Science Index and Abstracts (ASSIA), Bath Information and Data Services–Social Science Citations (BIDS), PsychINFO, International Public Affairs Information Service (PAIS), Education Resource Information Center (ERIC), MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Dissertation Abstracts. Search terms included combinations of knowledge implementation (and other related terms such as translation, transfer, mobilization, exchange, utilization, diffusion), innovation and implementation (plus the related terms above), translation and research or results, diffusion of innovation, theoretical models, concept formation, and nursing models. An information specialist designed and performed the searches. All searches were restricted to literature published in English or French, because these were the languages in which team members were fluent.

We also conducted an Internet search for models and theories using Google and sites of journal publishing companies (e.g., Blackwell Synergy). Search terms included combinations of the following terms: diffusion, dissemination, evidence, implementation, innovation, knowledge, practice, research, transfer, translation, and utilization. The journal Science Communication (formerly the journal Knowledge: Creation, Diffusion, Utilization) was hand searched. The references of retrieved documents were also scanned for other potentially relevant citations. At least two coinvestigators from two different disciplines initially screened all the results of the searches to identify potentially relevant hits. The electronic searches yielded 3,840 articles and 144 dissertation references. The Internet search identified 103 additional documents. A hand search of the references of relevant articles as well as key journals identified a further 142 potential papers of interest. Two individuals reviewed each potentially relevant abstract and decided whether the article was worth retrieving in full. In total, the literature search yielded 78 articles that were subject to data abstraction by two individuals. This involved abstracting the key or core concepts of each model or theory, determining the action phases, and deciding whether each fit the inclusion and exclusion criteria around being a planned action theory, model, or framework. This final step yielded 31 planned action theories (http://www.iceberg-grebeci.ohri.ca/resources/KT_Theories_Database.html), which were then subjected to a “theory analysis.”

A theory analysis is a useful process for determining the strengths and limitations of theories and to determine similarities and differences between them. The steps in a theory analysis\textsuperscript{26} are as follows.

1. Determine the origins of the theory. The “origins of a theory” refers to the original development of the theory. Who developed it? Where are they from (institution, discipline)? What prompted the originator to develop it? Is it inductive or deductive in form? Is there evidence to support or refute the development of the theory?
2. Examine the meaning of the theory. The meaning of a theory has to do with the concepts of the theory and how they relate to each other. What are the concepts or main ideas comprising the theory? How are the concepts defined? What is the relationship between or among concepts?
3. Analyze the logical consistency of the theory. The logical adequacy of a theory is the logical structure of the concepts and statements. Are there any logical fallacies in the structure of the theory?
4. Define the degree of generalizability and parsimony of the theory. Generalizability refers to the extent to which the theory may be extended to other situations. Parsimony refers to how simply and briefly a theory can be stated and still be complete in its explanation of the phenomenon in question.
5. Determine the testability of the theory. Testability is about whether or not the theory can be supported with empirical data. A theory that cannot generate hypotheses that can be subjected to empirical testing through research is not testable.
6. Determine the usefulness of the theory. Usefulness of the theory is about how practical and helpful the theory is to the discipline in providing a sense of understanding and/or predicting outcomes.

Of the 31 models/frameworks identified by our search, 15 were interdisciplinary, nine were from nursing, two from medicine, two from social work, and one each from human immunodeficiency virus/acquired immunodeficiency syndrome prevention, occupational therapy, family planning, health education, and health informatics literature. These models were published between 1983 and 2006. The intended foci for these models/frameworks were health care ($n = 26$), social work ($n = 2$), management ($n = 1$), and health care as well as non–health care ($n = 1$). In one model, the intended focus was not stated. Among the 31 documents, more than 16 terms were used to mean “knowledge to practice” (Table 1).

Nine documents were classified by their originators as frameworks and 18 as models; one was called a theory. In three cases, the originators did not label their work as theory, model, or framework. The reported purpose of the models and frameworks was to guide practice ($n = 27$), guide research ($n = 7$), and guide theory ($n = 5$). The intended audiences for the models and frameworks were practitioners ($n = 29$), administrators and managers
(n = 25), policy makers (n = 15), researchers (n = 12), patients (n = 7), and the public (n = 3). The sources for the models and frameworks were the literature (n = 21), research (n = 12), or experience of the originators (n = 11). In two cases, the sources for the model or framework were not stated. Most (19/31) of the theories or frameworks we identified have not yet been tested empirically. The model by Graham and Logan,29 for example, has demonstrated face and content validity through use in a number of unpublished studies and implementation projects, as has the model by Green and

Table 1
Terms Used to Mean “Knowledge to Practice”

<table>
<thead>
<tr>
<th>Terms Used to Mean “Knowledge to Practice”</th>
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<tbody>
<tr>
<td>Knowledge/research/innovation translation/transfer/translated evidence into practice/translate/scientific knowledge (N = 15)</td>
</tr>
<tr>
<td>Implementation (n = 12)</td>
</tr>
<tr>
<td>Evidence/research based (n = 8)</td>
</tr>
<tr>
<td>Knowledge/research/evidence utilization/uptake (n = 6)</td>
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<tr>
<td>Diffusion (n = 5)</td>
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<tr>
<td>Dissemination (n = 3)</td>
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<tr>
<td>Technology transfer (n = 3)</td>
</tr>
<tr>
<td>Knowledge exchange/mobilization (n = 2)</td>
</tr>
<tr>
<td>Organizational change (n = 2)</td>
</tr>
<tr>
<td>Assimilate (n = 1)</td>
</tr>
<tr>
<td>Behavior change (n = 1)</td>
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<tr>
<td>Integrate (n = 1)</td>
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<tr>
<td>Change management (n = 1)</td>
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<tr>
<td>Scaling up (n = 1)</td>
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<tr>
<td>Improvement (n = 1)</td>
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<tr>
<td>Adoption (n = 1)</td>
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Table 2
Action Categories Representing Steps of a Planned Action Model

<table>
<thead>
<tr>
<th>Action Categories Representing Steps of a Planned Action Model</th>
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</thead>
<tbody>
<tr>
<td>Identify a problem that needs addressing (n = 19)</td>
</tr>
<tr>
<td>Identify the need for change (n = 22)</td>
</tr>
<tr>
<td>Identify change agents (i.e., the appropriate actors to bring about the change) (n = 16)</td>
</tr>
<tr>
<td>Identify target audience (n = 13)</td>
</tr>
<tr>
<td>Assess barriers to using the knowledge (n = 19)</td>
</tr>
<tr>
<td>Review evidence and literature or develop or adapt innovation (n = 20)</td>
</tr>
<tr>
<td>Select and tailor interventions to promote the use of the knowledge (n = 27)</td>
</tr>
<tr>
<td>Link to appropriate individuals or groups who have vested interests in the project (n = 15)</td>
</tr>
<tr>
<td>Implement (n = 23)</td>
</tr>
<tr>
<td>Evaluate</td>
</tr>
<tr>
<td>Develop a plan to evaluate use of the knowledge (n = 15)</td>
</tr>
<tr>
<td>Pilot test (n = 10)</td>
</tr>
<tr>
<td>Evaluate process (n = 19)</td>
</tr>
<tr>
<td>Evaluate outcomes (n = 21)</td>
</tr>
<tr>
<td>Maintain change or sustain ongoing knowledge use (n = 11)</td>
</tr>
<tr>
<td>Disseminate results of the implementation process (n = 8)</td>
</tr>
</tbody>
</table>

n = the number of models or frameworks found that included these steps.

Figure 1. Knowledge-to-action process. Reprinted with permission from Graham et al.1
Kreuter, which was used to conduct systematic baseline diagnostic interviews with asthmatic patients treated in the emergency department or as outpatients.

The main outcome of our theory analysis of interest for this special issue of Academic Emergency Medicine was that we identified many commonalities in terms of the steps or phases of a planned action model. We list the action categories we created to represent these commonalities in Table 2. Furthermore, our analysis of the common steps included in the 31 theories and frameworks we examined indicated that when intending to implement change, one also needs to consider the impact of the following factors to fully understand what is involved in completing each of the steps: 1) nature of the evidence or knowledge (n = 24), 2) attributes of change or innovation (n = 21), 3) who the audience is (n = 28), 4) organizational context and culture in which the change is to take place (n = 28), 5) the organizational resources and support for the proposed change (n = 25), and 6) implementation-related factors (n = 28). Graham et al. derived a knowledge-to-action model from this analysis that includes a figure illustrating how the steps, actions, and factors interconnect in an iterative, organic fashion (Figure 1).

CONCLUSIONS

Implementation science is a relatively new and complex field of inquiry, and we searched the literature for theoretical guidance on best practice. We identified 31 planned change models and frameworks with many common elements and action categories. Most models have yet to be tested. Selection of a planned change model should be guided by a careful review of the model elements and how they relate to the action categories we derived as a result of our theory analysis. This means that the needs of the end-users should be carefully analyzed and incorporated into the implementation planning and evaluation process. This consideration requires as much, if not more, effort as determining the evidence base for change. A very practical use of implementation models is for planning and focusing implementation efforts and can provide all stakeholders with a common script or understanding of the action plan. More research is needed to confirm the advantages of using particular planned change models, including the set of common elements that we have described in this article. Whenever any planned change model is used, change agents should consider documenting their experiences with the model so as to advance understanding of how useful the model is and to provide information to others who are attempting a similar project.

Lang et al. challenged emergency medicine researchers to define the greatest research-to-practice gaps in their specialty to develop a research agenda in KT. The planned action steps we have identified as a result of our theory analysis can be used to form a theoretical underpinning to these KT efforts and at the very least can be used as talking points with the research end users to facilitate the implementation process and, ultimately, to facilitate the uptake of evidence-based practice and improved health outcomes.

References


APPENDIX A

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