Knowledge translation is the use of knowledge in health care decision making

Sharon E. Straus[a,*], Jacqueline M. Tetroe[b], Ian D. Graham[b]

[a]*Department of Medicine, St. Michael's Hospital, University of Toronto, 30 Bond Street, Shutter Wing 2-026, Toronto, Ontario M5B1W8, Canada*
[b]*Canadian Institutes of Health Research, Ottawa, Ontario K1A 0W9, Canada*

Abstract

Objective: To provide an overview of the science and practice of knowledge translation.

Study Design: Narrative review outlining what knowledge translation is and a framework for its use.

Results: Knowledge translation is defined as the use of knowledge in practice and decision making by the public, patients, health care professionals, managers, and policy makers. Failures to use research evidence to inform decision making are apparent across all these key decision maker groups. There are several proposed theories and frameworks for achieving knowledge translation. A conceptual framework developed by Graham et al., termed the knowledge-to-action cycle, provides an approach that builds on the commonalities found in an assessment of planned action theories.

Conclusions: Review of the evidence base for the science and practice of knowledge translation has identified several gaps including the need to develop valid strategies for assessing the determinants of knowledge use and for evaluating sustainability of knowledge translation interventions. © 2011 Elsevier Inc. All rights reserved.

Keywords: Knowledge translation; Implementation research; Clinical decision making; Evidence-based practice; Research utilization

1. Introduction

Globally, health care systems are experiencing the challenges of improving the quality of care and decreasing the risk of adverse events [1]. Health systems fail to optimally use evidence with resulting inefficiencies and reduced quantity and quality of life [2,3]. For example, McGlynn et al. [4] found that US adults received less than 55% of recommended care. Simply providing evidence from clinical research (such as through publication in journals or presentation at scientific meetings) is necessary but not sufficient for the provision of optimal care or decision making. The science and practice of knowledge translation is needed to answer these challenges. The growing emphasis on knowledge translation (and recognition that our knowledge about how to achieve knowledge translation is incomplete) has led to the establishment of an interdisciplinary field of research. Knowledge translation research and enhanced capacity in this field are essential if we are to reap the benefits of health research, improve health and quality of life, and enhance productivity. This article provides an overview of the topic and serves as an introduction to a series of articles on the science of knowledge translation that will appear in this journal.

2. What is knowledge translation?

There have been many terms used to describe the process of putting knowledge into action [5]. In the UK and Europe, the terms implementation science or research utilization are commonly seen in this context. In the United States, the terms dissemination and diffusion, research use, knowledge transfer, and uptake are often used. In Canada, the terms knowledge transfer and exchange and knowledge translation are commonly used. In their work to create a relevant search filter, McKibbon et al. have so far identified more than 90 terms for research use, which may contribute to confusion about what knowledge translation is and thus hinder its advance [6].

The Canadian Institutes of Health Research (CIHR) defines knowledge translation as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve health, provide more effective health services

* Corresponding author. Tel.: +416-603-5800; fax: +416-864-8605.

E-mail address: sharon.straus@utoronto.ca (S.E. Straus).

What is new?

Despite significant investment in and substantive productivity of biomedical, clinical, health services and population health research, consistent evidence shows that health systems fail to optimally use evidence with resulting inefficiencies and reduced quality of life. This has resulted in growing emphasis on knowledge translation and efforts to develop the science and practice of knowledge translation. In this article we describe a framework for knowledge translation that can be used by decision makers and researchers.

and products and strengthen the healthcare system'' [7]. This definition has been adapted by others including the US National Center for Dissemination of Disability Research and the World Health Organization. The common element in the different terms and definitions is the move beyond simple dissemination of knowledge to use of knowledge. Knowledge translation is about ensuring that decision makers at all levels of the health system (consumers, patients, practitioners, managers, and policy makers) are aware of, and can access and use research evidence to inform health-related decision making. Knowledge creation, distillation, and dissemination are not sufficient on their own to ensure evidence-informed decision making.

Some organizations may use the term knowledge translation synonymously with commercialization or technology transfer, but we believe this to be a narrow perspective of knowledge translation; other stakeholders (such as the public, informal caregivers, and clinicians) are involved in the process of using knowledge in decision making that are not captured in commercialization. Similarly, some confusion arises around continuing education vs. knowledge translation. Certainly, educational interventions (such as audit and feedback) are a strategy for knowledge implementation, but the audience for knowledge translation is larger than the health care professionals who are the targets for continuing medical education or continuing professional development. Knowledge translation strategies may vary according to the targeted user audience (e.g., researchers, clinicians, policy makers, and public) and the type of knowledge being translated (clinical, biomedical, and policy) [2]. Understanding of the different decision makers, their needs, and the context for decision making is essential before embarking on any knowledge translation strategy.

3. Why is knowledge translation important?

Failures to use research evidence to inform decision making are apparent across all key decision-maker groups,

including health care providers, patients, informal carers, managers, and policy makers, in developed and developing countries, and in care provided by all disciplines. Practice audits performed in a variety of settings have revealed that high-quality evidence is not being consistently applied in practice [8]. For example, although several randomized trials have shown that statins can decrease the risk of mortality and morbidity in poststroke patients, statins are considerably underprescribed [9]. In contrast, antibiotics are overprescribed in children with upper respiratory tract symptoms [10]. A synthesis of 14 studies showed that many patients (26–95%) were dissatisfied with information given [11]. Lavis et al. [12] studied eight health policy-making processes in Canada. Citable health services research was used in at least one stage of the policy-making process for only four policies, and only one of these four policies had citable research used in all stages of the policy-making process. Similarly, evidence from systematic reviews was not frequently used by World Health Organization policy makers [13].

Increasing recognition of these issues has led to attempts to effect behavior, practice, or policy change. Changing behavior is a complex process requiring evaluation of the entire health system, including systematic barriers to change (such as lack of integrated health information systems), and targeting of all those involved in decision making including clinicians, policy makers, and patients [2]. Efforts must be made to close the knowledge-to-practice gaps by effective knowledge translation interventions and thereby improve health outcomes. These initiatives must include all aspects of care, including access to and implementation of valid evidence and organizational and systems issues.

4. What are the determinants of successful knowledge translation?

Multiple factors determine the use of research by different stakeholder groups [14–18]. A common challenge that all decision makers face relates to the lack of knowledge management skills and infrastructure (the huge volume of research evidence currently produced, access to research evidence, time to read and skills to appraise, understand and apply research evidence) [14,17]. Better knowledge management is necessary, but this is insufficient to ensure effective knowledge translation, given other challenges that may operate at different levels including the health care system (e.g., financial disincentives), health care organization (e.g., lack of equipment or personnel), health care teams (e.g., local standards of care not aligned with recommended practice), individual health care professionals (e.g., knowledge, attitudes, and skills), and patients (e.g., low adherence to recommendations) [18]. In a review of barriers to physician implementation of guidelines, Cabana et al. [14] identified more than 250 barriers to adherence,

including lack of awareness, lack of agreement with the guidelines, and presence of external barriers to follow the recommendations. Frequently, multiple challenges operating at different levels of the healthcare system are present.

5. What is knowledge translation research?

The science of knowledge translation research is still in its infancy, and there are many gaps in the evidence base. Knowledge translation research includes work to explore measurement of gaps in decision making; improve knowledge synthesis and distillation (such as determinants of when systematic reviews and guidelines should be updated or how to enhance implementability of guidelines); enhance diagnosis and measurement of determinants of knowledge uptake; and determine effectiveness and sustainability of different knowledge translation approaches. In the development of a national research strategy to enhance knowledge translation capacity, we identified four core competencies for knowledge translation researchers, including understanding of the models of knowledge translation and knowledge translation research; capacity to conduct systematic reviews to address knowledge translation questions (such as realist reviews); capacity in qualitative methods to examine factors that influence use of evidence (such as document analysis); and capacity to evaluate the impact, effectiveness, and sustainability of knowledge translation strategies (including cost effectiveness) in different settings.

6. The knowledge-to-action framework: a model for the practice of knowledge translation

There are several proposed theories and frameworks for achieving knowledge translation that can be confusing for those responsible for it [19–23]. A conceptual framework developed by Graham et al., termed the knowledge-to-action cycle, provides an approach that builds on the commonalities found in an assessment of more than 30 planned action theories. It has been adopted by the CIHR as the accepted model for promoting the application of research and a framework for the process of knowledge translation.

In this model, the knowledge-to-action process is an iterative, dynamic, and complex process, concerning knowledge creation and knowledge application (action cycle) with the boundaries between the creation and action components being fluid. Fig. 1 illustrates the knowledge creation funnel and the major action steps comprising the knowledge-to-action model [5]. When using this process, it is essential that the end users of the knowledge are included in the entire process to ensure that the knowledge and its subsequent implementation are relevant to their needs.

6.1. Knowledge creation

Knowledge creation, or the production of knowledge, is composed of three phases: knowledge inquiry, knowledge
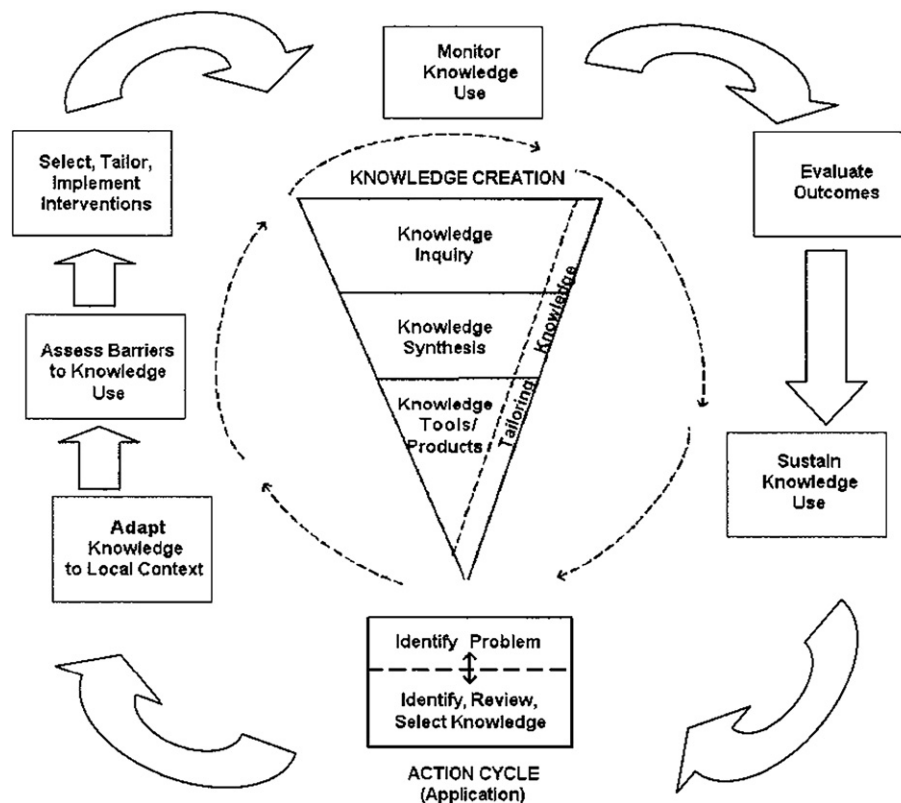

Fig. 1. The knowledge-to-action framework.

synthesis, and creation of knowledge tools [5]. As knowledge is filtered through each stage in the knowledge creation process, the resulting knowledge becomes more refined and potentially more useful to end users. For example, the synthesis stage brings together the disparate research findings that may exist globally on a topic and attempts to identify common patterns. At the tools development stage, the best quality knowledge and research is further synthesized and distilled into decision-making tools such as practice guidelines or patient decision aids.

6.2. The action cycle

The seven action phases can occur sequentially or simultaneously and the knowledge phases can influence the action phases at any point in the cycle. The action parts of the cycle are based on planned action theories that focus on deliberately engineering change in health care systems and groups [19,20]. Included are the processes needed to implement knowledge in health care settings specifically identification of the problem; identifying, reviewing, and selecting the knowledge to implement; adapting or customizing the knowledge to the local context; assessing the determinants of knowledge use; selecting, tailoring, implementing, and monitoring knowledge translation interventions and knowledge uptake; evaluating outcomes or impact of using the knowledge; and determining strategies for ensuring sustained knowledge use. Integral to the framework is the need to consider the various stakeholders who are the end users of the knowledge that is being implemented.

To illustrate this cycle, consider a local group of patient advocates, public health, home care, and internal medicine clinicians, which identified that many people in their region who were admitted to a local hospital with falls and fractures were not subsequently assessed for osteoporosis or falls risk [24]. Evidence from systematic reviews suggests that osteoporosis therapy (such as bisphosphonates) can decrease risk of fractures [25]. Evidence around fall prevention is more controversial [26], but the group was interested in tackling this problem. They completed a local audit and found that less than 40% of patients aged 65 and older who were admitted to hospital with fractures were subsequently assessed for osteoporosis. Considering how to adapt the evidence to their context, the group created tools for patients to implement the evidence (recommending weight-bearing exercise, use of calcium and vitamin D) because many did not have a primary care physician or may not discuss this issue with their physician. Barriers to implementation included the lack of an integrated health record to identify patients at risk and the vast geographic distance across the region. The group developed a multicomponent, nurse-led strategy that incorporated patient education, self-management, medication review, and home assessment for falls risk. Because the group did not know if their knowledge translation strategy was effective, they implemented a randomized trial of the intervention. The outcomes of interest included appropriate use of osteoporosis medications and falls at 6 and 12 months, quality of life, patient satisfaction, and fractures. Another outcome was the strength of collaborations this group developed, and this group grew to include representatives from the provincial government, pharmaceutical companies, and insurance companies. This example highlights the collaborations necessary for the practice of knowledge translation and the need to address questions that the stakeholders are interested in tackling.

7. Conclusions

We must be careful to avoid the "knowledge translation imperative" that all knowledge must be translated into action. Instead, we need to ensure that there is a mature and valid evidence base before we expend substantial resources on implementation of this evidence. And, the realities of health care systems are that we have insufficient resources to do everything, and thus, we must work with stakeholders (including patients/public, clinicians, and policy makers) to establish an explicit prioritization process for knowledge translation activities.

In this series of articles appearing in the *Journal of Clinical Epidemiology*, we attempt to provide an overview of the science of knowledge translation. We will describe the role of synthesis and knowledge tools in the knowledge creation process as well as present the key elements of the action cycle and outline strategies for successful knowledge translation targeted to relevant stakeholders, including the public, clinicians, and policy makers among others. Gaps in the literature will be identified; the science of knowledge translation is a relatively new field and we will attempt to reflect this, highlighting future areas of research and thus opportunities for knowledge translation research trainees.

References

[1] Kohn LT, Corrigan JM, Donaldson MS, editors. To err is human: building a safer health system. Washington, DC: National Academy Press; 1999.

[2] Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D, et al. The case for KT: shortening the journey from evidence to effect. BMJ 2003;327:33—5.

[3] Madon T, Hofman KJ, Kupfer L, Glass RI. Public health. Implementation science. Science 2007;318:1728—9.

[4] McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al. The quality of health care delivered to adults in the US. N Engl J Med 2003;348:2635—45.

[5] Graham ID, Logan J, Harrison MB, Straus SE, Tetroe J, Caswell W, et al. Lost in knowledge translation: time for a map? J Contin Educ Health Prof 2006;26:13—24.

[6] McKibbon KA, Lokker C, Wilczynski NL, Ciliska D, Dobbins M, Davis DA, et al. A descriptive study of the magnitude of the "Tower of Babel" problem for knowledge/information/research dissemination/diffusion/management/synthesis/exchange/implementation/mobilization/transfer/translation/transformation/uptake/utilization. Implementation Science (in press).

[7] Available at http://www.cihr-irsc.gc.ca/e/29418.html. Accessed February 2009.

[8] Majumdar SR, McAlister FA, Furberg CD. From knowledge to practice in chronic cardiovascular disease: a long and winding road. J Am Coll Cardiol 2004;43:1738−42.

[9] LaRosa JC, He J, Vupputuri S. Effect of statins on the risk of coronary disease: a meta-analysis of randomised controlled trials. JAMA 1999;282:2340−6.

[10] Arnold SR, Straus SE. Interventions to improve antibiotic prescribing practices in ambulatory care. Cochrane Database Syst Rev 2005;(4). CD003539.

[11] Kiesler DJ, Auerbach SM. Optimal matches of patient preferences for information, decision-making and interpersonal behavior: evidence, models and interventions. Patient Educ Couns 2006;61:319−41.

[12] Lavis JN, Ross SE, Hurley JE, Hohenadel JM, Stoddart GL, Woodward CA, et al. Examining the role of health services research in public policy making. Milbank Q 2002;80:125−54.

[13] Oxman A, Lavis JN, Fretheim A. Use of evidence in WHO recommendations. Lancet 2007;369:1883−9.

[14] Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. JAMA 1999;282:1458−65.

[15] Legare F, Ratte S, Gravel K, Graham ID. Barriers and facilitators to implementing shared decision making in clinical practice: update of a systematic review of health professionals' perceptions. Patient Educ Couns 2008;73:526−35.

[16] Legare F, O'Connor AM, Graham ID, Saucier D, Cote L, Blais J, et al. Primary health care professionals' views on barriers and facilitators to the implementation of the Ottawa decision support framework in practice. Patient Educ Couns 2006;63:380−90.

[17] Milner M, Estabrooks CA, Myrick F. Research utilisation and clinical nurse educators: a systematic review. J Eval Clin Pract 2006;12:639−55.

[18] Grimshaw JM, Eccles MP, Walker AE, Thomas RE. Changing physician's behaviour: what works and thoughts on getting more things to work. J Contin Educ Health Prof 2002;22:237−43.

[19] Graham ID, Harrison MB, Logan J and the KT Theories Research Group. A review of planned change (knowledge translation) models, frameworks and theories. Paper presented at: The JBI International Convention; November 2005; Adelaide, South Australia, Australia.

[20] Graham ID, Tetroe J, KT Theories Research Group. Some theoretical underpinnings of knowledge translation. Acad Emerg Med 2007;14: 936−41.

[21] Estabrooks CA, Thompson DS, Lovely JJ, Hofmeyer A. A guide to knowledge translation theory. J Contin Educ Health Prof 2006;26: 25−36.

[22] McDonald KM, Graham ID, Grimshaw J. Chapter 3. Toward a theoretic basis for quality improvement interventions. Volume 1—Series Overview and Methodology. Technical Review 9 2004 (Contract No. 290-02-0017 to the Stanford University-UCSF Evidence-based Practices Center). AHRQ Publication No. 04-0051-1. In: Shojania KG, McDonald KM, Wachter RM, Owens DK, editors. Closing the quality gap: a critical analysis of quality improvement strategies. Rockville, MD: Agency for Healthcare Research and Quality; 2004.

[23] Wensing M, Bosch M, Foy R, van der Weijden T, Eccles M, Grol R. Factors in theories on behaviour change to guide implementation and quality improvement in healthcare. Nijmegen, The Netherlands: Centres for Quality of Care Research (WOK); 2005.

[24] Ciaschini P, Straus SE, Dolovich L, Goeree R, Leung K, Woods C, et al. Community based randomised trial of an osteoporosis and falls assessment intervention. Trials 2008;9:62.

[25] Wells GA, Cranney A, Peterson J, Boucher M, Shea B, Welch V, et al. Alendronate for the primary and secondary prevention of osteoporotic fractures in postmenopausal women. Cochrane Database Syst Rev 2008;(1).

[26] Gates S, Fisher JD, Cooke ME, Carter YH, Lamb SE. Multifactorial assessment and targeted intervention for preventing falls and injuries among older people in community and emergency settings: systematic review and meta-analysis. BMJ 2008;336:130−3.