

Abstract

Knowledge translation has been defined as the synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health, resulting in a stronger health care system. This paper will describe the process of using an integrated knowledge translation approach to design a research protocol that will examine the effectiveness of a web-based patient educational intervention. It will begin with a description of integrative knowledge translation, followed by the presentation of a specific case example, in which integrative knowledge translation was used to develop a nursing intervention. The major elements of integrative knowledge translation that pertain to: need for a knowledge user, identification of the research approach, examination of study feasibility, and the presentation of outcomes will be addressed throughout this discussion.

Key Words: knowledge translation, patient education, web-based interventions, research approach, knowledge user

Introduction

Knowledge translation [KT] is quickly gaining popularity as a means of bridging the gap between those who produce research and those who use research. Using KT activities to aid in the adoption of evidence into practice can address current health care challenges such as increasing organizational practice standards, alleviating the risk for adverse events and meeting practitioner needs for evidence at the bedside. Other benefits from KT have been reported in the literature and include improvement for patient outcomes, service delivery and communication between all members of the health care system.^{1,2} Researchers are encouraged to adopt KT practices in addition to carrying out 'benchside' research, in order to facilitate decision making based on current, best quality evidence. Studies that do not incorporate KT activities are at risk of perpetuating inconsistent evidence use among health care providers, ineffective distribution of health care service and have the potential to suggest harmful treatments.³⁻⁷

In clinical areas, such as telemedicine, KT can also play a critical role in the provision of reliable and accessible information for patient designed internet based interventions. Within this area, the potential for misinformation is significant. Even though knowledge translation is a growing field, confusion exists around the intricacies of designing a program of research that contains a KT component. This confusion is due in part to the numerous definitions and terms that have been used to encapsulate KT.^{8,9} In particular, terms such as implementation science, knowledge mobilization, knowledge transfer and information exchange. A recent systematic review of the health sciences literature identified 100 terms that are used synonymously with knowledge

translation.⁸ Despite the many definitions, a common element among each representation of KT is the understanding that it is an iterative process involving the “synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health” leading to a stronger health care system and delivery of health services.

10

Based on the varied presentations of KT throughout the literature, the Canadian Institute of Health Research has defined it as a process that involves “raising the knowledge users’ awareness of research findings and facilitating the use of those findings”.^{10, pp. ii} This organization has identified two general forms of KT. These being: Integrated knowledge translation and end-of-grant KT. Integrated KT involves the knowledge users as members of the research team who are involved in the majority of stages of the research process. End-of-grant KT relates to the translation of findings through a well developed dissemination plan. The focus of this discussion paper will be to describe the process of using an integrated knowledge translation approach to design a research study that will evaluate a web-based patient education intervention. It will begin with a description of integrative knowledge translation, followed by a discussion of the strategies that will be used to design a protocol to evaluate a web-based intervention to be delivered to patients following heart surgery.

Integrated knowledge translation

Integrated knowledge translation is a method in which innovation is integrated into practice.⁹ It involves active collaboration between researchers [knowledge producers], patients, policymaker, and/or other decision makers [knowledge users] at various stages of the research process. Ideally, integrated KT requires all users of

research to assist with the identification of research questions, collection of data, interpretation of results, as well as dissemination based activities.^{11,12} This may not always be possible, however, it is assumed that if does occur it will allow for collaboration between knowledge producer and knowledge user.³ Through involving those who might use the research at various stages of the process, the hope is that the research will target and address the knowledge needs of the users promoting greater engagement in the research findings and their application to practice. Researchers need to identify innovative ways to disseminate their research so that it can have impact on practice and healthcare resource planning and distribution. Passive dissemination of research evidence, for example publishing results in a journal article, is a common way for researchers to get their message out; but it is largely ineffective at changing practice.¹³⁻¹⁶ Journal articles are not an accessible means for patients to access research evidence to support changes in health outcomes or the adoption of new health behaviours. Researchers ultimately need to consider the message that they aim to convey from research findings and how to develop the message for various audiences with differing knowledge needs.¹³⁻¹⁶

Recently, a growing debate has surfaced regarding whether or not decision makers and policymakers should be entering into integrated KT agreements, as the implications of the research findings for practice or policy change may not be feasible.¹⁷ In some cases, integrated knowledge translation is now the norm for disciplines such as education and social services; yet researchers in other disciplines struggle with funding bodies mandating the expectation that researchers will carry out integrated work with research 'end users'.^{17, 18} Some potential challenges related to an

integrated approach to KT include mandating a partnership between the researcher and the 'end user' who have different evidence needs, the expectation that resources will be available to support the research partnership and that researchers are expected to manage and nurture the partnership with the end user.¹⁷ One argument that end users have is that researchers do not understand the practical needs of end users who work in health care organizations and have to make management decisions or among policymakers who work in fast paced environments where multiple drivers influence decision making.¹⁷ As well, even though funding bodies may mandate a partnership between the researcher and 'end user' they rarely follow-up to assess and/or examine the effectiveness of this partnership.^{18, 19} Thus, variability in how partnerships are created and function exist.^{18, 19}

Despite these issues there are a number of potential benefits for integrated KT such as engaging end users to be part of the research process which can help shape the research question and potential outcomes so that they can meet the evidence needs of the end user and contribute to more 'practical' research results so that they are more likely to be used in practice, decision making and policy.¹⁸⁻²³ In a time of resource restraint, using integrated KT can be an innovative approach to obtaining relevant research findings to address current health care system issues.

While multiple studies call for the use of integrated knowledge translation, researchers are not actively engaging in this approach for reasons that include uncertainty related to the process involved in designing and managing an integrated KT study. This discussion paper presents a specific example of how to use an integrated knowledge translation approach to design, evaluate, and implement a patient education

intervention (Table 1). The steps that will be outlined throughout this discussion can be replicated in future studies using different interventions. A brief description of the intervention is first presented.

Web-based patient education

The intervention of interest is a post-operative cardiovascular surgical web-based patient education program that can be accessed during the first 6 months of recovery following hospital discharge. Patient education delivered following coronary artery bypass graft (CABG) and/or valve replacement (VR) surgery is an essential component of nursing care aimed at assisting patients in caring for themselves at home, following discharge from hospital.²² Typically, patient education is presented in the form of either individual, face-to-face teaching and/or written materials; and is delivered around the time of hospital discharge. The effectiveness of inpatient verbal and/or written teaching has been evaluated across the cardiovascular surgical (CVS) population.²⁴ Results indicated minimal to zero effect on self-care knowledge and compliance with self-care instructions; physical functioning⁹ specifically, mobility, ambulation, and body care/movement; as well as symptom frequency. A possible reason for the minimal effectiveness of existing CVS patient education interventions may be due to the time in which the education is provided, which is characterized by some form of short term memory loss, dementia, and/or delirium which may be present in up to 50% of all CVS patients following heart surgery.²⁵ For the most part, the majority of patients usually return to full cognitive functioning within 2 weeks of surgery.²⁴ However, this cognitive impairment has been shown to last up to 4 months post-operatively, in a number of patients with varying intensity.²⁶ Thus, if patients are experiencing some form of

cognitive impairment during the immediate post-operative recovery period, they will not be able to apply any of the education materials provided to them around their time of hospital discharge to manage their conditions. This is challenging for health care providers and decision makers who may have to discharge patients before they have had enough recovery time to benefit from the available education offered during their admission to hospital. Providing patients with access to web-based patient education during the post-hospital recovery period, for an extended length of time, may enhance their performance of self-care behaviour. In particular, this type of intervention provides a means through which nurses can communicate with patients outside of the healthcare arena. This media offers flexibility in terms of dosage and delivery [timing and repetition of messages].^{27, 28} The interactive aspect of multimedia alternatives can also increase attention toward messages. The possibility of personalizing information and activities according to diverse individual characteristics can enhance the effects of the intervention.^{28, 29} Consistently, use of the internet for information delivery has been shown to be a cost effective means for delivering specialized health care services to patients following hospital discharge.²⁹

The purpose of the intended study will be to evaluate the effectiveness of the web-based patient education intervention in improving patients' self-care behaviour performance, while reducing the rate hospital readmissions, during the first 6 months of post-hospital discharge recovery following heart surgery as compared to standardized patient education. Approximately, 272 patients who have had heart surgery will be recruited from a university-affiliated teaching hospital. Data will be collected to describe the sample and to determine if the web-based intervention was successful in

encouraging patients to perform specific behaviours while at home, thus preventing the need to be readmitted to a hospital. As not all individuals will have access to a computer or internet access, only those individuals who have a computer will be included in the study. Internet access will be provided for all study participants.

Knowledge User

Developing a web-based patient education intervention using an integrated knowledge translation approach involves incorporating knowledge users as equal partners within the research team. This will allow for the generation of research that is more relevant and likely to be useful to the end users.¹⁰ During the inception of the program of research, a knowledge user was identified. This individual represented a broad target audience group that consisted of cardiovascular surgical nurses. In addition she was identified as an individual with extensive years of experience in caring for post-operative cardiovascular surgical patients. Furthermore, she had the authority to enact practice based changes within a large, academic, tertiary organization. In designing the research question, the knowledge user was consulted to ensure that the question targeted the intended post-operative cardiovascular surgical context and environment; while at the same time could be transferred to similar audiences across similar settings. The research question that was designed asked whether or not a web-based patient education intervention was more effective in enhancing self-care behaviour performance, while reducing the rate hospital readmissions, during the first 6 months of post-hospital discharge recovery following heart surgery as compared to standardized patient education?

Research Approach

The methodology for evaluating the effectiveness of the intervention is a planned randomized controlled trial. Elements of the methodology are evolving; however specific strategies are in place to ensure there is meaningful participation of the knowledge users throughout the entire research process. For example, the knowledge user and the research team have started to collaborate on the drafting and submission of grants, construction of 2 manuscripts to date, and a systematic review, that is currently underway. Thus, all feasible opportunities for knowledge exchange have been discussed. The knowledge user's feedback served to provide valuable insight into the knowledge needs of other users [i.e. post-operative cardiovascular nurses as well as, home care nurses] in the field of cardiovascular surgical nursing. The feedback also served to assist in refining the grant proposals and manuscripts to maximize the likelihood that the research results will be easily implemented into practice. Thus, feedback that focused on the feasibility of the design of the intervention was helpful in refining study related outputs. It is anticipated that the knowledge user will be involved in all stages of the design and testing of the web-based intervention; thus, experienced nurses will be asked to assist in interpreting results, developing recommendations, and identifying audiences for dissemination. These nurses will be identified at the start of the study and will be listed as study collaborators. Within the study protocol, there will be a section dedicated to knowledge translation in which the use of knowledge users (i.e. nurses) throughout all stages of the design and testing of the intervention will be clearly stated. The protocol will be used as a guideline for the design and testing of the intervention. The involvement of nurses, as knowledge users will be important for the translation of the intervention which needs to be tailored to local circumstances and

settings.³⁰⁻³⁶ The involvement of patients during the process of design will reinforce the KT approach of this study. Preferences and acceptability of patients can influence the uptake of the intervention and the validity of an evaluation study.³⁰⁻³⁶ After designing a first draft of the structure and outline of the intervention, a focus group will be conducted with patients in order to inform on preferences and acceptability, and refine the content. During the evaluation phase of the intervention, patients will be asked to complete the Treatment Acceptability and Preferences Measure (TAP).³¹

Feasibility

In designing an integrated knowledge translation research project, the issue of feasibility was considered and addressed. In particular, incorporating a knowledge user throughout the entire process associated with designing and evaluating an intervention can take several months, if not years to adequately gather information about the need for an intervention, conduct systematic reviews of the current state of knowledge, use results to design and pilot intervention for feasibility and relevance, and continue to refine intervention before conducting large randomized controlled trials to evaluate effectiveness of intervention. Thus, the possibility for the knowledge user to change over time is likely. Our team took this potential risk very seriously and was strategic in our selection of our knowledge user. As a result, we selected an individual who was in his or her position for a number of years, identified his or her enjoyment with work, and who stated that he or she had no desire to change positions in the coming months/years. Having a stable knowledge user will allow us to maintain the rigor of our methodology, allow for adequate translation of results, and enable us to achieve results that are consistent and credible.¹⁰ Identifying multiple knowledge users (i.e. 2) at the

start of the study may be a good option, as there is the possibility that one of the knowledge users may leave or may no longer be available to engage in the project.

Outcomes

The identified outcomes of the integrated knowledge translation relate to enhancing self-care behaviour performance, while reducing hospital readmission rates. It is anticipated through the evaluation of the web-based intervention, the sustainable impact of this education on practice and policy will be demonstrated. The effectiveness of the CVS web-based intervention will be evaluated as well as the process of conducting an integrated knowledge translation approach.¹⁰ In particular, feedback from knowledge users regarding the amount of time involved in the study, perception of factors that facilitated or interfered with participation and adherence to knowledge translation activities, factors that affected the knowledge translation process, and issues in the engagement of knowledge translation based activities will be collected to quantify and refine the KT method. Data related to reasons for knowledge user attrition rate will also be collected to enhance knowledge user retention rates. Finally, data related to the effectiveness of the knowledge user recruitment strategy; as well as evaluating the utility and feasibility of the knowledge user screening procedure will be collected to enhance the methodological rigor of future integrated KT based activities.

Conclusion

The effects of different KT approaches and the solutions to overcome barriers are unclear.³¹ This project describes an application of the KT process, its effects and its barriers for the development of an innovative intervention for patients returning home after cardiac surgery. The development of psychosocial or educational interventions

involves different sources of knowledge.³⁰⁻³⁶ The KT approach seems to be an important tool for the development of new interventions as it helps to apply science to practice accurately. It supports the elaboration of the design, while enhancing the relevance of the intervention through the validation of feasibility and acceptability with clinicians and patients.^{29, 31}

Acknowledgment

The authors wish to acknowledge the funding received from the Primary Health Care Services Applied Health Research Fund.

References

1. Straus S. Knowledge translation: Resolving the confusion. *Journal of Continuing Education in the Health Professions* 2006; **26**: 3-4. DOI: 10.1002/chp.45
2. Straus S, Tetroe J and Graham I. Defining knowledge translation. *Canadian Medication Association Journal* 2009;**181** [3-4]: 165-168. doi:10.1503/cmaj.081229
3. McGrath PJ, Lingley-Pottie P, Johnson Emberly D, Thurston C, McLean C. Integrated knowledge translation in mental health: Family health as an example. *Journal of Canadian Academy of Child Adolescent Psychiatry* 2009; **18**[1]: 30-37.
PMCID: PMC2651209
4. Kitson AL. The need for systems change: reflections on knowledge translation and organizational change. *Journal of Advanced Nursing* 2009; **65**[1]: 217-228. doi: 76.189.222.248
5. Green LW, Ottoson J, Garcia C, Robert H. Diffusion theory and knowledge dissemination, utilization, and integration in public health. *Annual Review of Public Health* 2009; **30**: 151. doi: 10.1146/annurev.publhealth.031308.100049
6. Simpson E, Wittet S, Bonilla J, Gamazina K, Cooley L, Winkler JL. Use of formative research in developing a knowledge translation approach to rotavirus vaccine introduction in developing countries. *BMC Public Health* 2007; **7**[1]: 281.
doi:10.1186/1471-2458-7-281
7. Straus SE, Tetroe JM, Graham ID. Knowledge translation is the use of knowledge in health care decision making. *Journal of clinical epidemiology* 2011; **64**[1]: 6-10. doi: <http://dx.doi.org/10.1016/j.jclinepi.2009.08.016>

8. McKibbin KA, Lokker C, Wilczynski NL, Ciliska D, Dobbins M, Davis DA, Haynes RB, Straus SE. 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* 2010;**5**: 15. <http://www.biomedcentral.com/content/pdf/1748-5908-5-16.pdf>
9. Straus SE, Tetroe J, Graham ID. *Knowledge translation in health care: moving from evidence to practice*. John Wiley & Sons, 2013.
10. Canadian Institutes of Health Research [CIHR] [2009]. About Knowledge Translation. Available at <http://www.cihr-irsc.gc.ca/e/29418.html>. Accessed April 24, 2013.
11. Leung B, Catallo C, Riediger ND, Cahill NE, Kastner M. What do we know about developing an end-of-grant knowledge translation plan? The trainees perspective. *Implementation Science* 2010;**5**: 78.
12. Tetroe J. [2007]. Knowledge translation at the Canadian Institutes of Health Research: A primer. Focus Technical Brief [no. 18 2007]. The National Center for Dissemination of Disability Research. Available at <http://www.ncddr.org/kt/products/focus/focus18/>. Accessed April 24, 2013.
13. Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson M. Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. *British Medical Journal* 1998;**317**[**7156**]: 465-468. PMCID: PMC1113716
14. Grimshaw JM, Eccles MP, Lavis JN, Hill SJ, Squires JE. Knowledge translation of research findings. *Implementation Science* 2012;**7**[**1**]: 50. doi:10.1186/1748-5908-7-50

15. Wallerstein N, Duran B. Community-based participatory research contributions to intervention research: the intersection of science and practice to improve health equity. *American Journal of Public Health* 2010;**100**[S1]:S40-S46. doi: 10.2105/AJPH.2009.184036
16. Wensing M, Bosch M, Grol R. Developing and selecting interventions for translating knowledge to action. *Canadian Medical Association Journal* 2010; **182**[2]: E85-E88. doi: 10.1503/cmaj.081233
17. Kothari A, McLean L, Edwards N, Hobbs A. Indicators at the interface: managing policymaker-researcher collaboration. *Knowledge Management and Practice* 2011;**9**[3]: 203-10. doi:10.1057/kmrp.2011.16.
18. Prior M, Guerin M, Grimmer-Somers K. The effectiveness of clinical guideline implementation strategies—a synthesis of systematic review findings. *Journal of evaluation in clinical practice* 2008; **14**[5]: 888-897. doi:10.1111/j.1365-2753.2008.01014.x
19. Best A, Holmes B. Systems thinking, knowledge and action: towards better models and methods. *Evidence & Policy: A Journal of Research, Debate and Practice* 2010; **6**[2]: 145-159. DOI: <http://dx.doi.org/10.1332/174426410X502284>
20. Bowen S, Martens PJ. A model for collaborative evaluation of university-community partnerships. *Journal of Epidemiology and Community Health* 2006;**60**: 90-210. doi:10.1136/jech.2005.040881
21. Denis JL, Lomas J. Convergent evolution: the academic and policy roots of collaborative research. *Journal of Health Service Research Policy* 2003; **8**[S2]: S1-6. doi: 10.1258/135581903322405108

22. Kaminsky LA, Thur LA, Riggin K. Patient and Program Characteristics of Early Outpatient Cardiac Rehabilitation Programs in the United States. *Journal of Cardiopulmonary Rehabilitation and Preventative Medicine* 2013;**20**: 1-5. doi: 10.1097/HCR0b013e318289f6a8
23. Serenko A, Bontis N, Hull E. Practical relevance of knowledge management and intellectual capital scholarly research: books as knowledge translation agents. *Knowledge and Process Management*. 2011; **18**: 1-9.
24. Sawatzky JAV, Christie S, Singal RK. Exploring outcomes of a nurse practitioner- managed cardiac surgery follow- up intervention: a randomized trial. *Journal of Advanced Nursing* 2013. DOI: 10.1111/jan.12075
25. Fasken LL, Wipke-Tevis DD, Sagehorn KK. Factors associated with unplanned readmission following cardiac surgery. *Progress in Cardiovascular Nursing* 2001;**3**: 107-115. DOI: 10.1111/j.0889-7204.2001.00590.x
26. Newman MF, Kirchner JL, Phillips-Bute B, Gaver V, et al. Longitudinal assessment of neurocognitive function after coronary artery bypass surgery. *New England Journal of Medicine* 2001;**344**: 399-402. DOI: 10.1056/NEJM200102083440601
27. Cote J, Ramirez-Garcia P, Rouleau G et al. A nursing virtual intervention: real-time support for managing antiretroviral therapy. *Computer, Informatics, Nursing* 2011;**29**[1]: 43-51. doi:10.1097/NCN.0b013e3181f9dc02
28. Martorella G, Côté C, Racine M, Choinière M. Web-based nursing intervention for self-management of pain after cardiac surgery: Pilot randomized controlled trial. *Journal of Medical Internet Research* 2012;**14**[6]: e177. doi:10.2196/jmir.2070

29. Krebs P, Prochaska JO, Rossi JS. A meta-analysis of computer-tailored interventions for health behavior change. *Prev Med.* 2010;51[3-4]: 214-221.
30. Lustria ML, Cortese J, Noar SM, Glueckauf RL. Computer-tailored health interventions delivered over the Web: review and analysis of key components. *Patient Education and Counselling* 2009;**74**[2]: 156-173. doi:10.1016/j.pec.2008.08.023
31. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: The new Medical Research Council guidance. *British Medical Journal* 2008;**337**: a1655. PMCID: PMC2769032
32. Sidani S, Miranda J, Epstein DR, Bootzin RR, Cousins J, Moritz P. Relationships between personal beliefs and treatment acceptability, and preferences for behavioral treatments. *Behaviour, Research and Therapy* 2009;**47**: 823-829.
PMCID: PMC2742570
33. Sidani S, Epstein DR, Bootzin RR, Moritz P, Miranda J. Assessment of preferences for treatment: validation of a measure. *Research in Nursing and Health* 2009;**32**: 419-431. DOI: 10.1002/nur.20329
34. Grimshaw J, Eccles M, Lavis J, Hill S, Squires J. Knowledge translation of research findings. *Implementation Science* 2012;**7** [50].
<http://www.biomedcentral.com/content/pdf/1748-5908-7-50.pdf>
35. van Meijel B, Gamel C, van Swieten-Duijfjes B, Grypdonck MH. The development of evidence-based nursing interventions: methodological considerations. *Journal of Advanced Nursing* 2004;**48**[1]: 84-92. DOI: 10.1111/j.1365-2648.2004.03171.x

36. Thorpe R. Rigour, Relevance and Reward: Introducing the Knowledge Translation Value chain. *British Journal of Management* 2011;**22**:420-431. DOI: 10.1111/j.1467-8551.2011.00760.x

This manuscript was accepted for publication by Wiley, Fredericks, S., Martorella, G. & Catallo, C. (2014). Using knowledge translation as a framework for the design of a research protocol. *International Journal of Nursing Practice*.