ORIGINAL RESEARCH

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Knowledge translation: Principles and practicalities for trainees within interdisciplinary health research teams

Abstract

Within a dynamic health research environment with trends toward increasing accountability, governments and funding agencies have placed increased emphasis on knowledge translation (KT) as a way to optimize the impact of research investments on health outcomes, research products and health service delivery. As a result, there is an increasing need for familiarity with the principles of KT frameworks and components of KT strategies. Accordingly, health research trainees (graduate students and post-doctoral fellows) must be supported to enhance their capacity to understand KT principles and the practicalities of implementing effective KT practices. In this paper, the unique opportunities and challenges that trainees within an interdisciplinary research team encounter when they begin to understand and apply constructive and relevant KT practices are considered. Our commentary is based on trainee experiences within the Preterm Birth and Healthy Outcomes Team (PreHOT), an interdisciplinary research team.

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Knowledge translation (KT) is a process and strategy designed to close the gap between knowledge generated by health researchers and the information needs of policy makers, health practitioners and the public, in order to improve health outcomes [1]. Canada's government-directed health research mandate, articulated by the Canadian Institutes of Health Research (CIHR), emphasizes KT as an essential element of research and defines it as:

...a dynamic and iterative process that includes synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the health care system. This process takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user [2].

A comprehensive integration of KT into one's research involves understanding the process, implementing the components, and, as we enter the next wave of KT, evaluating its impact. The next generation of researchers, who are just beginning to understand and build KT into their programs of research, face a complex research environment. For trainees who are also new to interdisciplinary programmatic team research, the learning curve is steep. In this commentary, the opportunities and challenges that graduate students and post-doctoral fellows within the Preterm Birth and Healthy Outcomes Team (PreHOT), an interdisciplinary research team, encounter when operationalizing constructive and relevant KT practices are identified.

Principles of KT

Under traditional knowledge generation paradigms, it was sufficient for autonomous, internally-driven researchers to generate robust scientific discoveries and communicate them to society [3]. This is known as Mode 1 knowledge production [4]. Under the prevailing paradigm, there is an ever-increasing demand for the co-creation of knowledge, based on the needs of government, funding agencies and the public. In this paradigm, known as Mode 2, knowledge production is interdisciplinary, participatory and typically has direct application to an identified problem [4]. Each mode of knowledge generation is associated with a different approach to KT [5].

End-of-grant KT [2,6], which is typically associated with Mode 1 knowledge production [5], is embedded within traditions of academic merit and promotion based on publications

in high-impact, peer-reviewed journals and commercializable scientific discoveries [2,5]. With end-of-grant KT, the researcher is the scientific expert, and knowledge may take years to trickle down to end-users. Integrated KT [2,6] is more commonly associated with Mode 2 knowledge production [5]. It describes a way of conducting research that involves non-hierarchical collaboration between researchers and knowledge end-users for the formulation of health research questions and methodology and the interpretation and dissemination of results [6]. Integrated KT involves co-creation of knowledge through regular knowledge exchange sessions among researchers and end-users (patients, practitioners, policymakers) throughout the research process, and collaborative efforts to interpret and disseminate research findings [2].

Closely aligned with the concept of integrated KT is the knowledge-to-action (KTA) cycle; a useful guide for identifying actions that support the uptake and sustainability of new knowledge [6,7]. The KTA cycle describes two processes: knowledge creation and knowledge application. Knowledge creation represents the processes through which knowledge is refined and tailored for the end user from the level of knowledge inquiry, to the achievement of knowledge tools and products that can be easily adopted by stakeholders [6]. Knowledge application represents a series of milestones or steps necessary for the successful implementation of the knowledge created [6].

PreHOT: An Interdisciplinary Research Team

PreHOT is an Alberta Innovates-Health Solutions (AI-HS)-funded (#200700595) interdisciplinary research team formed in 2008 with a 5-year, \$5 million funding commitment to investigate preterm birth [8]. Preterm birth (<37 weeks gestation) accounts for nearly 10% of all births and is associated with higher mortality and morbidity [9]. An executive committee provides overall direction for (1) team operations, (2) research resources and (3) training the next generation of researchers. To date, PreHOT has mentored approximately 30 trainees (undergraduate and graduate students and postdoctoral fellows) from around the world. Trainees who seek out training in PreHOT span multiple disciplines across all four CIHR research pillars: biomedical, clinical, research respecting health systems and services, and the social, cultural and environmental factors that affect the health of populations. Their research projects are diverse and include (1) regulation of human uterine contraction and relaxation, (2) immunological regulation of birth and (3) environmental and population determinants of preterm delivery. An important PreHOT train-

ing component includes strengthening trainee competence in end-of-grant and integrated KT.

Practicalities of KT for Health Research Trainees in Interdisciplinary Teams

Trainees in an interdisciplinary health research team must develop the KT element of their research while balancing the short-term goals of accomplishing discipline-specific course, thesis, and research productivity requirements with the long-term goal of developing collaborative research relationships. An important support for the research trainee in this environment is the interdisciplinary context itself. PreHOT trainees have identified the necessity of capitalizing on the interdisciplinary team environment, where investigators from a variety of disciplines converge around common issues. Those trainees who are included in these interactions, participate in the discussions and contribute to the research are better positioned to build on these relationships.

PreHOT further leveraged its interdisciplinary training environment to support trainees' development of KT competence by offering a graduate level course: INTD600, *Building Foundations – An Introduction to Transdisciplinary Research*. A particularly relevant course assignment required that trainees develop an end-of-grant and integrated KT plan anchored in the trainee's program of research. The assignment, based on the Scientist Knowledge Translation Plan Template [10], a tool designed to assist scientists develop their KT plans, highlighted for each trainee the scope and depth of KT strategies most relevant to individual research objectives. For most trainees, this was their first formal exploration of KT and its application to their own research. Trainees were able to use the expertise of more senior team members from multiple disciplines to chart the probable path of their project(s) and to develop personal KT plans that included end-of-grant and integrated KT strategies targeted to the appropriate audiences. Once documented, academic supervisors and mentors were better able to support trainees' KT plans to optimize successful implementation.

End-of-Grant KT: Trainee Perspectives

Trainees often make use of end-of-grant KT for manuscript preparation and conference presentations intended for investigators in their own disciplines [11]. End-of-grant KT practices can be daunting to trainees who are just beginning to exchange ideas and research results within their own discipline. To facilitate the transition from discipline-specific audiences to interdisciplinary audiences, PreHOT funds their trainees to par-

ticipate in an annual regional conference aligned with the team's core theme. In this venue, PreHOT trainees are required to formally present their research projects and discuss their results with an audience of scientists with diverse training and backgrounds. While trainees identify this is a valuable experience, there is frustration with the lack of shared terminology. This challenge has been recognized in the literature [12]. Differences in the goals, needs, knowledge and professional language of members from other disciplines add a layer of complexity to the information exchange process. One strategy identified to mitigate this barrier has been participation in a plain language writing workshop, such as one offered by the Health Research Transfer Network of Alberta [13], to provide scientists with practical training in effective communication.

Integrated KT: Trainee Perspectives

Published articles and presentations alone will not establish partnerships, collaborations or exchanges among researchers and end-users. Developing trainee capacity to create relationships with other researchers, knowledge end-users and key partners at the conceptualization stage of their research projects is critically important to career success; yet, it is time consuming and requires careful planning. Integrated KT, while desirable, is therefore more challenging for the trainee than end-of-grant KT. Nevertheless, these one-on-one relationships help to establish trust and collegiality, and trainees who develop them early have a better chance to be successful creators and transmitters of new knowledge. Lasting relationships can move with investigators throughout their careers, serve as conduits for knowledge exchange for years and will be enriched and more meaningful for both parties with each exchange. It is expected that the more mature interdisciplinary research teams, similar to PreHOT, have well-established relationships with knowledge end-users that are shared with trainees to facilitate KT integration into their research projects. Furthermore, whether members of teams or not, senior scientists should not only model effective communication with knowledge end-users, thereby demonstrating *how* effective relationships are built, but also actually *facilitate* introductions between end-users and their trainees to initiate their own new relationships.

PreHOT trainees have communicated that it is necessary that they be proactive and seek ways to increase their personal involvement in integrated KT practices. To that end, a number of federal and provincial initiatives are available to build trainee KT capacity. For instance, trainees across Canada are invited by the CIHR to attend summer institutes (e.g., KT Canada Summer Institute) where active research mentors and

trainees are invited to participate in a series of workshops, case studies and events that explore the knowledge-to-action framework and expose trainees to opportunities and challenges in this field [14]. Moreover, the KT Clearinghouse website, funded by CIHR, is a superb resource for trainees “who want to learn the basics of ‘doing knowledge translation’” [15].

Conclusion

Health research funding agencies in Canada are placing increased emphasis on supporting effective end-of-grant and integrated KT strategies. KT, within an established interdisciplinary team model, creates a number of unique opportunities and challenges for all team members. It is important for health researchers to work with research trainees to strategize, model and facilitate best practices so all are able to capitalize on the potential offered by this new research landscape.

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