

# Accelerating knowledge translation to improve cardiovascular outcomes and health services: opportunities for bridging science and clinical practice

Sandra B. Lauck (1) 1\*, Markus Saarijärvi (1) 2,3, Ismália De Sousa (1) 1, Nicola Straiton (1) 4, Britt Borregaard (1) 5,6, and Krystina B. Lewis (1) 7

<sup>1</sup>School of Nursing, University of British Columbia, St. Paul's Hospital, Vancouver, Canada; <sup>2</sup>Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Stockholm, Sweden; <sup>3</sup>Gothenburg Centre for Person-Centred Care (GPCC), University of Gothenburg, Gothenburg, Sweden; <sup>4</sup>Maridulu Budyari Gumal Sydney Partnership for Health, Education, Research and Enterprise (SPHERE), Nursing Research Institute, St Vincent's Health Network, Sydney, Australia; <sup>5</sup>Department of Cardiology, Odense University Hospital, Odense, Denmark; <sup>6</sup>Department of Clinical Research, University of Southern Denmark, Odense, Denmark; and <sup>7</sup>Faculty of Health Sciences, University of Ottawa, University of Ottawa Heart Institute, Ottawa, Canada

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Knowledge translation (KT) is the exchange between knowledge producers and users to understand, synthesize, share, and apply evidence to accelerate the benefits of research to improve health and health systems. *Knowledge translation practice* (activities/strategies to move evidence into practice) and *KT science* (study of the methodology and approaches to promote the uptake of research) benefit from the use of conceptual thinking, the meaningful inclusion of patients, and the application of intersectionality. In spite of multiple barriers, there are opportunities to develop strong partnerships and evidence to drive an impactful research agenda and increase the uptake of cardiovascular research.

**Keywords** 

Knowledge translation • Integrated knowledge translation • Knowledge users • Knowledge mobilization • Patient engagement • Cardiovascular care

#### **Highlights**

- There are complex barriers to effectively move evidence into cardiovascular practice. These challenges present missed opportunities to close the 'Know-Do' gap.
- Knowledge translation (KT) facilitates the exchange and mobilization of evidence by connecting knowledge users and producers.
- The study of the activities and science of KT, guided by conceptual thinking and strengthened by patient engagement and the critical use of intersectionality, is essential to accelerate the uptake of evidence.
- The European Journal of Cardiovascular Nursing KT Corner aims to support this research agenda to improve outcomes, implement effective and sustained health services, and promote equity.

### Introduction

People with cardiovascular disease, their caregivers and families, clinicians, scientists, policy-makers, and funders of health research share the alarming concern that there can be a 9–17-year lag between scientific discovery and adoption in practice and health policy, with estimates that  $\sim\!85\%$  of health research is avoidably wasted. In many cases, this gap in translation from evidence to adoption is the result of multiple factors, including the

challenges of engaging effectively with knowledge users to inform the identification of pertinent research questions, developing partnerships between knowledge producers and users, and mapping the conduct of studies to users' differing needs and priorities. Regardless of how valuable, novel, or pertinent evidence may be, findings are scarcely implemented by researchers or simply through the production of good research alone.<sup>2</sup> There are significant barriers to implementing new or existing knowledge across complex organizational systems of care: how to reach users most

 $<sup>\</sup>hbox{$*$ Corresponding author. Email: $sandra.lauck@ubc.ca}\\$ 

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effectively, how to overcome the lack of patient and public involvement, and how to improve knowledge about which strategies are most effective in which contexts. The compounding impact of these challenges can result in impaired patient outcomes, ineffective or extraneous care, as well as the provision of low-value healthcare and sub-optimal experience of healthcare professionals.<sup>3</sup>

There is a pressing need to optimize the co-creation and use of evidence to address these challenges. This urgency echoes the Institute for Healthcare Improvement's Quintuple Aim to improve population health, enhance care experience, improve staff experience, reduce costs, and advance health equity. In this context, expectations are rising to close the 'Know-Do' gap and the separation between producers and users of evidence and to accelerate knowledge translation (KT). This call to collective action—'Off the shelves, and onto the streets'5—has been adopted by the European Journal of Cardiovascular Nursing (EJCN). The journal has launched a dedicated KT Corner and is calling on the cardiovascular nursing and allied health scientific and clinical communities, patients, and the public to champion and accelerate the uptake of the high-quality evidence into practice.

The purpose of this manuscript is to (i) define KT and explore its conceptual underpinnings in health research; (ii) highlight the pivotal role of patients and the public, and the consideration of an intersectional lens to increase impact and promote health equity in KT activities; (iii) discuss recent exemplary contributions in KT research within the field of cardiovascular care that showcase the excellence achieved in the *EJCN*, and (iv) conclude with a discussion of the opportunities and challenges of using KT to improve outcomes and experiences and to change care delivery and health systems.

### Knowledge translation: facilitating the exchange and mobilization of evidence to sustain change

Scrutiny, evidence, and debate about KT continue to evolve in this growing field of inquiry. There has been an explosion of interest across groups of people invested in addressing the research to practice gap and help answer essential questions such as: 'What is known?', 'Is this the best treatment option for this patient?', 'Why is evidence not delivered as intended?', 'Why is the intervention not scaled?', or 'Why is success not sustained?' among many.

Knowledge translation refers to the exchange between knowledge producers and knowledge users to understand, synthesize, share, and apply evidence to accelerate the benefits of research to improve people's health and health systems. <sup>6,7</sup> Much of this interest centres on two important areas of inquiry: *KT practice*, the activities undertaken to move evidence into practice and the strategies to adopt and integrate evidence to change practice within specific settings, and *KT science*, also defined as implementation science, the scientific study of the methods to promote the uptake of research findings in clinical, organizational, or policy contexts. <sup>8</sup> Simply defined, KT is about getting the right evidence to the right people in the right way. (*Central illustration*) provides a visual representation that outlines various components of KT practice and science.

Knowledge translation can be viewed in the greater environment of the shift from 'traditional' research that conventionally was unidisciplinary, researcher-driven, and based on a post-positivist theory of knowledge (e.g. observable phenomena, aiming to explain and predict, value-free science judged only by logic) to 'co-produced' (i.e. constructivist) research that is more multi-disciplinary, aware of context, inclusive of stakeholder participation, and working from a problem-solving epistemology. In this context, greater emphasis is placed on the understanding and application of practical knowledge, through engaged scholarship and collaborative knowledge production to complement

traditional, research-based knowledge. Increasingly, scientific, clinical, advocacy, and policy efforts are focused on moving beyond implementation to examine how to sustain KT to promote the stability of ingrained change and support the dynamism of continuing change. <sup>10</sup>

Many terms are used to describe the process of informing practice by using evidence, including (but not limited to) KT, knowledge utilization, knowledge transfer and mobilization, dissemination, research translation, and implementation science. This evolving terminology not only contributes to a dynamic scientific environment but can also be a source of confusion and a barrier for clinicians and scientists to work towards a common enterprise. Common KT terminology is outlined in *Table 1*.

The following teaching tool has been proposed to describe the simple and jargon-free definitions of implementation science to support novice learners to grasp the central concepts in clear and non-scientific language and keep scientist grounded:

- the intervention/practice/innovation is the thing;
- effectiveness research looks at whether the thing works;
- implementation research looks at how best to help people/places do the thing;
- implementation strategies are the activities we do to try to help people/places do the thing;
- main implementation outcomes are how much and how well they do the thing to sustain adoption/change.<sup>17</sup>

## Strengthening knowledge translation: the value of conceptual thinking

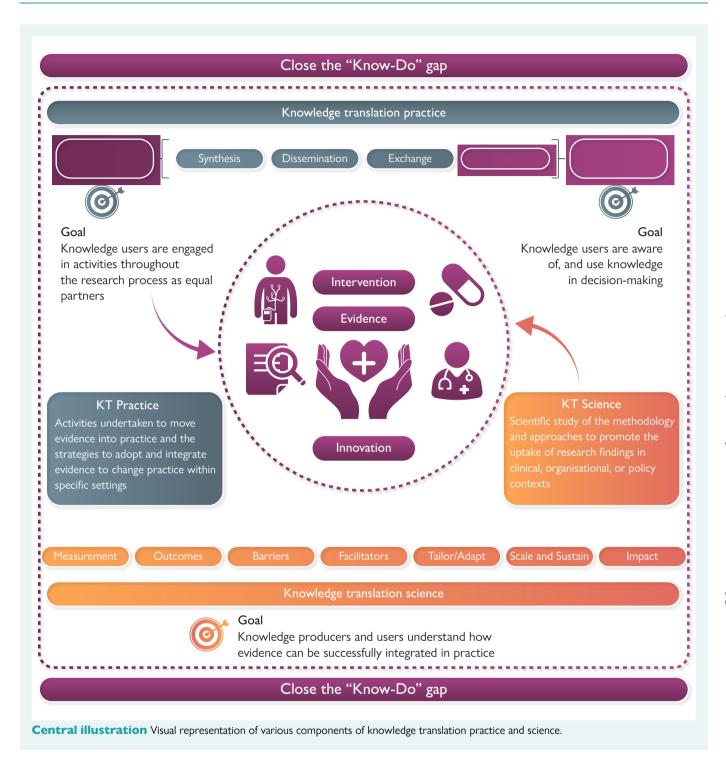
There are many theories, models, and frameworks that underpin how we think about and do KT. Ideally, these serve as helpful roadmaps to guide activities focused on knowledge creation and implementation. The use of conceptual thinking is a critical ingredient for exploring the overall 'big picture' to guide planning and provide clear and effective rationales for actions and activities to achieve sustained adoption. Planned-action KT theories describe predictive and causal mechanisms, whereas models specify steps in the process of translating research into practice, the contextual impact of the implementation processes, and frameworks explain factors that influence implementation and outcomes. The goal of conceptual thinking in KT is to inform research and strengthen scientific rigour.

The proliferation of conceptual underpinnings also contributes to making this growing field of research increasingly complex and, at times, even overwhelming, resulting in confusion for users to select the most valid, effective, and/or pertinent approach to use. <sup>13</sup> For example, in a scoping review of literature used to guide the dissemination or implementation of interventions to prevent and/or manage cancer or other chronic diseases, investigators identified 159 KT theories, models, or frameworks, with most (87%) used in 5 or fewer studies, and 60% only used once. <sup>18</sup> This creates a challenging context to guide cardiovascular nurses and allied health professionals to accelerate their contributions to KT while promoting optimal scientific approaches to this challenging and still emerging area of scholarship.

For the purpose of our discussion, we highlight two frameworks that have been extensively used in nursing and allied health to inform the process of KT and to promote the effective and sustained uptake of innovative evidence in cardiovascular care.

### Knowledge-to-action cycle

Graham et al. <sup>19</sup> developed the knowledge-to-action (K2A) framework in 2006, which was subsequently adopted by the Canadian Institutes of Health Research (CIHR) to guide health research and promote a comprehensive KT agenda. Investigators leveraged the commonalities of over 30 theories to develop a framework inclusive of knowledge



creation and an action cycle to progress through dynamic and progressive activities to achieve sustained knowledge use. <sup>12,20</sup> The K2A framework is grounded in three stages of knowledge creation: inquiry (e.g. primary studies), synthesis (e.g. body of evidence, meta-analysis), and tools (e.g. guidelines). The identification of a gap in knowledge, emerging new healthcare/practice needs, and/or the availability of new knowledge can trigger the K2A action cycle in which knowledge is tailored to context. In the action cycle, users conduct a series of iterative

activities to (i) adapt knowledge to local contexts; (ii) assess the barriers and facilitators to knowledge use; (iii) select, tailor, and implement interventions; (iv) monitor knowledge use; (v) evaluate outcomes; and (vi) sustain knowledge use (*Figure 1*). Throughout these steps, K2A emphasizes adaptation to local cultures and context by privileging social interaction and tailoring of research evidence. In addition, other theoretical underpinnings—e.g. organizational, sociological, and education theories—may be relevant to consider to achieve the study's specific objectives. <sup>12</sup>

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Table 1 Common knowledge translation terminole	ogy
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Knowledge translation (KT)  Process by which research is created and translated into practice for the purpose of improving healthcare and health outcomes. It is a dynamic and iterative process of exchange of information between knowledge producers and knowledge users (including patients) that includes the synthesis, dissemination, exchange, and application of knowledge to improve health and provide more effective health services and to strengthen the healthcare system <sup>11</sup> Approach to KT: integrated  KT  Approach to KT: integrated  KT  Gool: knowledge users are engaged as equal partners with researchers throughout the research process:  Approach to research that engages users as equal partners throughout the project alongside researchers using diverse strategies, including stakeholder engagement, co-production of research questions and study design, and partnering in dissemination/ implementation. It highlights the idea that getting evidence into use happens at many stages in the research cycle <sup>11</sup> Approach to KT: end of grant/project KT  Gool: the researcher develops and implements a plan for making howledge users aware of research findings:  Development and implementation of a plan for making potential research user audiences aware of the knowledge that is gained during a project <sup>12</sup> Implementation science  Scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practices to improve the quality and effectiveness of health services. Implementation science is not a direct evaluation of an intervention but an examination of how and why the intervention was effective or not effective <sup>13</sup> Implementation strategies  Methods or techniques used to enhance the adoption, implementation, and sustainability of interventions and other forms of evidence <sup>14</sup> Activities undertaken to move evidence into practice and the strategies to adopt and integrate evidence to change practice within specific settings	Term	Key defining concept(s)
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	KT practice	practice and the strategies to adopt and integrate evidence to change practice

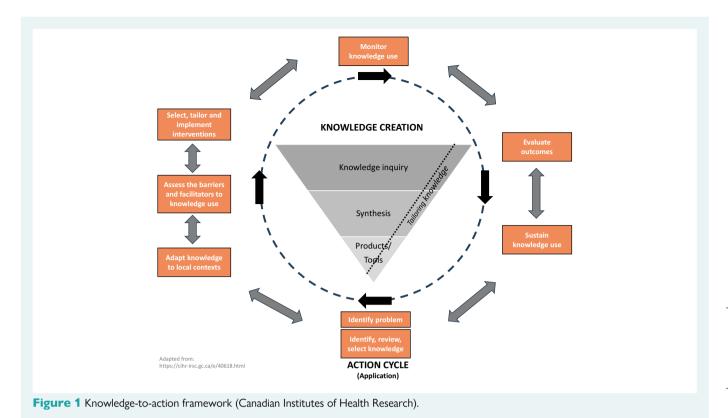
Term	Key defining concept(s)
KT science	The umbrella term used to capture scientific study of the theories, mechanisms, concepts, and/or methods used in KT, including the development of partnerships and the research methods, implementation and dissemination of results <sup>12</sup>
Dissemination	Purposive distribution of information and intervention materials to a specific audience to spread information <sup>12</sup>
Patient and public involvement in research	Engagement driven by six standards: inclusive opportunities, working together, support and learning, communications, impact, and governance <sup>15</sup>
Sustainability	Stability of ingrained change and the dynamism of continuing change 10
Citizen science	Type of participatory research that leverages the expertise and information provided by community members affected by the research topic. It aims to

promote health equity by engaging individuals who may not respond to traditional methods of data collection and increasing the diversity of data used to shape policies and research<sup>16</sup>

### Promoting action on research implementation in health services

Within this framework, successful implementation ('SI') of evidence into practice is a function ('f') of the quality of three dimensions: the nature and type of innovation or evidence ('E'), the qualities/characteristics of the context ('C') in which change is being introduced, and the strategies used to facilitate ('F') the process of implementation [SI = f(E, C, F)].<sup>21</sup> In 2016, the framework was further refined to include integration as a central explanatory component. Conceptually, evidence is discussed as a multidimensional construct that is integral to innovation and operationalized by individual or teams of clinicians who work within and across multiple layers of context. Importantly, facilitation is described as the deliberate and active ingredient to achieve KT by making the innovation easier to use and understood by knowledge users. Internal or external facilitators—ranging from beginner to experienced and expert—complement the role of other KT roles within healthcare organizations and are positioned as essential requirements in complex KT projects (Figure 2).<sup>22</sup>

These two examples of conceptual thinking illustrate the diverse evolution of KT as an area of scientific inquiry and the commitment to attending to the rigour of scholarship. Below, we discuss KT through two interrelated but distinct issues to strengthen KT research and practice: the role of patient and public involvement, and the value of intersectionality.



# Strengthening knowledge translation: the role of patients and the public

Patient and public involvement in research is well recognized as a means to improve the relevance, impact, and efficiency of research.<sup>23</sup> Collectively, KT science and patient and public involvement partnerships offer support for research aimed at enhancing the delivery of effective and responsive healthcare services and addressing health disparities. These efforts are augmented by local and international patient advocacy organizations, which are increasingly visible and strongly engaged in promoting the inclusion of people with lived and living experience of cardiovascular disease across clinical care, research, and policy. Organizations such as national heart foundations and public associations, the European Alliance for Cardiovascular Health (https://www.cardiovascular-alliance.eu), Global Heart Hub (https://globalhearthub.org/), Heart Valve Voice (https://www. heartvalvevoice.ca/), and Hearts4Heart (https://hearts4heart.org.au/) illustrate the power of collective and co-ordinated efforts to elevate the voices of patients, caregivers, and families across the continuum of cardiovascular care, research, and health policy. In the E/CN, further priority has recently been placed on active involvement of patients to raise their perspectives in the evaluation of healthcare delivery. The inclusion of a patient representative on the journal's editorial board, the systematic addition of highquality lay summaries to scientific reports, and the investment in a new Patient Perspective section are concrete actions to un-do barriers that separate knowledge users and producers.<sup>24</sup>

Yet to date, despite patients and the public being recognized as legitimate recipients of knowledge in the context of KT, their involvement is not consistently applied. Given the significant importance of patient engagement in current health research discussions, there is an opportune moment to redirect our focus on their involvement in KT. The continuum of engagement may range from consultation to involvement and to

partnership and shared leadership, across various levels, including direct care, organizational design and governance, or policy-making. <sup>26</sup>

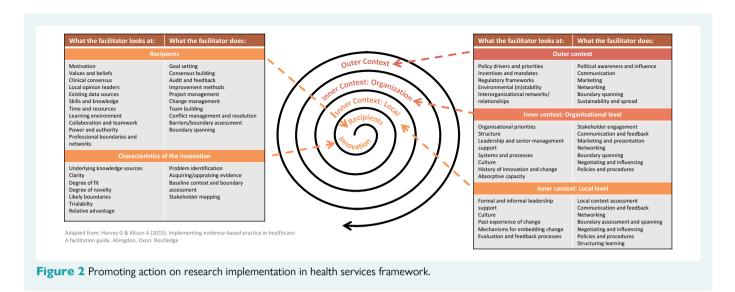
In the KT Corner, within the established framework of the EJCN Science for Patients series and our ongoing collaboration with the European Society of Cardiology Patient Forum, one of our objectives will be to identify methods to enhance the accessibility of KT science for all stakeholders and explore opportunities for partnering with patients and the public to develop and embed evidence in practice.

# Strengthening knowledge translation: the added value of intersectionality

Leveraging the partnership with patients and the public to strengthen KT science and activities can be further bolstered by adopting an intersectional perspective. Intersectionality is an analytical tool of value to applied disciplines with strong ethical values in social justice and the pursuit of social and health equity. <sup>27</sup> It broadens the discussion on the influence of social determinants of health in health equity to a more informed understanding of the roots of these observed differences in the health of individuals, peoples, and groups. As an analytic lens, intersectionality demands a recognition of the web of systems of power (i.e. racism, sexism, cisheteronormativity, classism, ageism, colonialism, and other forms of discrimination) that particular individuals experience, placing them at risk of, or leading to, social and health inequities. <sup>28</sup> The focus of intersectionality is on the explicit examination of the multiple and interlocking systems of power that underlie inequities and the development of upstream solutions to redress social and health injustices.

There is an increasing interest in embedding intersectionality in KT. In Canada, the CIHR Institute of Gender and Health has been at the

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forefront of a paradigm shift in sex and gender considerations in research and KT, opening a window of possibility for adopting intersectionality in implementation science. Yet, researchers face challenges in operationalizing intersectionality in research and KT activities, in spite of the emergence of resources. <sup>27,29</sup> There is a risk of interpreting current guidance as 'cookbook recipes', reducing the inherent complexity of this shift in thinking and scientific inquiry to a researcher's tick box list. To address this, we move away from these guides to focus on a variety of the second sec

list. To address this, we move away from these guides to focus on a value that ought to be foundational to the cardiovascular nursing and allied health community interested in exploring intersectionality in KT: critical reflexivity.

Critical reflexivity in KT is an ongoing process of awareness, reflection, and action of one's values and beliefs influenced by various systems of power and their implications in the ways people interpret the world and conduct research.<sup>30</sup> Power and positionality ask the researcher to reflect on their lived experiences, their experiences of privilege, discrimination, and oppression, and how such experiences have shaped beliefs, assumptions, relationships with others, and decisions throughout the research process. For instance, questions such as 'Whose voices are represented or excluded in the KT process and why?', 'What barriers and systems of power do individuals face or are at risk of, due to their positionality?', and 'How are we mitigating these barriers and levelling the power differentials throughout the KT process?' may prompt researchers to move beyond individual reflections and consider interpersonal relations and the impact of existing systems and structures to contribute to advance implementation science. While some researchers have paved the way in re-conceptualizing KT models, theories, and frameworks in light of intersectionality, 31,32 there are ample opportunities to advance implementation science in this regard.

### Knowledge translation research done well: examples from the EJCN

Within the *EJCN*, there have been several studies highlighting the opportunities, challenges, and values of conducting KT research in the field of cardiovascular care. Focus has primarily been on understanding the potential barriers and facilitators to implementation of a new or existing innovation and how implementation strategies can be used to facilitate uptake of the innovation in a contextually appropriate way. The first example is the study by Strachan *et al.*<sup>33</sup> where the authors, in collaboration with stakeholders, identified the need for an intervention to facilitate appropriate end-of-life care for heart failure patients. Their

aim was to develop an evidence-based and user-friendly tool to facilitate a palliative care approach for this patient population. Using the K2A framework, <sup>12,20</sup> the investigators identified several contextually specific barriers and facilitators towards the implementation of this knowledge: a lack of a common language to discuss end-of-life issues and the need for a simple and time-effective tool for nurses with varying degrees of clinical specialization to use in practice. The authors highlighted that the benefit of using a KT framework was the emphasis on a collaborative approach in the development phase. This was essential in developing an innovation that addressed issues geared to implementation as well as promoting receptivity of the innovation by users.

The second example describes a quality improvement project of an accelerated discharge process following percutaneous coronary intervention for patients presenting with non-ST elevation acute coronary syndromes, performed by Slone et al. 34 In this study, the authors describe that, although there is growing evidence of the safety, costeffectiveness, and increased patient satisfaction associated with an accelerated discharge process, implementation of this knowledge in practice is scarce. Also guided by the K2A framework, the study employed a peer-coaching programme as their main implementation strategy and selected both clinical and implementation outcomes to measure the impact and success of their KT project. The results showed that, although patients' total length of stay did not decrease, complications and readmission rates were unchanged, and the providers' utilization of the discharge process increased four-fold. Thus, the strategy proved effective in implementing an innovation into practice that resulted in patient safety and improved adoption of the discharge process.

### Challenges and opportunities of knowledge translation

These examples illustrate that there is much more to the activities of KT practice and science than the evidence to be implemented. The relationship between knowing and doing relies on people (the knowledge producers, knowledge users, or those who simultaneously hold both roles), the interactions between them, and the organizational, social, and political contexts in which healthcare is provided, all of which are tremendously complex and dynamic. For a successful uptake of relevant and usable evidence, it is increasingly recognized that KT relies on the application of KT principles in the entire research process—from crafting the research

question to the dissemination and implementation of the findings—through purposeful partnered action between knowledge users and researchers as equal members of the research team. Depending on where one is situated geographically or philosophically, this approach can be referred to integrated KT, research co-production, participatory research, collaborative research, and citizen science, among others. Further, KT relies on the deliberate and thoughtful tailoring of the evidence to desired audiences (e.g. end-of-grant/project KT).

Establishing, nurturing, and managing the relationships necessary for partnered approaches can be challenging. First, identifying team members through inclusive recruitment with diverse representation across identity, lived experiences, roles, expertise, career stages, and skillsets can be difficult. Bringing diverse people together to work towards a common goal can help mitigate risk, yet it requires significant time, resources, and effort. Often, the activities needed for meaningful engagement are not built into project timelines or acknowledged by funding agencies that mainly provide support for shorter term projects. 37

Second, the diverse expertise, interests, and motivations represented by various stakeholders may give rise to moments of discomfort and disagreement. For example, Lewis et al. 38 highlighted an instance where a patient's own personal story involving a significant emotional account did not align with the research evidence. Some participants hinted that the situation devalued the role of scientific evidence. Working through these situations collectively as they arise, legitimizing the differing forms of knowledge shared by all stakeholder groups including experiential knowledge, may be more advantageous in the longterm. Third, point-of-care clinicians bring clinical and context expertise, given their intimate involvement and understanding of the implementation climate. This increases researchers' understanding of the context and needs, enhancing the relevance of the research. But despite these gains, absenteeism and attrition may occur, particularly given high turn-over rates of health system staff. <sup>39,40</sup> Engaging patient partners, too, can be empowering; yet, it is critical to be aware of power imbalances among patients, researchers, and other team members, how these imbalances are playing out in these relationships, and the evolving dynamics. 30,36 For patient partners, health status can also affect their capacity for sustained engagement, with some needing to step away from their roles due to progressive or exacerbated illness and associated physical and cognitive limitations. 41,42 Despite the availability of appropriate accommodations and supports to address stakeholders' needs, some may need to withdraw. This may require renewed searches for new partnerships, inevitably bringing in new ideas and perspectives, which may or may not align with work achieved to date.<sup>38</sup> Regardless of turnover, co-partnered projects are inherently iterative and evolving given the dynamic teams and environments in which such research is conducted.

Finally, challenges related to the accurate measurement of collaborative research endeavours, including impact of KT approaches, remain. <sup>43</sup> Most of what is known at the present time are proximal, descriptive, and experiential process outcomes; outcomes and impacts of health research partnerships are specifically lacking. <sup>44</sup> This is in keeping with Mrklas et al.'s <sup>45</sup> recent systematic review that identified 58 empirically evidenced tools for the assessment of health research partnership, the majority of which focuses on measures of process (n = 55; 95%), rather than outcomes (n = 30; 52%) or both outcomes and impacts (n = 26, 45%). More research is needed; yet, in the meantime, the authors suggest research teams wishing to embark on measurement work develop partnerships with KT experts and select the tool(s) that best align with their intended goals.

Although it may be easy to feel overwhelmed by these challenges, opportunities abound. Deliberate KT planning as a team can be a valuable exercise to reflect upon the main message(s) that need to be shared, the audience/knowledge users who ought to benefit from the message, and KT activities that will help achieve desired goals. A variety of formats and strategies are available to tailor the evidence to its intended audience, depending on context and resources, for greatest impact. 46,47 Prior to project launch, equipping teams and individuals

leading and working within inclusive teams with KT skills and competencies could enhance readiness for collaborative and meaningful (nontokenistic) engagement. Training and education in the core competencies for KT, including knowledge (e.g. of context, research process, evidence-based practices), skills (e.g. collaboration and teamwork, leadership, knowledge synthesis, use and dissemination of findings), and attitudes (e.g. confidence, trust, self-directed learning, towards teamwork) will help foster new generations of diverse scientists and partners.8 Hands-on training, education, mentorship opportunities, and organizational support may be useful for all engaged collaborators to ensure that expectations, discussions, and activities are communicated in a language, tone, and manner that is accessible to everyone. In fact, the number and availability of resources and toolkits for engaging stakeholders on research teams are growing. For example, the CIHR<sup>4</sup> and the Ontario Strategy for Patient-Oriented Research SUPPORT Unit offer training and resources, many of which are tailored to researchers, patients, clinician scientists, or policy-makers. 49 Further, attention should be drawn to offering learning opportunities for trainees, 50 early career researchers, 51 and clinicians 52 to develop KT skills, competencies, and confidence to build, manage, and sustain relationships and communicate their research findings as an essential part of their training and clinical practice. Finally, achieving sustainability of research partnerships in evolving and complex contexts merits further scrutiny to achieve the objectives of KT.5

#### **Conclusions**

In this paper, we launch the EJCN KT Corner with the aim of improving patient outcomes, implementing effective and sustained health services, and promoting equity. Expertise in providing complex care and facilitating effective processes positions nurses and allied health professionals—the largest healthcare workforce—to play an essential role across the continuum ranging from the *activities of KT* to the *science of KT* to help close the research to practice gap.

The EJCN KT Corner aims to champion KT research and equip clinicians, policy-makers, scientists, and other knowledge producers and users to be KT leaders. We share a vision to build capacity to accelerate the adoption of patient-centred, evidence-based practice. Together, we can contribute to strengthening KT research and building scientific competencies to make the EJCN a powerhouse that moves evidence 'off the shelves, and onto the streets'.

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### Data availability

Not applicable.

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