Knowledge Translation (KT) and Health Technology Reassessment (HTR): Unravelling the Black Box

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CADTH Symposium 2019
Disclosure

We have no actual or potential conflict of interest in relation to this topic or presentation.
What is the problem?

Underused & highly beneficial, clinical- and cost-effective

Overused/misused & unnecessary, NOT clinical- and/or cost-effective
Why is this a problem?

- Harmful to patients
- High-quality, evidence-based care
- Scarce healthcare dollars
- Headroom for innovation & high value care
How big is the problem?

Unnecessary care in Canada

- Wastes health system resources
- Increases wait times for patients
- Can lead to patient harm

Canadians have 1 million+ potentially unnecessary medical tests and treatments each year.

Up to 30% of patients indicated in the 8 selected Choosing Wisely Canada recommendations had tests, treatments and procedures that are potentially unnecessary.

There is room to reduce unnecessary care.

Substantial variation exists among regions and facilities in terms of the number of unnecessary tests and procedures performed — this points to an opportunity to improve.

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Health Technology Assessment Unit
O’Brien Institute for Public Health
Health Technology Reassessment (HTR)

• Structured, evidence-based assessment of the medical, economic, social and ethical impacts of a health technology (e.g., drug, device, test, procedure, etc.) currently used in the healthcare system, to inform its optimal use in comparison to its alternatives

(Noseworthy & Clement, 2012)
Conceptual model for HTR

(Soril et al., 2017)
What’s in a name?

*disinvestment: partially or completely withdrawing healthcare resources

*de-adoption or de-implementation: changes at the clinical practice level

(Niven et al., 2015)
Clarifying Terminology

- **Disinvestment:** The processes of (partially or completely) withdrawing health resources from currently funded areas that provide little benefit for their cost (Elshaug, 2009)

- **De-implementation:** use of low-value care is reduced or stopped in a planned process (van Bodegom-Vos, 2017)

- **De-adoption:** discontinuation or rejection of a clinical practice after it was previously adopted (Rogers, 2003).
Outcomes: achieving the change, not achieving the change, remaining at status quo

Outputs: increased use or adoption, decreased use, no change, de-adoption of the technology

Conceptual model for HTR

(Soril et al., 2017 SAGE Open Med)
So how can we mobilize HTR outputs?

► Field of KT

► KT has been used effectively to implement new interventions into clinical practice

► Can it be used for HTR?
Understanding Knowledge Translation
Terms for Knowledge Translation
KT has Many Names

- Knowledge management, knowledge mobilization, K*

- Also known as effectiveness research, patient oriented research

- UK: implementation science or research utilization

- US: dissemination, diffusion, research use, knowledge transfer and uptake

- Canada: knowledge transfer and exchange, and knowledge translation
Knowledge translation is a **dynamic** and **iterative** process that includes the **synthesis**, **dissemination**, **exchange**, & **ethically sound application** of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the healthcare 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 (Graham, 2010).
Why Study it?

- Mechanism for determining how the two are linked
- How KT approaches can be used in the translation of HTR outputs
  - Leading to optimal care for patients
  - Fewer wasted resources
- Illuminate the understanding of the KE and utilization function of HTR model
## Barriers and Facilitators to KT in the context of HTR

<table>
<thead>
<tr>
<th>WHO Category*</th>
<th>Barriers</th>
<th>Facilitators</th>
</tr>
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<tbody>
<tr>
<td>Climate and Context</td>
<td>Physicians are reluctant to dismiss outmoded devices</td>
<td>Use of clinical champions</td>
</tr>
<tr>
<td>Linkage and Exchange</td>
<td>Lack of a well planned strategy for implementation that engages all stakeholders</td>
<td>Broad and early stakeholder engagement</td>
</tr>
<tr>
<td>Research Evidence, HTR process, resources/timelines</td>
<td>Lack of relevant evidence of the technology itself</td>
<td>Good evidence base for the identification and recommendations</td>
</tr>
<tr>
<td>Role of Researchers and HTR</td>
<td>Difficulty in communicating with a variety of audiences</td>
<td>Capacity building in KT and change management</td>
</tr>
<tr>
<td>Role of Stakeholders, Knowledge users, and the health system in HTR, skills and expertise</td>
<td>Lack of resources and human resources to support HTR</td>
<td>Decision makers need to understand the HTR process and provide support</td>
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</tbody>
</table>

*World Health Organization’s classification of barriers and facilitators, WHO, 2012*
PhD Research Question

Employing a health systems perspective, this project will study and determine how KT approaches are used to translate HTR outputs to achieve the desired outcomes?
Methodological Approach

- Multiple methods
  - Systematic review of KT Theories, Models, Frameworks (TMFs)
  - Modified Delphi Process for expert validation (underway)
  - Key informant interviews
What is a Theory, Model, Framework?

Theory: a set of analytical principles or statements designed to structure our observation, understanding and explanation of the world

Model: a deliberate simplification of a phenomenon or a specific aspect of a phenomenon

Framework: usually denotes a structure, overview, outline, system or plan consisting of various descriptive categories

Nilsen P, 2015
Many KT theories, models, frameworks

- Tabak et al (2012)-61 dissemination and implementation research theories, models, and frameworks

- Locker et al (2015)-51 classification schemes (23 taxonomies, 15 frameworks, eight intervention lists, three models and two other approaches) on KT interventions that could be used to integrate evidence into practice

- Milat et al (2017)-found 41 different frameworks and models from 98 papers with a focus on research translation frameworks

- Strifler et al (2018)-limited to models, theories and frameworks used in cancer and chronic disease management and prevention, searched 305 KT theories, models and frameworks, and identified 159 articles that met the inclusion criteria of the review
  - Identified 26 full-spectrum KT theories, models, frameworks
Full-Spectrum TMF

Consist of all four KT phases:

- planning/design (identifies a knowledge gap, engages stakeholders, develops an intervention),
- implementation,
- evaluation, and
- sustainability/scalability

Strifler et al, 2018
Full-Spectrum KT Theories, Models, Frameworks

Esmail et al (unpublished, 2018)
Internal Committee Review of 36 TMFs

3-Round Modified Delphi Process (2 HTR/KT experts, 2 KT experts, 1 HTR expert)

Third Round - Application of criteria:

- Face validity (KT theories, models, or frameworks that are common and well-known should be included)
- Active KT theories, models, or frameworks (passive KT theories, models, or frameworks were excluded)
- Feasible to apply to take something out of practice
- Pragmatic (theoretical KT theorises, models, or frameworks were excluded)
- Specific (vague or those that were not prescriptive were excluded)
- Could build on other KT theories, models, or frameworks but needed to be generic rather than for a specific context
- Easily understood and practical
Potential List of 16 KT TMFs for HTR

- Classic Theory=1
  - Diffusion of Innovations (Rogers, 3rd Edition, 1983)

- Frameworks=2
  - Consolidated Framework for Implementation Research (CFIR) (Damschroder, 2009)
  - Reach Effectiveness Adoption Implementation Maintenance (RE-AIM) (Glasgow, 1999)

- Fits both Model/Framework=1
  - Evidence-Driven Community Health Improvement Process (EDCHIP) (Layde, 2012)

- Process Models=12
# Potential KT Process Models for HTR

<table>
<thead>
<tr>
<th>KT Models</th>
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<tbody>
<tr>
<td>Stages of Research Evaluation (Nutbeam, 2006)</td>
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<tr>
<td>Knowledge-to-Action (KTA) (Graham, 2006)</td>
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<tr>
<td>Quality Implementation Framework (Meyers, 2012)</td>
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<tr>
<td>Western Australia (WA) Health Network Policy Development and Implementation Cycle (Briggs, 2012)</td>
<td></td>
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<tr>
<td>Collaborative Model for Achieving Breakthrough improvement (Institute for Healthcare Improvement, 2003)</td>
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<tr>
<td>Healthcare Improvement Collaborative Model (Edward, 2017)</td>
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</table>
## Potential KT Process Models for HTR

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<th>KT Models</th>
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<tbody>
<tr>
<td>Co-KT framework (Kitson, 2013)</td>
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<tr>
<td>Plan-Do-Study-Act (PDSA) Cycles (Deming, 1986)</td>
</tr>
<tr>
<td>A Staged Model of Innovation Development and Diffusion of Health Promotion Programs (Oldenburg, 1996)</td>
</tr>
<tr>
<td>CollaboraKTion framework (Jenkins, 2016)</td>
</tr>
<tr>
<td>KT framework for Agency for Healthcare Research and Quality (AHRQ) patient safety portfolio and grantees (Nieva, 2005)</td>
</tr>
<tr>
<td>Design Focused Implementation Model (Ramaswamy, 2018)</td>
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</table>
Modified Delphi Process

- 22 International Experts (11 KT and 11 HTR)
- Countries: Canada, US, UK, Australia, Germany, Spain, Italy, and Sweden
- Round 1: Survey of 16 KT Theories, Models, Frameworks (Jan to March 2019)
Survey Questions for each KT Theory, Model, Framework

- Familiarity
- Logical Consistency/Plausibility
- Degree of specificity
- Accessibility
- Ease of use
- HTR Suitability
Next Steps

- Complete analysis of Round 1
- Round 2: Key Informant Interviews with experts
- Identification of key constructs/attributes/elements of a KT theory, model, or framework for HTR
Acknowledgments

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Committee members:
Dr. Jayna Holroyd-Leduc
Dr. Daniel Niven
A little knowledge that acts is worth infinitely more than much knowledge that is idle.

Khalil Gibran
Is Health Technology Reassessment Clinically Relevant?

CADTH – April 15, 2019
Objective – Tell You a Clinical Story of HTR

- Patient case to ground us in clinical reality

- Share lessons learned
  - Passive diffusion of knowledge is ineffective
  - Focus on reproducible science
  - Test effectiveness
Lesson #1

Passive Diffusion of Knowledge is Ineffective
Original Investigation | LESS IS MORE

Effect of Published Scientific Evidence on Glycemic Control in Adult Intensive Care Units

Daniel J. Niven, MD, MSc; Gordon D. Rubenfeld, MD, MSc; Andrew A. Kramer, PhD; Henry T. Stelfox, MD, PhD

IMPORTANT Little is known about the deadoption of ineffective or harmful clinical practices. A large clinical trial (the Normoglycemia in Intensive Care Evaluation and Survival Using Glucose Algorithm Regulation [NICE-SUGAR] trial) demonstrated that strict blood glucose control (tight glycemic control) in patients admitted to adult intensive care units (ICUs)

OBJECTIVE To evaluate glycemic control in critically ill patients before and after the publication of clinical trials that initially suggested that tight glycemic control reduced mortality (Leuven I) but subsequently demonstrated that it increased mortality (NICE-SUGAR).
The Tale of Tight Glycemic Control

- Intensive Insulin Therapy in Critically Ill Patients
  - Single center RCT
  - N = 1,548
  - NNT = 29 (survival)

- Intensive versus Conventional Glucose Control in Critically Ill Patients
  - Multi-center RCT
  - N = 6,104
  - NNH = 38 (death)
Tight Glycemic Control

Proportion ICU Admissions with Tight Glycemic Control (%)

Study Quarter

Leuven I
NICE-SUGAR
Lesson #2

Focus on Reproducible Science
A few years back, scientists at the biotechnology company Amgen set out to replicate 53 landmark studies that argued for new approaches to treat cancers using both existing and new molecules. They were able to replicate the findings of the original research only 11 percent of the time.

*Science has a reproducibility problem.* And the ramifications are widespread.
Inconsistent Scientific Findings

Contradicted and Initially Stronger Effects in Highly Cited Clinical Research

RESEARCH LETTERS

ONLINE FIRST | LESS IS MORE

The Frequency of Medical Reversal

A Decade of Reversal: An Analysis of 146 Contradicted Medical Practices

Vinay Prasad, MD; Andrae Vandross, MD; Caitlin Toomey, MD; Michael Cheung, MD; Jason Rho, MD; Steven Quinn, MD; Satish Jacob Chacko, MD; Durga Borkar, MD; Victor Gall, MD; Senthil Selvaraj, MD; Nancy Ho, MD; and Adam Cifu, MD

Time to Reproduction of Research

- No reproduction attempt
- Reproduction attempt & consistent results
- Reproduction attempt & inconsistent results

Cumulative Percent of Practices

Time since original study (years)
Risk of the Oscillating Science
Lesson #3

Test Effectiveness
Efficacy is Not Enough
Critical Care in Alberta

- 4 million residents
- 7 cities
- 201 med-surg ICU beds
- 5 beds per 100,000
- $300 million annually
Prevent Blood Clots

Unfractionated Heparin

Low Molecular Weight Heparin
Interventions
Intervention & Process Change

1. EDUCATION – Site visits, newsletter, meeting presentations, and grand rounds
2. REMINDER – Prescribing pocket cards and LMWH stickers tagged on ICU computers
3. REMINDER – resident paging if UFH is ordered for a patient instead of LMWH
4. EDUCATION – Research seminar to frontline providers and decision makers
5. AUDIT & FEEDBACK – Zone report to frontline providers and decision makers
<table>
<thead>
<tr>
<th>Clinical Outcomes</th>
<th>Ratio of Odds Ratios (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous thromboembolism</td>
<td>1.13 (0.51–2.46)</td>
<td>0.77</td>
</tr>
<tr>
<td>Deep vein thrombosis</td>
<td>1.04 (0.39–2.77)</td>
<td>0.93</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>1.31 (0.57–3.01)</td>
<td>0.52</td>
</tr>
<tr>
<td>Major bleeding</td>
<td>1.22 (0.97–1.54)</td>
<td>0.09</td>
</tr>
<tr>
<td>Death</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>0.94 (0.75–1.18)</td>
<td>0.58</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.02 (0.77–1.34)</td>
<td>0.90</td>
</tr>
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Intervention Better | Control Better
# Healthcare Utilization Effects

<table>
<thead>
<tr>
<th>Healthcare utilization</th>
<th>Ratio of Mean Ratios (95% CI)</th>
<th>p–value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of stay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>1.05 (0.96–1.15)</td>
<td>0.25</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.10 (0.94–1.29)</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Actual costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>1.05 (0.90–1.23)</td>
<td>0.54</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.09 (1.00–1.20)</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Modelled costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>1.04 (0.97–1.11)</td>
<td>0.29</td>
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<tr>
<td>Hospital</td>
<td>1.05 (0.95–1.17)</td>
<td>0.34</td>
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</table>
Care will not change on its own

Focus on technologies with reproducible science

Test effectiveness – efficacy is not enough
Acknowledgements

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- Alberta Innovates
- CIHR
- NCE
Major barriers for HTR

1. Engagement across multiple levels of the healthcare system
2. Difficulty identifying and prioritizing low value care
3. Little guidance and/or methods for implementation

(Sevick et al., 2017; Elshaug et al., 2007; Daniels et al., 2013; Rooshenas et al., 2015; Schlesinger and Grob, 2017)
SOLUTION 1

SOLUTION 2

SOLUTION 3
Pick the team to win

Patients, community, civil society organisations
- Present and past patients and the wider public; represented as individuals or groups (e.g., patient advocacy groups with experience with technology)

Clinical professionals
- Individuals involved in the care of patients and use of the technology; represented as individuals or in groups by clinical professional associations

Industry representatives
- Includes technology manufacturers, pharmaceutical industry, and industry union

System leaders
- Administrators and executives in arm's-length (e.g., safety and health quality commissions) or non-government organisations, and third party payers or insurers

Government policy-makers
- Elected officials (e.g., Ministers of Health) at the regional (e.g., municipal, provincial, state) or federal levels

Academic and other researchers
- With expertise in health technology assessment, health economics, health services research, epidemiology, implementation science
Understand the playing field

What is the role of the government and other third party payer/s?

Who is covered and how is it financed including any rules/limits?

How is the delivery system organized and financed?

What important political forces or issues need to be considered?

What assets are at your disposal?

- Health data sources
- Human resources
- Funding
A Data-Driven Prioritization Process

1. Technology Selection
   - Identification
   - Prioritization

- Data-driven
- Routine & replicable
- Stakeholder collaboration
- Actionable
- High return on investment
Things not to Do....

- In-hospital admissions (DAD)
- Physician claims
- Laboratory data
Pilot tested in British Columbia
THE HTR PLAYBOOK

A HOW-TO GUIDE FOR PLANNING YOUR HEALTH TECHNOLOGY REASSESSMENT INITIATIVE

1. The Stats & Projections
2. The Team
3. The Playing Field
4. Offensive Plays
5. Defensive Plays
6. Winning the Game
Final reflections