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

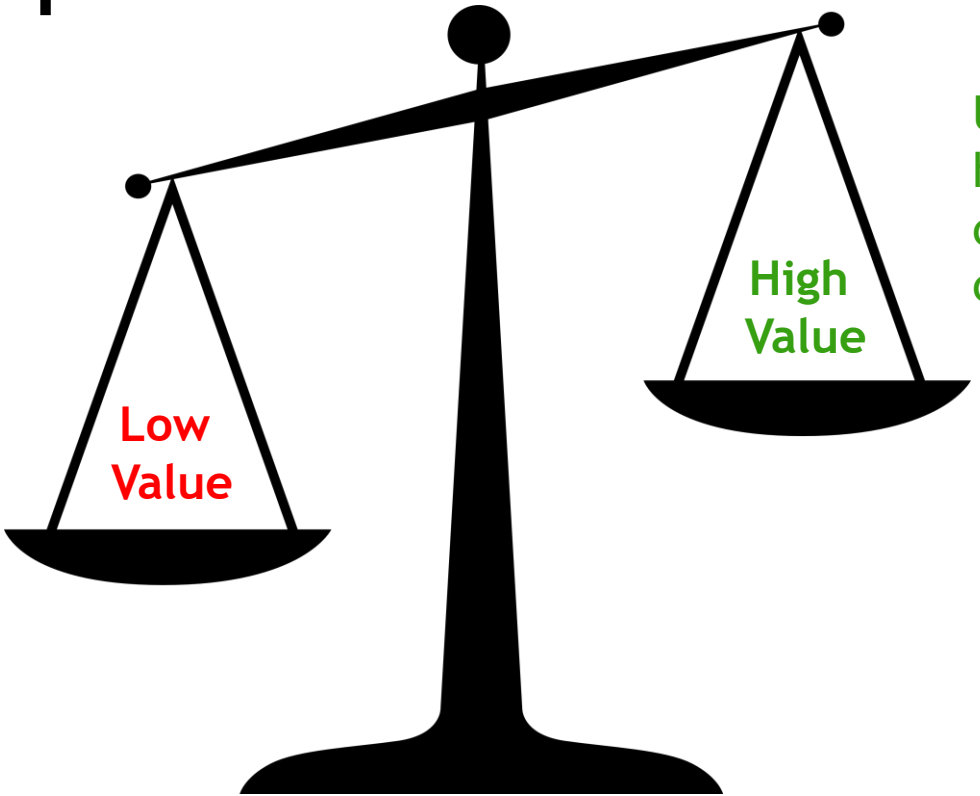
Rosmin Esmail, PhD Candidate
Dr. Tom Stelfox
Dr. Fiona Clement
University of Calgary
April 15, 2019
CADTH Symposium 2019

Health Technology Assessment Unit
UNIVERSITY OF CALGARY
O'Brien Institute for Public Health

Disclosure

We have no actual or potential conflict of interest in relation to this topic or presentation.

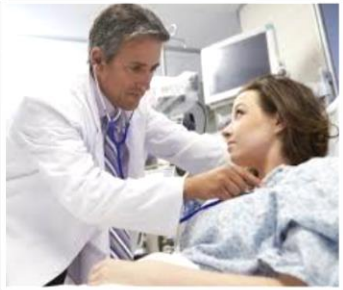
What is the problem?



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.

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.**

cihi.ca

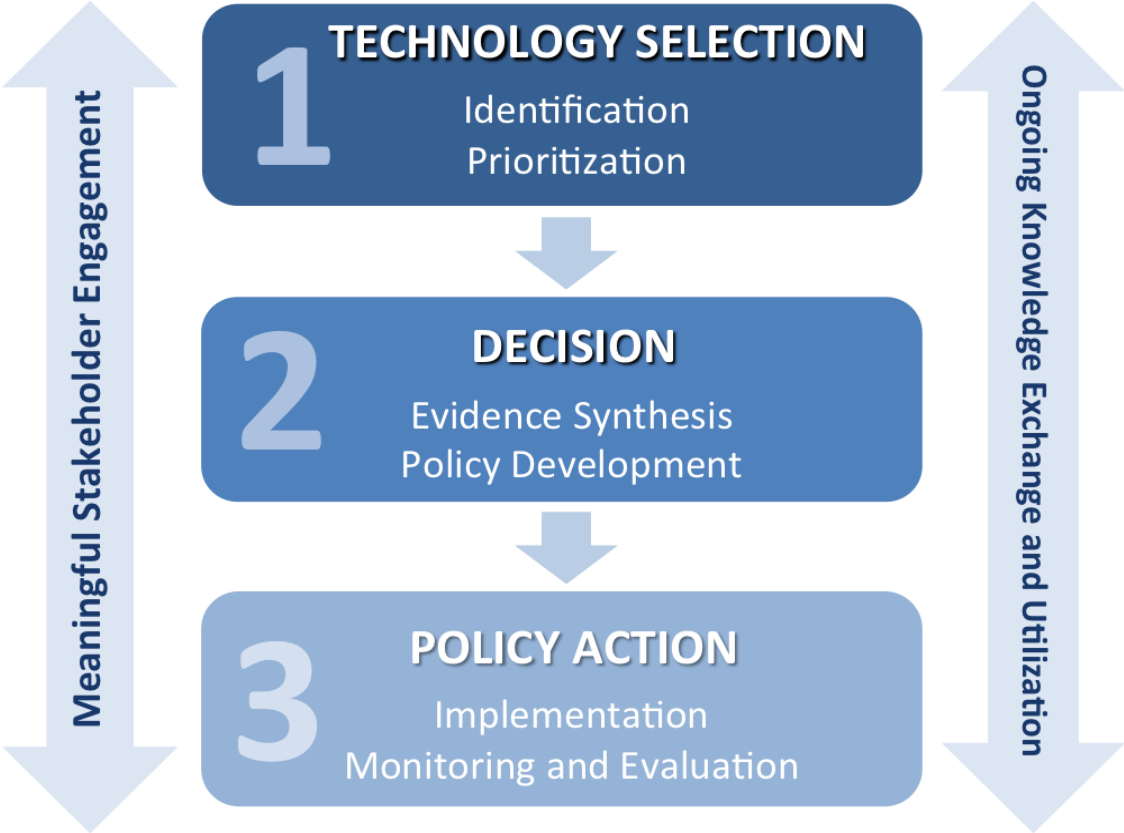
Health Technology Reassessment (HTR)

- 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**

withdrawing
redeploying
disadoption
defunding
refute
value
substitutional
reallocation
implement
inappropriate
health
withdraw
reduc
change
invest
commission
reversal
medical
resources
release
prioritization
remov
obsole
reassess
ineffective
disinvest
misuse
based
resource
technology
decline
decrease
adopt
appraisal
service
redeploy
discontinu
redesign
replace
contradict
intervention
evidence
relinquish
practice
clinical
reassessment
reinvestment

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

(Niven et al., 2015)

UNIVERSITY OF CALGARY

Clarifying Terminology

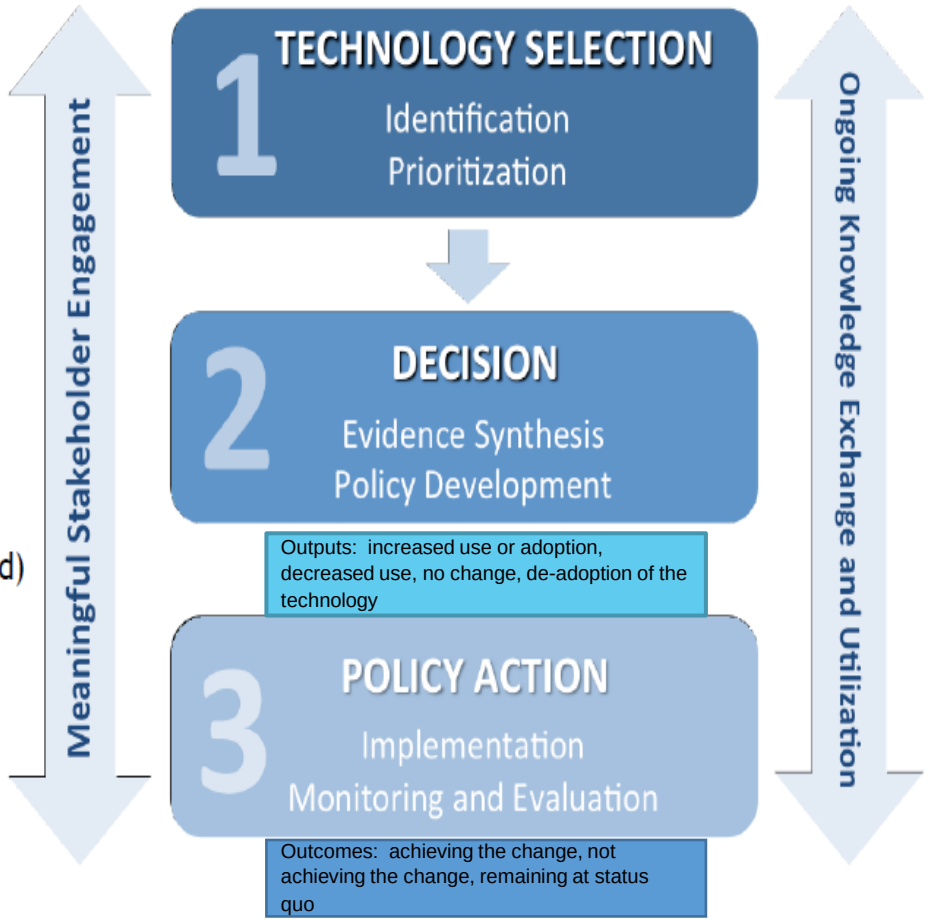
Outputs

- **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).

UNIVERSITY OF CALGARY

Conceptual model for HTR

(Soril et al., 2017 SAGE Open Med)



UNIVERSITY OF CALGARY

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?

UNIVERSITY OF CALGARY

Understanding Knowledge Translation

UNIVERSITY OF CALGARY

Terms for Knowledge Translation

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY

CIHR definition (part 1)

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.

UNIVERSITY OF CALGARY

CIHR definition, (part 2)

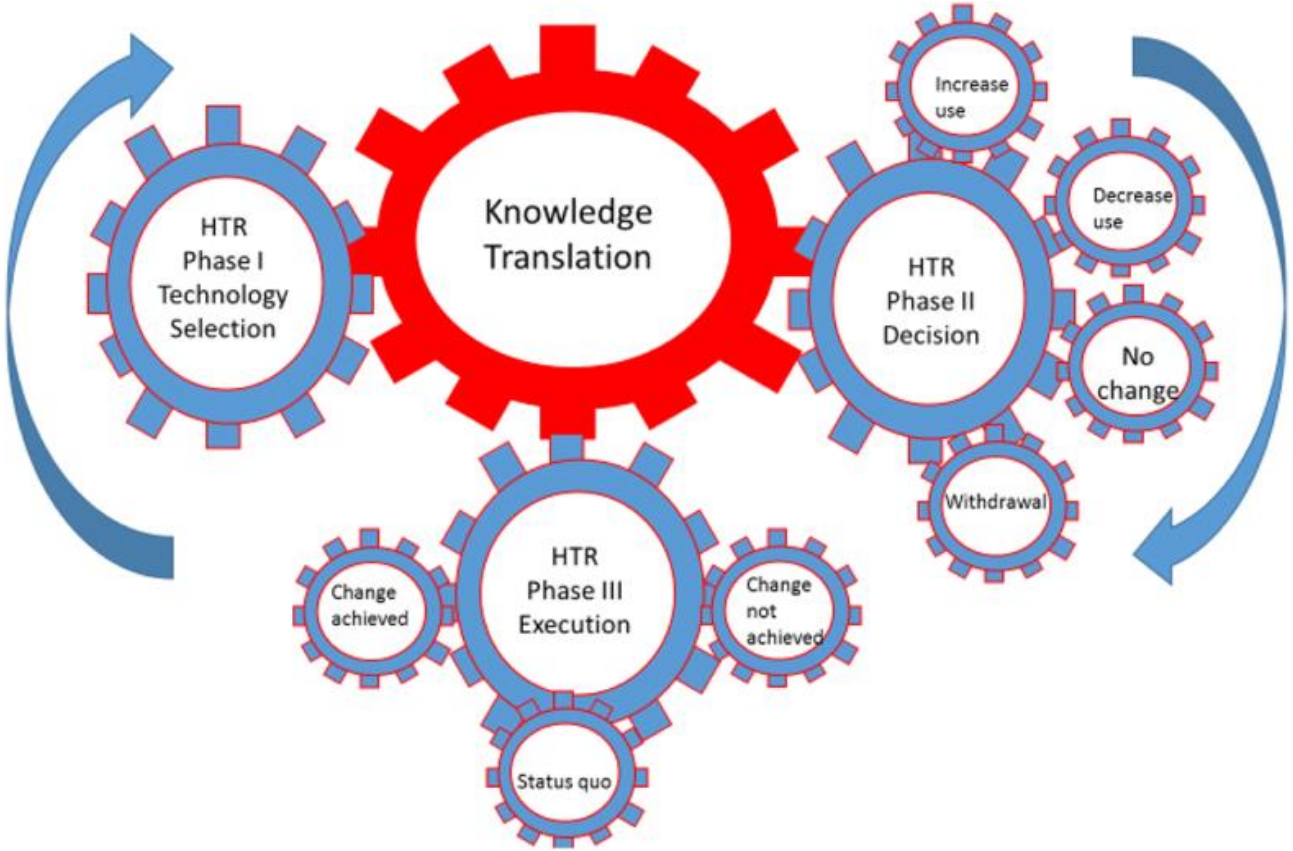
This process takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user (Graham, 2010).

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY



Esmail R et al, 2018 **Knowledge translation and health technology reassessment: identifying synergy.** BMC Health Services Research 201818:674https://doi.org/10.1186/s12913-018-3494-y

UNIVERSITY OF CALGARY

Barriers and Facilitators to KT in the context of HTR

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

*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?

UNIVERSITY OF CALGARY

Methodological Approach

- Multiple methods
  - Systematic review of KT Theories, Models, Frameworks (TMFs)
  - Modified Delphi Process for expert validation (underway)
  - Key informant interviews

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY

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

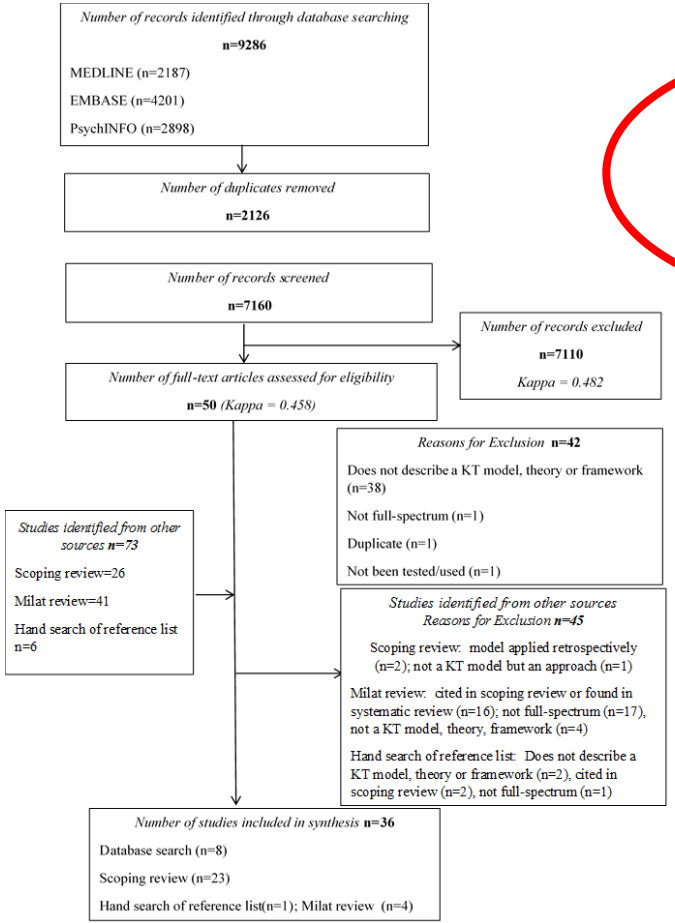
Consist of all four KT phases:

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

Strifler et al, 2018

UNIVERSITY OF CALGARY

Full-Spectrum KT Theories, Models, Frameworks



36 Full-Spectrum KT Theories, Models, Frameworks

Esmail et al (unpublished, 2018)

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY

Potential KT Process Models for HTR

KT Models
Stages of Research Evaluation (Nutbeam, 2006)
Knowledge-to-Action (KTA) (Graham, 2006)
Quality Implementation Framework (Meyers, 2012)
Western Australia (WA) Health Network Policy Development and Implementation Cycle (Briggs, 2012)
Collaborative Model for Achieving Breakthrough improvement (Institute for Healthcare Improvement, 2003)
Healthcare Improvement Collaborative Model (Edward, 2017)

Potential KT Process Models for HTR

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

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)

UNIVERSITY OF CALGARY

Survey Questions for each KT Theory, Model, Framework

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

UNIVERSITY OF CALGARY

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

UNIVERSITY OF CALGARY

Acknowledgments

Supervisors:

Dr. Fiona Clement

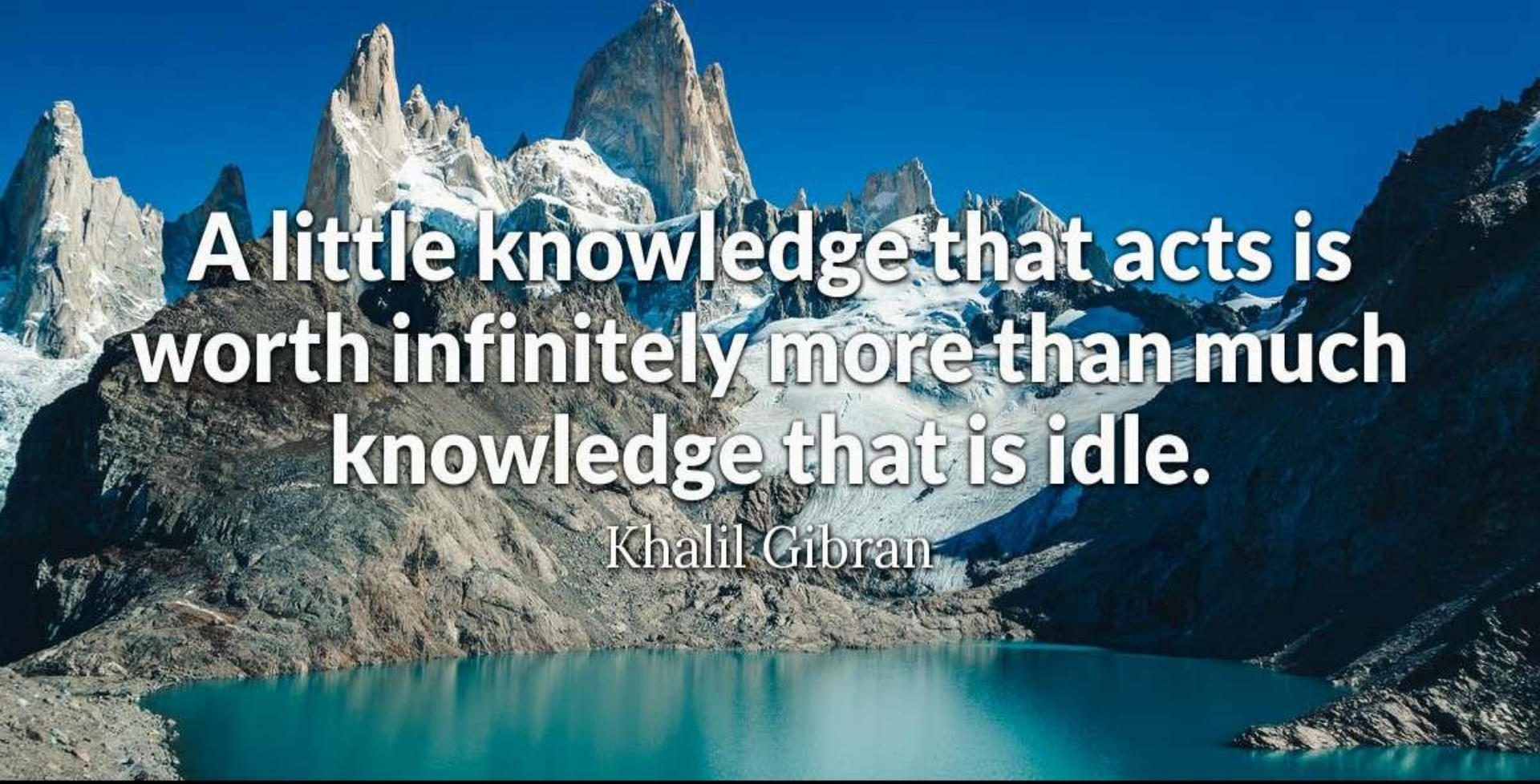
Dr. Heather Hanson

Committee members:

Dr. Jayna Holroyd-Leduc

Dr. Daniel Niven

UNIVERSITY OF CALGARY



Is Health Technology Reassessment Clinically Relevant?

CADTH – April 15, 2019

Objective – Tell You a Clinical Story of HTR

Institute for Public Health

- Patient case to ground us in clinical reality
- Share lessons learned
  - Passive diffusion of knowledge is ineffective
  - Focus on reproducible science
  - Test effectiveness

Institute for Public Health

Lesson #1

Passive Diffusion of Knowledge is Ineffective

Research

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

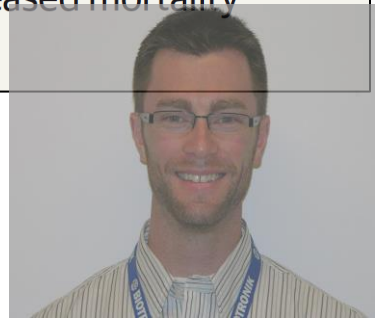
IMPORTANCE Little is known about the deadoption of ineffective or harmful clinical practices. A large clinical trial (the Normoglycemia in Intensive Care Evaluation and Survival Using Glucose Algorithm Regulation [NICE-SUGAR] trial) demonstrated that strict blood glucose control (tight glycemic control)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

Invited Commentary

Related articles

Supplemental content at jamainternalmedicine.com

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).



JAMA Intern Med 2015; 175: 801-09

The Tale of Tight Glycemic Control

Institute for Public Health

INTENSIVE INSULIN THERAPY IN CRITICALLY ILL PATIENTS

GREET VAN DEN BERGHE, M.D., PH.D., PIETER WOUTERS, M.SC., FRANK WEEKERS, M.D., CHARLES VERWAEST, M.D., FRANS BRUYNINCKX, M.D., MIET SCHETZ, M.D., PH.D., DIRK VLASSELAERS, M.D., PATRICK FERDINANDE, M.D., PH.D., PETER LAUWERS, M.D., AND ROGER BOUILLON, M.D., PH.D.

- Single center RCT
- N = 1,548
- NNT = 29 (survival)

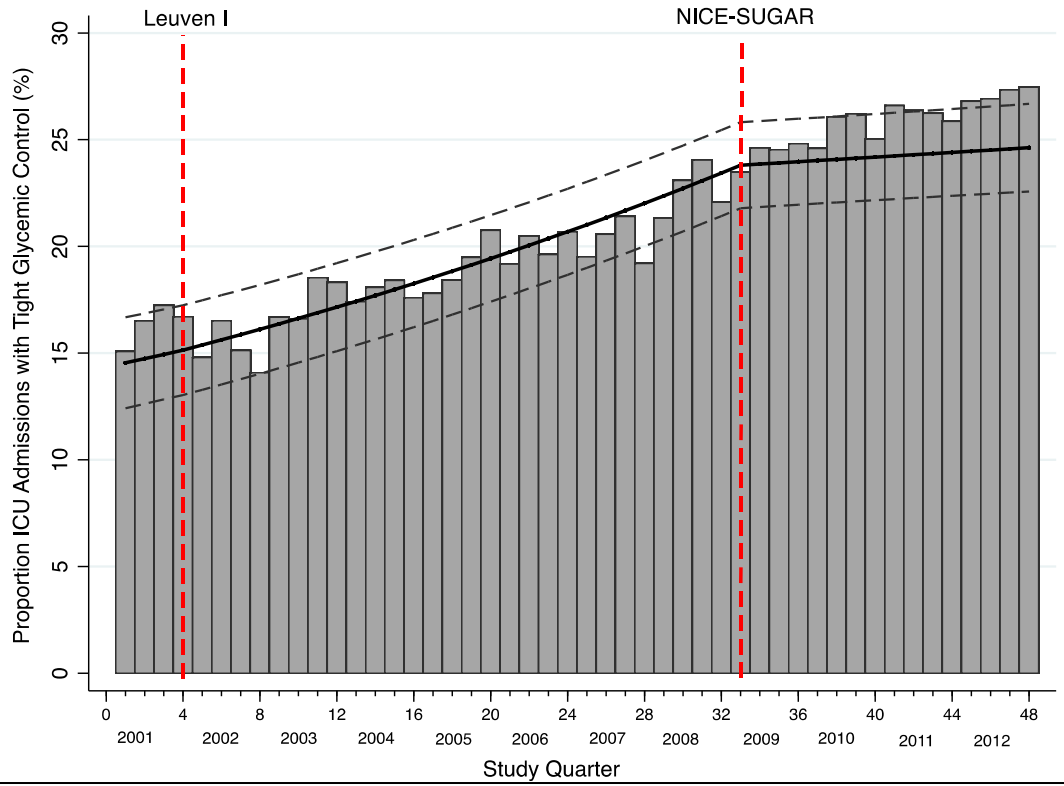
Intensive versus Conventional Glucose Control in Critically Ill Patients

The NICE-SUGAR Study Investigators*

- Multi-center RCT
- N = 6,104
- NNH = 38 (death)

Tight Glycemic Control

Institute for Public Health



Institute for Public Health

Lesson #2

Focus on Reproducible Science

The New York Times

The Upshot

Science Needs a Solution for the Temptation of Positive Results

Aaron E. Carroll
THE NEW HEALTH CARE MAY 29, 2017

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

Institute for Public Health

Contradicted and Initially Stronger Effects in Highly Cited Clinical Research — 44%

RESEARCH LETTERS

ONLINE FIRST | LESS IS MORE

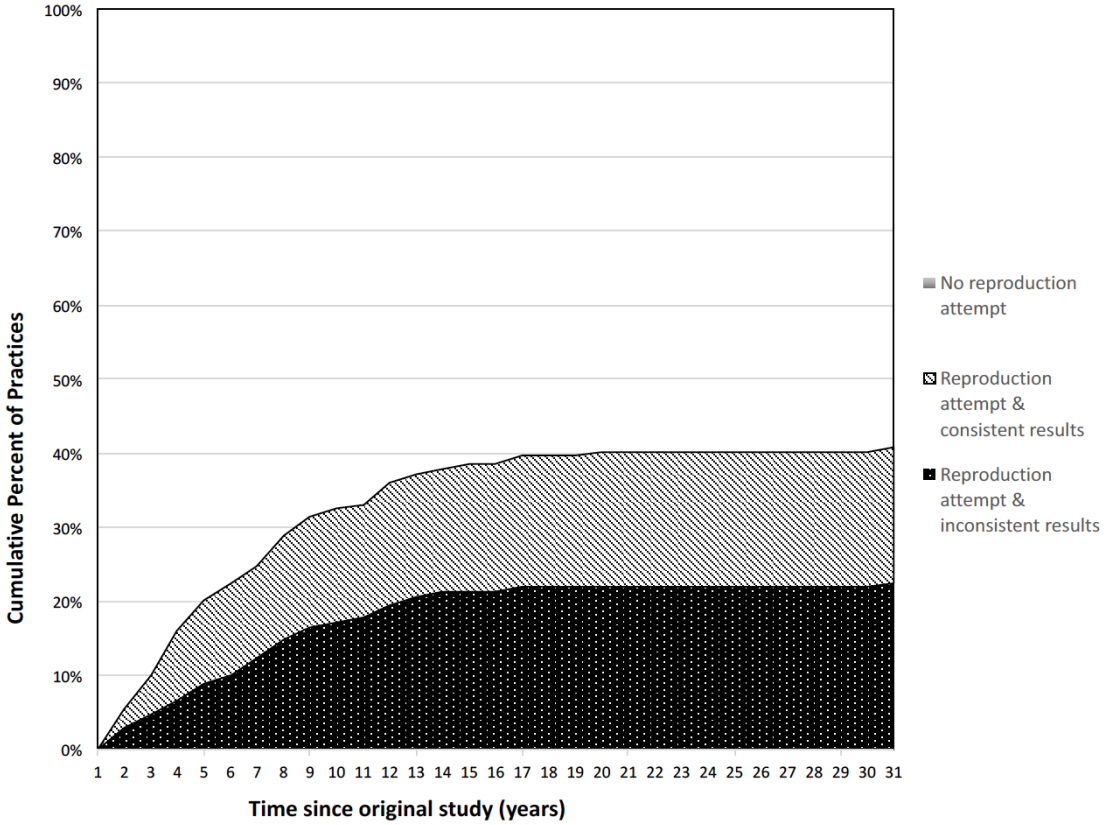
The Frequency of Medical Reversal — 46%

A Decade of Reversal: An Analysis of 146 Contradicted Medical Practices — 38%

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

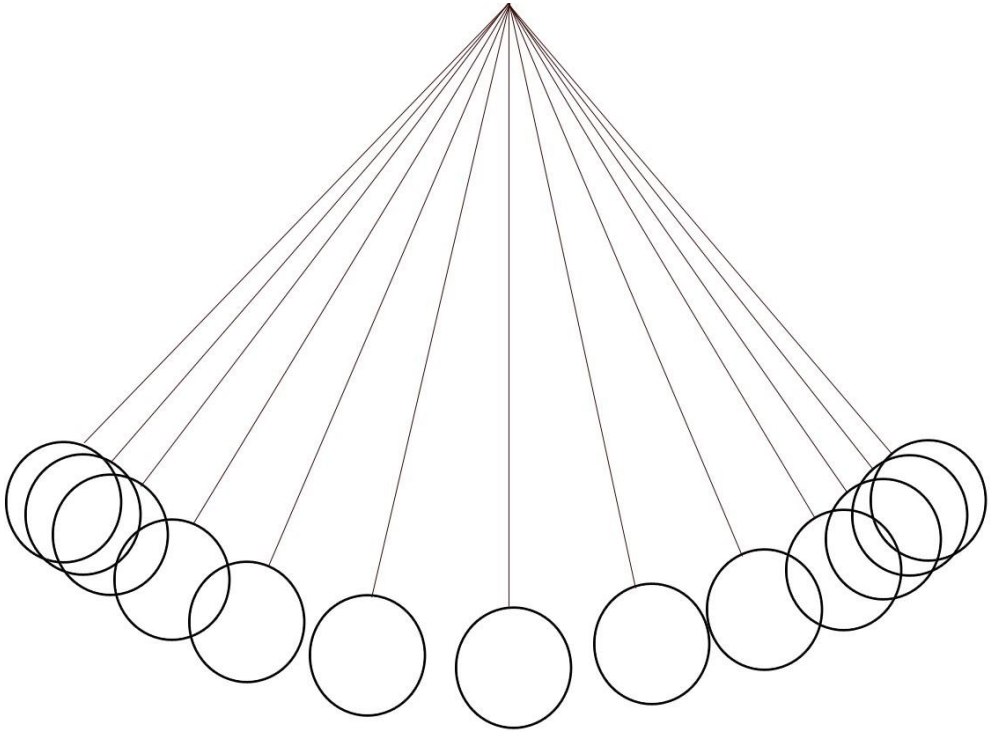
Ioannidis JAMA 2005, Prasad et al. Arch Int Med 2011, Prasad et al. Mayo Clinic Proc. 2013

Time to Reproduction of Research



Risk of the Oscillating Science

Institute for Public Health



Institute for Public Health

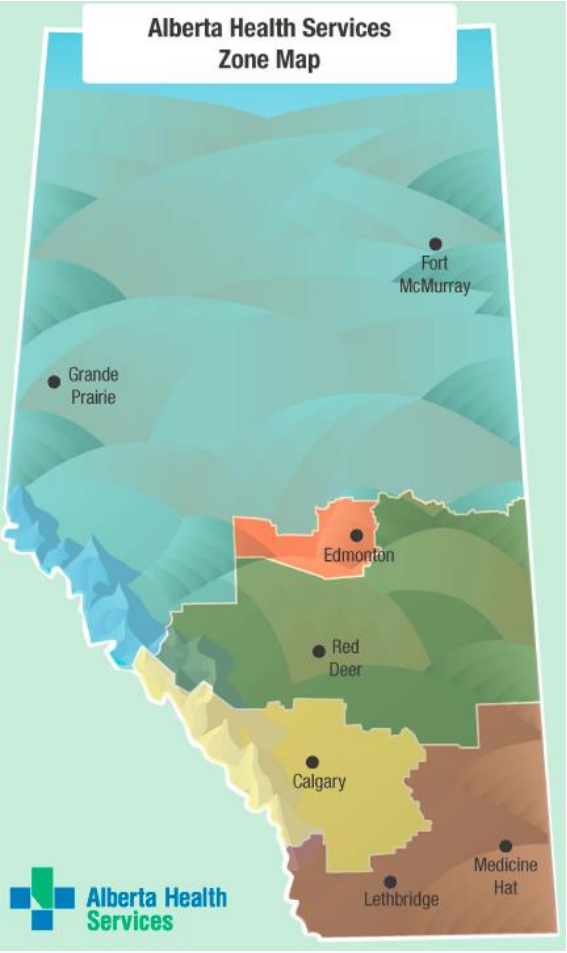
Lesson #3

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

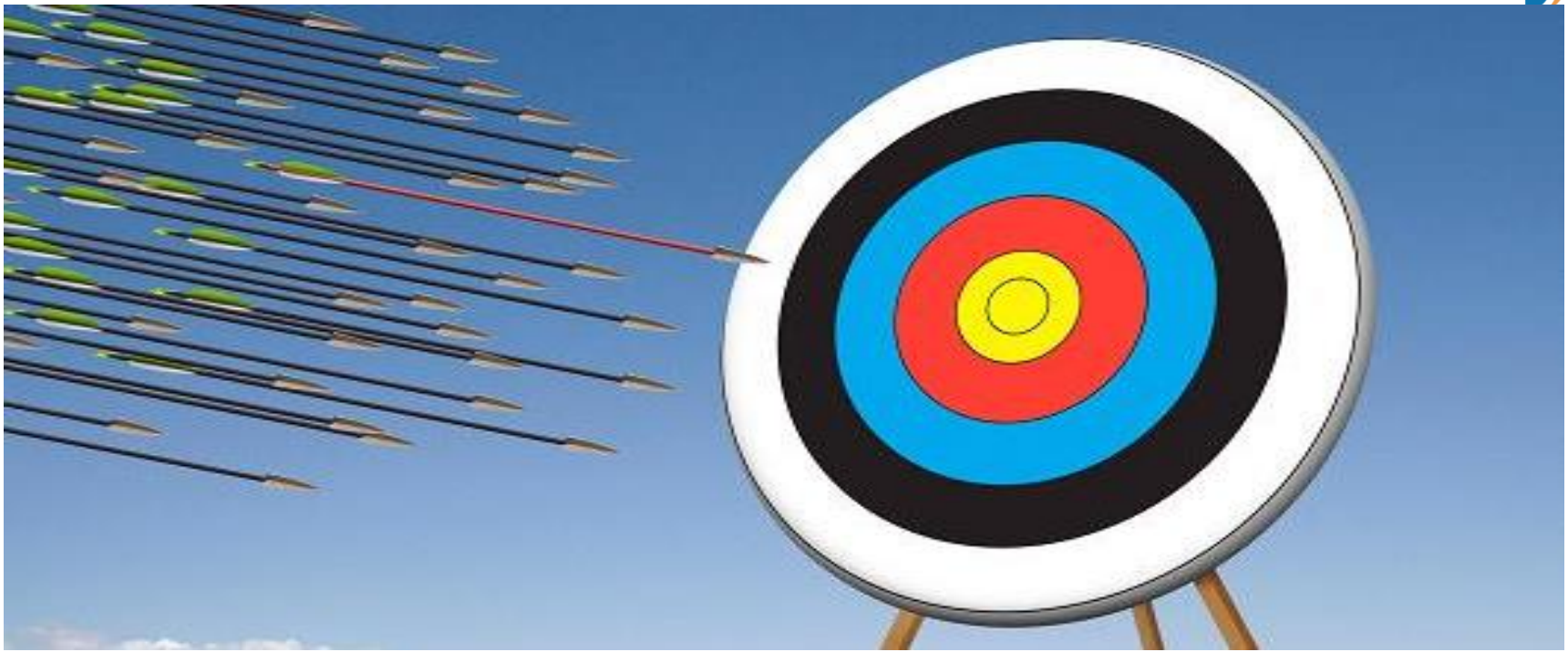
Institute for Public Health

Unfractionated Heparin

Low Molecular Weight Heparin

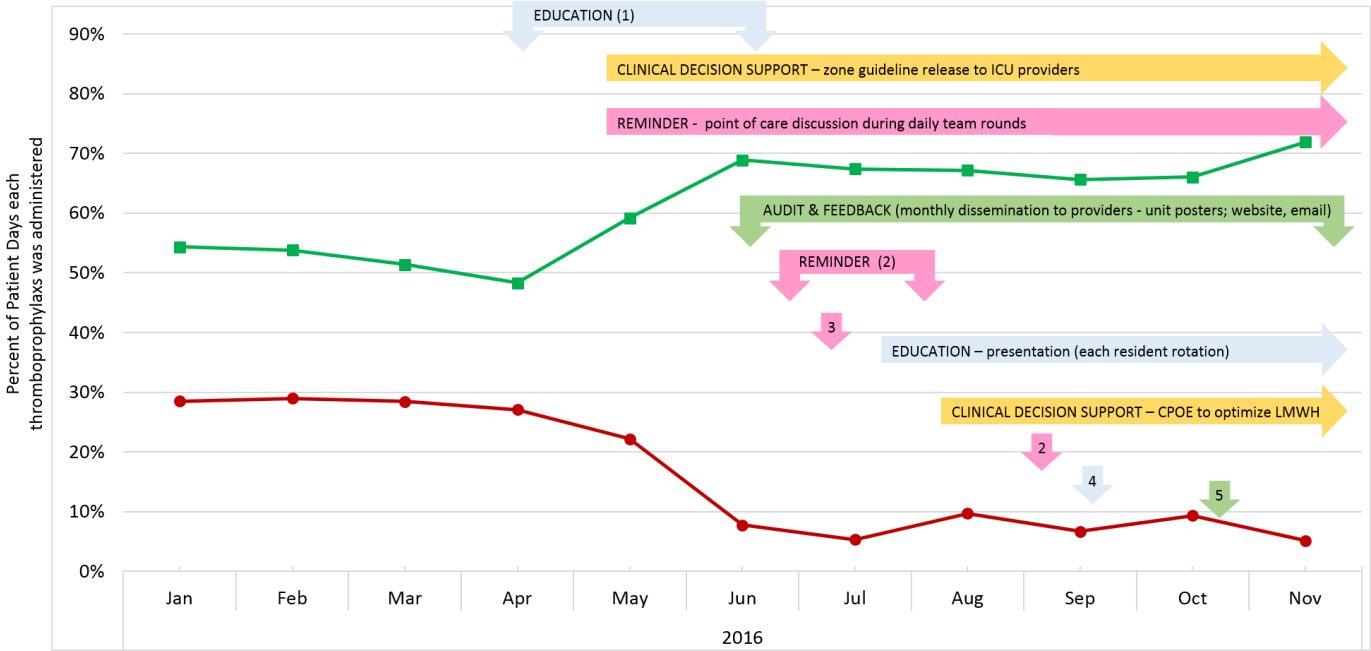
Interventions

Institute for Public Health



Intervention & Process Change

Institute for Public Health

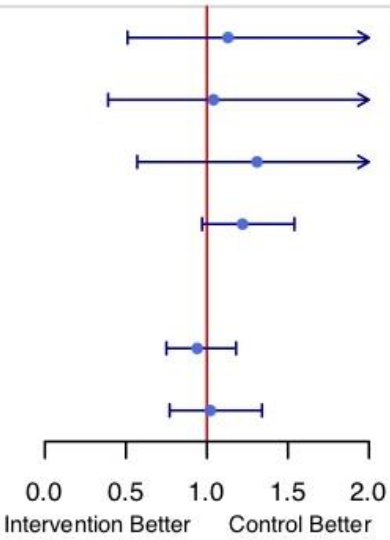


1. EDUCATION – Site visits, newsletter, meeting presentations, and grand rounds
2. REMINDER – prescribing pocket cards and LMWH stickers tagged on ICU computers
3. REMINDER – resident paging if UFH is ordered for a patient instead of LMWH
4. EDUCATION – research seminar to frontline providers and decision makers
5. AUDIT & FEEDBACK – zone report to frontline providers and decision makers

Clinical Effects

Institute for Public Health

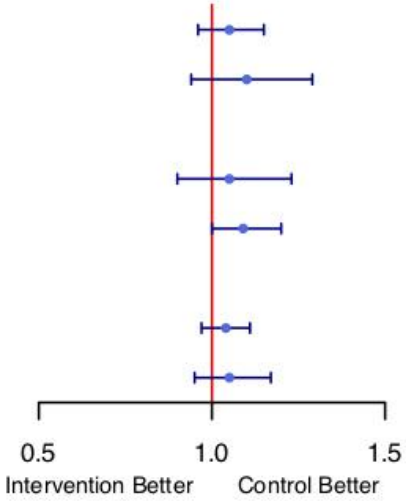
Clinical Outcomes	Ratio of Odds Ratios (95% CI)	p–value
Venous thromboembolism	1.13 (0.51–2.46)	0.77
Deep vein thrombosis	1.04 (0.39–2.77)	0.93
Pulmonary embolism	1.31 (0.57–3.01)	0.52
Major bleeding	1.22 (0.97–1.54)	0.09
Death		
Intensive care unit	0.94 (0.75–1.18)	0.58
Hospital	1.02 (0.77–1.34)	0.90



Healthcare Utilization Effects

Institute for Public Health

Healthcare utilization	Ratio of Mean Ratios (95% CI)	p–value
Length of stay		
Intensive care unit	1.05 (0.96–1.15)	0.25
Hospital	1.10 (0.94–1.29)	0.23
Actual costs		
Intensive care unit	1.05 (0.90–1.23)	0.54
Hospital	1.09 (1.00–1.20)	0.06
Modelled costs		
Intensive care unit	1.04 (0.97–1.11)	0.29
Hospital	1.05 (0.95–1.17)	0.34



Technology & Science Evolve

- Care will not change on its own
- Focus on technologies with reproducible science
- Test effectiveness – efficacy is not enough

Acknowledgements

Mentors

- Sharon Straus

Collaborators

- Sean Bagshaw
- Fiona Clement
- Chip Doig
- Kirsten Fiest
- Barry Kushner
- Dan Niven
- Jeanna Parsons Leigh
- Dan Zuege
- Dave Zygun

Trainees

- Kea Archibold
- Kyla Brown
- Chloe de Grood
- Hasham Kamran

Research Team

- Jamie Boyd
- Rebecca Brundin-Mather
- Andrea Soo

Funding Agencies

- 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 3
SOLUTION 2

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, epiemiology, 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

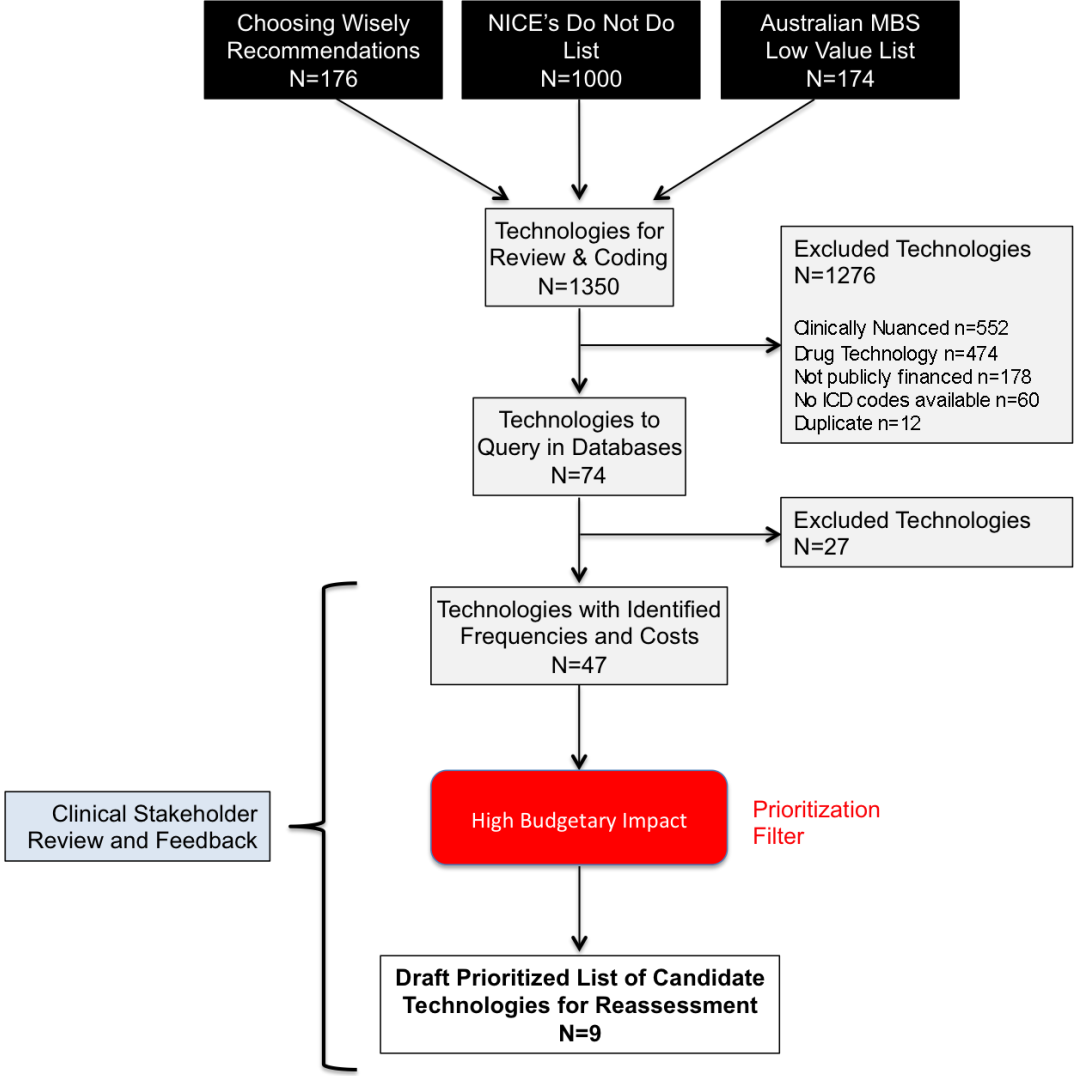
Prioritization

- Data-driven
- Routine & replicable
- Stakeholder collaboration
- Actionable
- High return on investment

Choosing Wisely Canada™

- 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

iDSI
Better decisions. Better health.

Health Technology Assessment Unit
UNIVERSITY OF CALGARY
O'Brien Institute for Public Health

THE UNIVERSITY OF SYDNEY
Menzies Centre for Health Policy

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

Final reflections