Narrative review of frameworks for translating research evidence into policy and practice

Andrew Milat and Ben Li

Supplementary Table 1. Synthesis of the most frequently applied research translation frameworks and models

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
RE-AIM Framework			
Glasgow et al. (1999)[17]	1. Reach (proportion of the target population that participated in the intervention) 2. Efficacy (success rate if implemented as in guidelines; defined as positive outcomes minus negative outcomes) 3. Adoption (proportion of settings, practices, and plans that will adopt this intervention) 4. Implementation (extent to which the intervention is implemented as intended in the real world) 5. Maintenance (extent to which a program is sustained over time)	General commentary	First study to propose the RE-AIM framework. The study discusses issues associated with each element to determine overall public health impact.
Glasgow et al. (2003)[18]	1. Reach 2. Efficacy or effectiveness 3. Adoption 4. Implementation 5. Maintenance	General commentary	Both efficacy and effectiveness are considered in the model as recognition that generalization, external validity, and contextual factors are important considerations when developing new programs.
Dzewaltowski et al. (2004)[19]	1. Reach (individual level) 2. Efficacy or effectiveness (individual level) 3. Adoption (setting level) 4. Implementation (setting level) 5. Maintenance (setting and individual level)	RE-AIM website / Case study	To better balance internal and external validity concerns, a setting level consideration is added to the adoption, implementation, and maintenance elements. Setting level considerations involve entire organizations, while individual level considerations involve individual participants in the program.
Klesges et al. (2005)[20]	Elements unchanged	Health behaviour change / Case study	Adopting RE-AIM as a planning framework does not ensure a program will be successful, but assessing RE-AIM dimensions yields essential information to evaluate the potential for future dissemination of an intervention.
Glasgow et al. (2006)[21]	Elements unchanged	Commentary	Composite metrics that combine two or more RE-AIM dimensions offer potential to help identify interventions most likely to meaningfully impact population health.
Glasgow (2006)[22]	Elements unchanged	Family medicine / Case study	RE-AIM can be applied as a framework to improve evidence use in family medicine.
Jilcott et al. (2007)[23]	Elements unchanged	Food labelling / Case study	The RE-AIM framework can be useful in estimating public health impact, comparing different health policies, planning policies

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			designed for increased likelihood of success, and identifying areas for integration of policies with other health promotion strategies.
Bakken and Ruland (2009)[24]	Elements unchanged	Randomized controlled trials / Case study	The case studies validate the applicability of RE-AIM to inform the design, implementation, evaluation, and reporting of clinical informatics intervention studies.
Glasgow et al. (2011)[25]	Elements unchanged	Patient centred medical home / Case study	RE-AIM can help clinicians and media developers create practical products more likely to be widely adopted, feasible in busy medical practices, and able to produce public health impact.
Shubert et al. (2011)[26]	Elements unchanged	Falls prevention / Case Study	The intervention developed with RE-AIM was highly appealing to the target audience, resulted in improved outcomes and was successfully adopted and maintained by the community partner.
Weiss et al. (2011)[27]	Elements unchanged	Community health centres / Case study	The RE-AIM model was successfully applied to three community health centres (CHCs) in the U.S. and Zambia.
Kim et al. (2012)[28]	Elements unchanged	Smoking cessation / Case study	Considering reach and efficacy instead of efficacy alone yielded differential impacts across sites, suggesting that worksite characteristics may influence program impact.
Kessler et al. (2013)[29]	Elements unchanged	Implementation grants / Case study	Only 9.5% of grant proposals met the requirements for fully developed use across all RE-AIM dimensions.
Almeida et al. (2014)[30]	Elements unchanged	Diabetes prevention / Case study	The RE-AIM framework was effectively used to plan a randomized controlled trial with a diabetes prevention intervention.
Sweet et al. (2014)[31]	Elements unchanged	Multi-sector partnerships / Case study	This study operationalized the RE-AIM framework for large multi-sectoral partnerships.
Matthews et al. (2014)[32]	Elements unchanged	Diabetes prevention / Systematic review	Future publications relating to the translation of evidence into everyday practice should use a tool, such as the RE-AIM framework, to report consistent and useful information.
Alpeter et al. (2015)[33]	Elements unchanged	Burden amongst caregivers for dementia / Case study	Using the RE-AIM framework to guide development of data collection tools provided better clarity about the intervention and improved ease of implementation.

Translation Research Continuum 'T' Models

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Zerhouni (2003)[34]	1. Bench (Basic Science Research) 2. Translation step 1 (T1) 3. Bedside (Human Clinical Research) 4. Translation step 2 (T2)	Medical research / Commentary	First study to describe a translation research continuum model. The National Institutes of Health (NIH) Roadmap acknowledges that translational steps are required to realize the potential for medical discoveries at the 'bench' to be applied to better patient care

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
	5. Practice (Clinical Practice)		'bedside' and in clinical practice.
Sung et al. (2003)[35]	1. Basic biomedical research 2. Translation from basic sciences to human studies (T1) 3. Clinical science and knowledge 4. Translation of new knowledge into clinical practice and health decision making (T2) 5. Improved health	General commentary	Translating the information gained through these basic discoveries into knowledge that will affect clinical practice and, ultimately, human health requires clinical research involving human subjects and human populations, as well as development of improved health services based on that research.
Westfall et al. (2007)[16]	T1. Basic to human clinical research ("bench to bedside") T2. Knowledge is moved from early clinical trials to use with patients in phase II and IV clinical trials through guideline development, meta-analyses and systematic reviews T3. Translation to practice, encompassing dissemination and implementation research	General commentary	This model is an expansion of the NIH Roadmap model by Zerhouni (2003) that adds an additional research laboratory (Practice-based Research) and translational step (T3) to improve incorporation of research discoveries into day-to-day clinical care.
Khoury et al. (2007)[36]	T1. From gene discovery to health application T2. From health application to evidence based guideline T3. From guideline to health practice T4. From health practice to impact	Genomics / Commentary	An addition step (T4) is added, which seeks to evaluate the population health impact of an intervention.
Dougherty and Conway (2008)[37]	1. Basic biomedical science 2. Clinical efficacy research (T1) 3. Clinical efficacy knowledge 4. Outcomes, comparative effectiveness, and health services research (T2) 5. Clinical effectiveness knowledge 6. Implementation, measurement, and scaling (T3) 7. Improved health care quality and value and population health	General commentary	T1, T2, and T3 strategies build on each other to continually improve health care delivery, as well as to provide essential feedback to the biomedical enterprise.
Fleming et al. (2008)[38]	Cycle consisting of: 1. Biomedical/basic behavioural and social science research (determine underlying causes of disparities and develop/adapt interventions) 2. Clinical research (test interventions with human subjects/populations) 3. Public health research (detect disparities in disease incidence or prevalence/intervention utilization)	General commentary	This model integrates many elements of the NIH Roadmap model by Zerhouni (2003) and provides a salient conceptualization of how a wide range of research endeavours from different disciplines can be used harmoniously to improve health.
Khoury et al. (2010)[39]	T0. Description and discovery T1. From discovery to health applications T2. From health application to evidence guidelines T3. From guidelines to health practice T4. From health practice to population health outcomes	Genomics / Commentary	An additional step (T0) is added, which refers to new knowledge and insight into the causes, pathobiology, or natural history of disease. T0 research can come from laboratory sciences, as well as clinical and public health disciplines.

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Drolet et al. (2011)[40]	1. Basic science discovery 2. Translation of basic science to humans (T1) 3. Proposed human application 4. Translation to clinical treatment (T2) 5. Effective clinical application 6. Translation to practice (T3) 7. Public health impact	General commentary	The authors propose the Biomedical Research Translation Continuum, which defines the translation process and describes the progression of knowledge from laboratory to health gains.
Bergman et al. (2011)[41]	T1. From basic science to potential health application T2. From health application to evidence based guidelines T3. From guidelines to health care practice T4. From health care practice to populations or community	Child health / Commentary	The authors propose a framework for dissemination, diffusion, and implementation (DD&I) science, which can support the scaling up of evidence-based practices in child health by identifying innovations that are most likely to implemented and spread, and organizations that are able to adopt the proposed changes.
Glasgow et al. (2012)[15]	T0. Description and discovery; T1. From discovery to health applications T2. From health application to evidence guidelines; T3. From guidelines to health practice; and T4. Evaluation of the effectiveness and cost-effectiveness of such interventions in the "real world" and in diverse populations.	General commentary	The continued development of a robust dissemination and implementation evidence base must not only demonstrate success in integrating the knowledge gained into clinical and community practice, but must feedback knowledge to improve the rigor, relevance, efficiency, speed, and impact of the biomedical research enterprise.
Callard et al. (2012)[42]	An interlocking loop of: T1. Moving basic discovery to candidate health application T2. Developing a health application/evidence-based guidelines T3. Moving evidence-based guidelines into health practice T4. Moving health practice into population health impact At the centre of the loop is service user and other stakeholder involvement.	General commentary	The authors reconceptualise the model of translational research as an interlocking loop rather than as a pipeline, one in which service user and other stakeholder involvement feed into each of its elements.
Spoth et al. (2013)[43]	1. Pre-adoption (intervention, consumer, provider, and organizational characteristics influence the adoption of the intervention) 2. Adoption (factors influencing policymaker, practitioner, and organizational decisions to implement the intervention) 3. Implementation (strategies used to integrate intervention within specific service systems and settings) 4. Sustainability (how interventions are maintained over the long term or expanded within and across settings)	General commentary	This paper presents an integrative, systems oriented framework called translation science to population impact (TSci), which aims to address the challenges of T2 translation research.
Rubio et al. (2014)[44]	1. Basic research (new technologies are discovered, fundamental scientific knowledge is generated) 2. T1 (discovers from the basic science phase are applied	General commentary	Most of the literature discusses the translational continuum as linear. This study found that the linear model was but one pathway that investigators use to approach their research program.

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
	to human conditions) 3. Clinical research (humans are participants in the research) 4. T2 (results from clinical research are applied in clinical practice) 5. Practice (decision analysis, comparative effectiveness research, dissemination and implementation research)		Understanding that there are more approaches to one's research beyond the linear path is important.
Atchan et al. (2014)[45]	1. Research synthesis, guidelines, evidence journals 2. Bedside evidence-based practice 3. Clinical quality improvement 4. Decision aids, patient education, compliance aids	Breastfeeding / Case study	The pipeline model has been demonstrated as useful in examining where and how barriers occur in the gap between evidence and practice in the uptake of an initiative that promotes breastfeeding.

Knowledge to Action (KTA) Framework

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Graham et al. (2006)[12]	The KTA framework consists of two interconnected cycles (knowledge creation and action) Knowledge creation (in the form of a funnel guided by tailoring knowledge): 1. Knowledge inquiry 2. Knowledge synthesis 3. Knowledge tools/products Knowledge creation is linked to action by 1. Identify problem 2. Identify, review, and select knowledge Action cycle: 1. Adapt knowledge to local context 2. Assess barriers to knowledge use 3. Select, tailor, implement interventions 4. Monitor knowledge use 5. Evaluate outcomes 6. Sustain knowledge use	General commentary	First study to describe the knowledge to action (KTA) framework. The authors offer a conceptual framework for thinking about the process and integrate the roles of knowledge creation and knowledge application.
Tugwell et al. (2007)[46]	Elements unchanged	Translating knowledge to consumers / Case study	This article describes the use of the KTA to translate evidence-based knowledge to consumers. Using the framework, tailored consumer summaries, decision aids, and a scale to measure consumer effectiveness were created in collaboration with consumers.
Straus et al.	Elements unchanged	General	The framework provides an approach that builds on the

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
(2009)[47]		Commentary	commonalities found in a review of planned action theories.
Heyland et al. (2010)[48]	Elements unchanged	Critical care nutrition / Case study	The KTA model can be applied to support the implementation of critical care nutrition guidelines.
Straus et al. (2011)[49]	Elements unchanged	Narrative review	This narrative review outlines what knowledge translation is and a framework for its use.
Licskai et al. (2012)[50]	Elements unchanged	Asthma / Case study	The KTA framework can guide multi-level organizational change, facilitate asthma guideline implementation, and improve health outcomes in community primary care practices.
Kastner et al. (2012)[51]	Elements unchanged	Osteoporosis / Case study	The KTA framework helped map out the process for translating osteoporosis evidence into practice, and facilitated the selection of appropriate study designs to rigorously address barriers, evaluate outcomes, and address sustainability.
Sood et al. (2014)[52]	Elements unchanged	Dialysis / Case study	Using the KTA framework, the authors developed evidence-based guidelines addressing the timing of dialysis initiation.
Field et al. (2014)[13]	Elements unchanged	Systematic review of studies applying the KTA framework	This study is a citation analysis and systematic review synthesizing studies applying the KTA framework to implementation projects between 2006 and July 2013. 146 studies describing the use of KTA were found and in 10 studies, the KTA framework was integral to the design, delivery and evaluation of the implementation activities.

Promoting Action on Research Implementation in Health Services (PARiHS) Framework

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Kitson, Harvey and McCormack (1998)[53]	The framework presents successful research implementation as a function of the relationships among evidence, context, and facilitation Evidence: 1. Research 2. Clinical experience 3. Patient experience Context: 1. Culture 2. Leadership 3. Measurement Facilitation 1. Characteristics 2. Role 3. Style	General commentary	Successful implementation of research into practice is a function of the interplay of three core elements--the level and nature of the evidence, the context or environment into which the research is to be placed, and the method or way in which the process is facilitated

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications

Rycroft-Malone et al. (2002)[54]	Evidence:
	  1. Research
	  2. Clinical experience
	  3. Patient experience
	Context:
	  1. Culture
	  2. Leadership
	  3. Evaluation
	Facilitation
	  1. Purpose
	  2. Role
	  3. Skills and attributes
		General commentary	The authors coin the term "PARiHS framework" by adapting the model proposed by Kitson, Harvey and McCormack (1998). They make slight adjustments to the terms of the sub-elements.

Rycroft-Malone (2004)[55]	Elements unchanged	General commentary	The PARiHS framework presents successful research implementation as a function of the relationships among evidence, context, and facilitation.
Brown et al. (2005)[56]	Elements unchanged	Postoperative pain management / Case study	Adopting a systematic approach by utilising the PARiHS framework has been advantageous in development guidelines for postoperative pain management.
Ellis et al. (2005)[57]	Elements unchanged	Nursing / Case study	Using the PARiHS framework, the authors demonstrated that context and facilitation are critical to successful implementation of a new evidence-based clinical practice protocol for nurses.
Doran and Sidani (2007)[58]	Elements unchanged	Nursing / Commentary	The framework guided the design of a knowledge translation intervention aimed at continuous improvement of patient care and evidence-based practice.

Stetler et al. (2011)[59]	Evidence:
	  1. Research and published guidelines
	  2. Clinical experiences and perceptions
	  3. Patient experiences, needs, and preferences
	  4. Local practice information
	  5. Characteristics of targeted intervention
	
	Contextual readiness for targeted intervention
	  1. Leadership support
	  2. Culture
	  3. Evaluation capabilities
	  4. Receptivity to the targeted change
	
	Facilitation
	  1. Role of facilitator (purpose, expectations, and skills)
		Critical synthesis of literature	A number of revisions, perceived as consistent with the PARiHS framework's general nature and intent, are proposed.

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
	Successful implementation 1. Implementation plan and its realization 2. Intervention uptake 3. Patient and organizational outcomes achievement		
Bergstrom et al. (2012)[60]	Context sub-elements expanded to: 1. Commitment and informal payment 2. Resources 3. Community involvement 4. Receptive context 5. Evaluation 6. Leadership 7. Culture Evidence and facilitation remain unchanged	Neonatal health in a low-income setting / Case study	The components of organizational context as suggested by the PARiHS framework appear also to be relevant in a low-income setting like Uganda. In addition, resources, commitment and informal payment, and community involvement should be considered as important components for developing context assessment tools for low-income settings.

Evidence based public health (EBPH) models

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Brownson et al. (1999)[61]	1. Develop an initial, concise, operational statement of the issue 2. Determine what is known through the scientific literature 3. Quantify the issue 4. Devleop program or policy options 5. Develop an action plan for the program or policy 6. Evaluate the program or policy	General commentary	EBPH models help ensure that resources in public health are spent appropriately.
Kohatsu et al. (2004)[62]	Elements unchanged	General commentary	Evidence-based public health (EBPH) has been proposed as a practice model that builds upon the success of evidence-based medicine (EBM).
McGuire (2005)[63]	Elements unchanged	General commentary	Critical realism can enable public health researchers from various disciplines and research paradigms to work together, bringing the full weight of scientific knowledge to bear on increasingly complex and global public health problems.
Brownson et al (2009)[14]	1. Community assessment 2. Quantifying the issue 3. Developing a concise statement of the issue 4. Determining what is known through the scientific literature 5. Developing and prioritizing a policy or program 6. Developing plans and implementing interventions 7. Evaluating the policy or program	General commentary	Community assessment is added as the first element of the framework. Key components of evidence-based public health (EBPH) include making decisions on the basis of the best available, peer-reviewed evidence, using data and information systems systematically, applying program-planning frameworks, engaging the community.
Jacobs et al. (2012)[64]	1. Engaging the community in assessment and decision making	General commentary	An increasing volume of scientific evidence is now at the fingertips of public health practitioners. Putting this evidence to work can help

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
	2. Using data and information systems systematically 3. Making decisions on the basis of the best available peer-reviewed evidence 4. Applying program planning frameworks 5. Conducting sound evaluation 6. Disseminating what is learned		practitioners meet demands for a systematic approach to public health problem solving that yields measurable outcomes.
Hess et al. (2014)[65]	1. Definition of decision space 2. Identification of biggest or most severe problems/assessment of the size of the problem through an integrated assessment or impact assessment 3. Search for evidence of effective prevention/intervention efficacy 4. Evaluation/assessment of quality of evidence for prevention; identification of research gaps 5. Recommendations based on strength and consistency of evidence 6. Prioritization of interventions 7. Intervention, implementation and evaluation 8. Identification of knowledge gaps/next steps	Climate change / Case study	EBPH has emerged as a powerful framework for assessing public health concerns and identifying the most effective health protection strategies. With some modifications, the existing EBPH framework can be applied to public health adaptation to climate change.

Stages of research progression (rocket model)

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Nutbeam and Bauman (2006)[66]	1. Problem definition 2. Solution generation 3. Intervention testing 4. Intervention demonstration 5. Intervention dissemination 6. Program monitoring	Public health / Book	The model shows the different research and evaluation questions and research methods that are applied stage by stage in the planning, evaluation and dissemination of a comprehensive set of public health interventions over six stages and can be used to inform the development of public policies and programs.
Milat et al. (2011)[67]	1. Understanding the problem 2. Testing for efficacy 3. Testing for replicability 4. Testing for dissemination	General commentary	Despite recent efforts by policy makers and funders to increase intervention research outputs, there remains a need to increase the quantity and quality of such research, with a greater focus on the conduct of intervention replication and dissemination studies.
Rychetnik et al. (2012)[68]	1. Problem definition 2. Solution generation (Program development) 3. Intervention testing (process and impact evaluation to determine program efficacy or effectiveness) 4. Intervention replication (effective programs are adapted for other settings to determine if similar outcomes can be reproduced) 5. Dissemination research (up-scaling of a programme to a	Public health / Commentary	Framework enables decision makers to map the evidence for a given policy or program; that is, to identify what type of evaluations have been done, including translation research, and which of this evidence (if any) informed current policy and practice.

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
	population-wide level)		
Rissel et al. (2012)[69]	1. Program definition (how well defined is the problem?) 2. Solution generation (how well defined is the solution?) 3. Intervention testing (how rigorous are studies testing efficacy of the solution?) 4. Intervention replication (has the program been successfully replicated?) 5. Dissemination research (has research been disseminated?)	Child obesity prevention / Case study	Application of a theoretical 'evidence-building' framework to an existing health promotion initiative proved useful in identifying evidence gaps, and provided guidance for future research and evaluation. This framework provides a useful approach for assessing evidence gaps in health promotion programs, and highlights opportunities to improve the evidence-base.
O'Hara et al. (2014)[70]	1. Problem definition 2. Solution generation 3. Innovation testing 4. Intervention demonstration (replication) 5. Intervention dissemination/translation Additions: • Evidence synthesis on stage 3 and 4 findings • Environmental and situation analysis, mixed methods research with target audience, and consultation with key stakeholders after stage 4 • Implmentation of intervention and evaluation of intervention during step 5	Chronic disease prevention / Case study	Additional translational formative evaluation steps are added to the model. These steps are necessary for the translation of effectiveness evidence into wide-scale public health practice. The authors illustrate the utility of this enhanced model through a case study of a population-based chronic disease prevention program.

Interactive Systems Framework for Dissemination and Implementation (ISF)

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Wandersman et al. (2008)[71]	The framework consists of three levels: 1. Implementing prevention - prevention delivery system (general capacity use, innovation-specific capacity use) 2. Supporting the work – prevention support system (general capacity building, innovation-specific capacity building) 3. Distilling the information – prevention synthesis & translation system These three levels are encapsulated by four pillars: 1. Funding 2. Macro policy 3. Existing research and theory 4. Climate	General commentary	The framework provides a heuristic for understanding the needs, barriers, and resources of the different systems, as well as a structure for summarizing existing research and for illuminating priority areas for new research and action.

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Lesesne et al. (2008)[72]	Elements unchanged	Teenage pregnancy / Case study	This ISF was applied to facilitate practice improvement for a teenage pregnancy prevention project
Flaspohler et al. (2012)[73]	Elements unchanged	General commentary	The ISF identifies three key systems necessary for bridging research and practice, which include the Synthesis and Translation System, the Support System, and the Delivery System.
Chambers (2012)[74]	Elements unchanged	General commentary	The ISF recognizes the need to synthesize evidence and package the information in order to better meet the needs of target audiences. The ISF also recognizes the top-down approach to implementation is sub-optimal, as implementation efforts require partnerships.

UK Medical Research Council (MRC) framework

Framework / Author	Elements of the framework / Key changes	Context / Study type	Key implications
Barley et al. (2012)[75]	A cycle consisting of: 1. Development (identifying the evidence base) 2. Feasibility and piloting (testing procedures) 3. Evaluation (assessing effectiveness) 4. Implementation (dissemination, surveillance, follow-up)	Coronary heart disease (CHD) and depression / Case study	Using the Medical Research Council (MRC) framework, the authors developed an intervention to improve outcomes in patients with CHD and depression.
Kastner et al. (2012)[51]	Elements unchanged	Osteoporosis / Case study	The UK MRC helped map out the process for translating osteoporosis evidence into practice, and facilitated the selection of appropriate study designs to rigorously address barriers, evaluate outcomes, and address sustainability.

Supplementary table 1: Additional research translation frameworks and models included in the review

Framework / author	Elements of the framework / Key changes	Context / study type	Key implications
Evidence into practice framework			
Brown et al. (2015)[76]	1. Focussing efforts where the biggest gain can be made 2. Considering how to make a policy relevant difference with an emphasis on translation into policy and practice 3. Establishing a foundation for action by engaging with stakeholders throughout the process 4. Developing a framework to guide action 5. Drafting policy relevant and framework appropriate essential service standards 6. Defining standards that help policy decision makers achieve policy targets	Cardiovascular care in Aboriginal populations / Case study	The evidence into practice framework provided a systematic approach to addressing inequities in cardiovascular health care in Aboriginal populations based on sound evidence.
Implementation science			
Sivaram et al. (2014)[77]	1. Controlled and observational study 2. Evidence that a technology or modality works 3. Planning cancer control programs 4. Guiding program implementation 5. Conducting program evaluation to inform policy	Cancer prevention and control / Case study	Implementation science is a set of tools, principles and methodologies that can be used to bring scientific evidence into action. Implementation science has much to offer to cancer control practitioners and researchers.
Pragmatic-Explanatory Continuum Indicator Summary (PRECIS)			
Gaglio et al. (2014)[78]	1. Participant eligibility criteria 2. Experimental intervention flexibility 3. Experimental intervention practitioner expertise 4. Comparison intervention 5. Comparison intervention practitioner expertise 6. Follow-up intensity 7. Primary trial outcome 8. Participant compliance with prescribed intervention 9. Practitioner adherence to study protocol 10. Analysis of primary outcome	General commentary	Combining PRECIS and RE-AIM allows for an understanding of not only how pragmatic or explanatory a trial was, but also the context of participants, setting, and processes involved that affected the results.

Overarching knowledge translation framework

Colquhoun et al. (2014)[79]	1. Active ingredients (components that have the capacity to bring about change) 2. Causal mechanisms (processes or mediators by which an intervention effects change) 3. Mode of delivery or practical application (the way in which an active ingredient is applied) 4. Intended target (intervention's intended effects and beneficiaries)	General commentary	In 2012, an international working group was convened to develop an overarching framework for knowledge translation interventions. The group identified existing frameworks, mapped together a subset of those frameworks, and worked towards consensus.

Conceptual framework for planning and improving evidence-based practices

Spencer et al. (2013)[80]	This is a continuum of evidence-based practices (emerging, promising, leading, best) consisting of 2 interrelated components: public health impact (effectiveness, reach, feasibility, sustainability, and transferability) and quality of evidence (weak, moderate, strong, and rigorous)	General commentary	This framework brings together important aspects of impact and quality to provide a common lexicon and criteria for assessing and strengthening public health practice.

Co-creating knowledge (co-KT) framework

Powell et al. (2013)[81]	1. Initial contact and refining the issue 2. Knowledge refining and testing 3. Knowledge interpreting, contextualizing and adapting 4. Implementation and evaluation 5. Embedding in context, translating to other contexts	Population health / Commentary	In contrast to other models, co-KT has provided the framework in which the knowledge user community, or study context, may be involved at the commencement of the knowledge building process

Policy effectiveness-feasibility loop (PEFL)

Bowman et al. (2012)[82]	An interconnected loop consisting of: 1. Trends in burden of disease and risk factors 2. Epidemiology modelling (incidence mortality, risk factor trends, treatment evidence) 3. Situation analysis (stated and real policy, health coverage, beliefs, experience and opportunities) 4. Option appraisal and selection (intervention development, feasibility, effectiveness and costs) 5. Evaluation of interventions	Cardiovascular disease and diabetes / Case study	PEFL was used in a project to inform public policy for the prevention of cardiovascular diseases and diabetes in the Mediterranean.

Health Network approach to translate evidence-informed policy into practice

Briggs et al.	1. Policy development	General	Health Networks have provided a sustainable mechanism to

| (2012)[83] | a. Form network
b. Identify population health issue
c. Engage stakeholders within and outside network
d. Develop evidence-informed policy
e. Engage and consult with stakeholders
f. Revise and complete policy
2. Policy uptake
   a. Re-engage stakeholders
   b. Disseminate policy
3. Policy implementation
   a. Re-engage stakeholders
   b. Identify priorities for implementation
   c. Determine barriers and enablers to implementation
   d. Undertake phased implementation approach, supported by evaluation | commentary | meaningfully engage consumers, carers, clinicians and other stakeholders. |

LEAD framework

| Kumanyika et al. (2012)[84] | 1) Locate Evidence
2) Evaluate it
3) Assemble it
4) Inform Decisions | Obesity prevention / Commentary | The LEAD framework takes a systems perspective to evidence based public health. It stresses the importance of addressing the multilevel and dynamic complexity of real world contexts. |

Policy-into-practice intervention for management of low back pain

| Slater et al. (2012)[85] | A cycle consisting of:
1. Policy
2. Stakeholders
3. Grant funding
4. Translation
5. Review
6. Implementation and evaluation | Low back pain / Case study | This framework guided the development of an effective intervention for managing low back pain. |

Research-Practice Integration framework

| Vivian et al. (2012)[86] | 1. Clinical observation and basic research
2. Treatment validation
3. Training in evidence based practice
4. Assessment of clinical utility and feedback to research | General commentary | The authors describe an overarching framework of translational research efforts that bridge the gap between research and practice. |

	5. Cross-level integrative research and communication		

Evidence integration triangle (EIT)

| Glasgow et al. (2012)[87] | A triangular cycle consisting of:
  1. Intervention program/policy
  2. Participatory implementation process
  3. Practical progress measures
At the centre of the cycle are evidence and stakeholders. | General commentary | The EIT model is a straightforward framework to guide practice, research, and policy. |

Evidence-driven community health improvement process (CHIP)

| Layde et al. (2012)[88] | Two cycles connected by an identified health issue to address.

Problem identification and prioritization:
  1. Identify and convene stakeholders
  2. Analyse community assets and health data
  3. Inventory evidence-based interventions
  4. Identify critical health issues

Analysis and implementation:
  1. Analyse causes and contributing factors of health issue in community
  2. Select evidence-based interventions
  3. Adapt and operationalize health improvement strategy for community
  4. Develop indicator set including RE-AIM framework
  5. Implement strategy
  6. Monitor process and outcomes | General commentary | The evidence-driven CHIP will help communities plan, implement, and evaluate effective evidence-based interventions that are responsive to community needs and priorities. |

Evidence informed decision making (EIDM)

| Ward (2011)[89] | 1. Define the quesiton
2. Develop the conceptual model
3. Search the literature
4. Critical appraisal
5. Synthesis
6. Applicability and transferability
7. Report and recommendations
8. Manager checklist | General commentary | EIDM is a process for systematically applying research to public health decisions. |

	9. Implementing a decision		

Knowledge translation framework for globally oriented public health

Lapaige (2010)[90]	1. Individual level factors 2. Community-level factors 3. National-level factors 4. Global-level factors	Global health / Commentary	In globally oriented public health, integrated KT is a dynamic, interactive (collaborative), and nonlinear phenomenon that goes beyond a reductionist vision of knowledge translation.

Translation framework for public health research

Ogilvie et al. (2009)[91]	• Redefines the endpoint from that of institutionalizing effective interventions to that of improving population health • Reflects a spectrum of determinants of health from the individual to the collective level and a corresponding spectrum of levels of intervention • Embraces a wide range of biomedical, social and environmental 'basic sciences' that have roles throughout the framework, not merely in supplying knowledge to be implemented • Recognises the non-linear and inter-sectoral interfaces with the public realm where decisions that influence population health are made	General commentary	Rigorous evaluative and implementation research is increasingly required and should not be regarded as inferior to the more traditional public health sciences.

The Tehran University of Medical Sciences (TUMS) Knowledge Translation Cycle

Majdzadeh et al. (2008)[92]	Cycle consisting of: 1. Push side (knowledge creation) 2. Knowledge transfer 3. Pull side (research utilization) 4. Question transfer	General commentary	As a model, the TUMS knowledge translation cycle should enable organization and evaluation of attempts to analyze the current situation and design further interventions on the transfer and utilization of research knowledge.

Translational research paradigm

Spoth (2008)[93]	1. Orienting purpose – strengthening the translational function 2. Adopting a broad view of factors influencing the translational function 3. Improving a primary vehicle for translation 4. Directing the translational course	General commentary	The framework is designed to guide a broad translational research agenda fostering a shift toward a paradigm of public health impact-called a translational impact paradigm

Model for closing the evidence-to-practice gap

Lang et al. (2007)[94]	1. Research synthesis guidelines, evidence-based medicine journals 2. Beside evidence-based medicine 3. Clinical quality improvement 4. Decision aids, patient education and compliance aids	Emergency medicine / Case study	The authors describe a model for improving the widespread implementation of evidence-based practices for emergency medicine.

Cascade for equity-oriented knowledge translation

Tugwell et al. (2006)[95]	1. Barriers and facilitators 2. Prioritizing barriers 3. Choosing KT interventions to address key barriers 4. KT effectiveness 5. Knowledge management and sharing	Malaria and childhood immunization / Case studies	The authors describe two examples of effective interventions (insecticide-treated bednets to prevent malaria and childhood immunization) to illustrate how this framework can provide a systematic method for decision-makers to ensure the application of evidence-based knowledge in disadvantaged populations.

Knowledge-value chain

Landry et al. (2006)[96]	Cycle consisting of: 1. Mapping and acquisition 2. Creation and destruction 3. Integration and sharing/transfer 4. Replication and protection 5. Performance and innovation	General commentary	The knowledge-value chain is a non-linear, integrated conceptual model of knowledge management.

Ottawa Model of Research Use (OMRU)

Santesso and Tugwell (2006)[97]	1. Assess barriers and supports (evidence-based innovation, potential adopters, practice environment) 2. Monitor interventions and degree of use (implementation intervention strategies, adoption) 3. Evaluate outcomes	Developing countries / commentary	The OMRU helps tailor KT strategies to salient barriers and supports found within the setting. The OMRU approach may be a valid method of tackling the challenges of KT strategies to improve health care in developing countries

Knowledge integration model

Gauthier et al. (2005)[98]	Venn diagram consisting of: 1. Creation 2. Implementation 3. Appraisal	Geriatric psychiatry / Commentary	This model of knowledge integration can improve the use of research evidence in clinical practice

		Linked by insights, dissemination, and practice.	

Evidence-informed policy and practice

Bowen and Zwi (2005)[99]	1. Policy idea 2. Sourcing the evidence 3. Using the evidence 4. Considering capacity to implement	General commentary	The pathway illustrates different types of evidence and their uses in health policymaking, and proposes that specific capacities, such as an individual's skills, experience, and participation in networks, influence the adoption and adaptation of evidence in practice.

Framework for transforming knowledge into practice

Neufeldt (2004)[100]	1. Frame the issue 2. Clarify values involving all key parties 3. Imagine the future (i.e., create the vision) 4. Clarify interests 5. Maximize legitimacy 6. Invent options 7. Build relationships 8. Seek to empower relevant sectors 9. Communicate and listen 10. Commit carefully	Mental health / Commentary	This framework provides a systematic approach to transforming mental health knowledge into workplace practices.

Contextual Knowledge Translation framework

Ho et al. (2004)[101]	1. Knowledge producer (researchers) 2. Knowledge consumer (practitioners) 3. Knowledge beneficiary (community of patients)	General commentary	Technologies can make significant contributions to the acceleration of KT. To maximize the benefits, it is important to recognize the contextual and conceptual frameworks from which information and communication technologies can be perceived as beneficial to KT processes.

Conceptual framework for evidence-based decision-making

Dobrow et al. (2004)[102]	1. Evidentiary sources 2. Introduction of evidence 3. Interpretation of evidence 4. Application of evidence	Colorectal cancer screening / Case study	The conceptual framework attempts to capture the role that context plays in the introduction, interpretation and application of evidence. The paper illustrates this framework with examples from policy development for colorectal cancer screening.

Framework for knowledge translation (with a focus on understanding user context)

Jacobson et al. (2003)[103]	1. User group (context in which the user group operates) 2. Issue (what are the characteristics of the issue?)	General commentary	The framework helps researchers increase their familiarity with intended user groups

	3. Research (what research is available?) 4. Research-user relationship (how much trust exist between the researcher and the user group?) 5. Dissemination strategies		

Stetler Model of Research Utilization

Stetler (2001)[104]	1. Preparation 2. Validation 3. Comparative evaluation 4. Decision making 5. Translation/application 6. Evaluation	General commentary	The model continues focuses on a series of judgmental activities about the appropriateness, desirability, feasibility, and manner of using research findings in an individual's or group's practice.

Research-to-Practice Framework for Technology Transfer

Sogolow et al. (2000)[105]	1. Context 2. Research steps (needs assessment, intervention study) 3. Research synthesis 4. Practice steps (identify effective interventions, translate interventions, support transfer) 5. Feedback and evaluation	HIV prevention / Case study	This study examines key challenges and offer a framework for moving research to practice in HIV prevention, one in which research steps are linked to practice steps and all these activities take place in a complex and dynamic environment.

Program assessment feedback model

Sneden et al (2006)[106]	1. Formulate research questions using logic models to identify key evaluation items 2. Format data displays from multiple data sources to address research questions 3. Use a facilitated group process to present and review research findings 4. Prepare group recommendations 5. Involve local partners to translate recommendations into practice.	Tobacco control / Case study	The expanded program assessment feedback model is another tool for public health promotion and is not limited to tobacco-cessation programs. Effective use of the model depends on the timely availability of locally relevant data and a knowledge-management, retention, and transfer process.

International Obesity Task Force Evidence requirements for Obesity Prevention

Swinburn, Gill and Kumanyika (2005)[107]	1. Building a case for action on obesity 2. Identifying contributing factors and points of intervention 3. Defining the opportunities for action	Obesity prevention / Case study	Compared with clinical decision-making where the evidence base is dominated by randomized controlled trials with high internal validity, the evidence base for obesity prevention needs many different types of evidence and often needs the informed opinions of

	4. Evaluating potential interventions 5. Selecting a portfolio of specific policies, programmes, and actions.		stakeholders to ensure external validity and contextual relevance.

Steps of research evaluation

Weber et al (2012)[108]	1. Efficacy and fundamental research 2. Effectiveness 3. Efficiency 4. Availability 5. Distribution	Diabetes / case study	The model has the potential to address the key components of translational research and can be used as a model for prevention of chronic diseases in other low and middle-income country settings.