Translating research findings and evidence-based guidelines into clinical practice

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- Editor and Co-director, Australian Satellite of Cochrane Effective Practice and Organisation of Care (EPOC) Group
- Associate editor, Implementation Science
Outline

1. The problem: a gap between research and practice
2. Research translation: some definitions and key concepts
3. What research knowledge should be translated?
4. How should research knowledge be translated?

The problem: a gap between research and practice
The problem: research – practice gap

“There is a gap between today’s scientific advances and their application: between what we know and what is actually being done. Health work teaches us with great rigour that action without knowledge is wasted effort, just as knowledge without action is wasted resource’.

LEE Jong-wook
WHO Director General 2003-2006
Address to 58th World Health Assembly, 2005

Unhealthy Medicine
All Breakthrough, No Follow-Through

By Steven H. Woolf
Sunday, January 8, 2006: B03

We tend to view medical advances -- the breakthroughs that produce better medications, technology and procedures -- as the front line in the war on disease. They capture the media’s attention; we marvel over the technological wizardry and the ingenuity of scientists; and to the afflicted, each advance gives hope of a cure. The federal government invests billions of dollars in this enterprise, and competition for better products drives the highly lucrative pharmaceutical and medical device industries.

But the promise of a cure requires an additional step. Patients must receive the treatments promptly and properly. This step requires a well-functioning system to deliver care, which our country lacks. We spend far more money on inventing new treatments than on research into how to deliver them. Last year, Congress gave $2.9 billion to the National Institutes of Health, most of it to devise better treatments. The smaller federal agency responsible for solving problems with the delivery of health care, the Agency for Healthcare Research and Quality (AHRQ), received only $320 million. Starkly put, for every dollar Congress allocates to develop breakthrough treatments, it allocates one penny to ensure that Americans actually receive them.
“So, one thing we need to do is figure out what works, and encourage rapid implementation of what works into your practices.”

**President Barack Obama**

Address to the American Medical Association Conference, 2009

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“It’s vital that we stimulate investment for translational research, to use research results in treatments and clinical practice.”

**Hon Peter Dutton**

Australian Federal Minister for Health

Address to the George Institute for Global Health, May 2014
Research translation: definitions and key concepts
Definitions and key concepts

Research translation (aka implementation) is...

- ensuring stakeholders* are aware of and use research evidence to inform their health and healthcare decision-making
- ensuring research is informed by current available evidence and the experiences and information needs of stakeholders

*stakeholders include:
- healthcare professionals
- consumers of health care (i.e. patients, family members, carers)
- policy makers
- educators
- research funders
- researchers

Grimshaw et al, Implement Sci 2012

What is research translation?

US Institute of Medicine, Clinical Research Roundtable
Sung et al, JAMA 2003
Different terms used...

- research translation
- implementation
- getting knowledge into practice
- research into practice
- research transfer
- knowledge translation
- knowledge exchange
- knowledge transfer and exchange (KTE)
- research utilisation
- quality improvement
- dissemination
- diffusion
- and more....

“Evidence-based medicine should be complemented by evidence-based implementation”

Grol, BMJ 1997
Research translation vs. RT science

- *Research translation* involves the ‘doing’ of trying to improve the uptake of research into clinical practice and/or policy and reduce the gaps between what we know and what we do.

- *Research translation science (implementation science)* is the scientific study of methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice and policy, and hence to improve the quality (effectiveness, reliability, safety, appropriateness, equity, efficiency) of health care\(^1\)
  
  - It involves study of the determinants, processes and outcomes of implementation

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**What** research knowledge should be translated?

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\(^1\) Eccles et al, *Implement Sci* 2009
Contradicted and Initially Stronger Effects in Highly Cited Clinical Research

John P. A. Ioannidis, MD

Clinical research on important questions about the efficacy of medical interventions is sometimes followed by subsequent studies that either reach opposite conclusions or suggest that the original claims were too strong. Such disagreements may upset clinical practice and acquire publicity in both scientific circles and the lay press. Several empirical investigations have tried to address whether specific types of studies are more likely to be contradicted and to explain observed controversies. For example, evidence exists that small studies may sometimes be refuted by larger ones.

Similarly, there is some evidence on disagreements between epidemiological studies and randomized trials. Prior investigations have focused on a variety of studies without any particular attention to their relative importance and scientific impact. Yet, most research publications have little impact while a small minority receives most attention and dominates scientific discourse. Controversy and uncertainty ensue when the results of clinical research on the effectiveness of interventions are subsequently contradicted. Controversies are most prominent when high-impact research is involved.

Objectives To understand how frequently highly cited studies are contradicted or find effects that are stronger than in other similar studies and to discern whether specific characteristics are associated with such refutation over time.

Design All original clinical research studies published in 3 major general clinical journals or high-impact-factor specialty journals in 1990-2003 and cited more than 1000 times in the literature were examined.

Main Outcome Measure The results of highly cited articles were compared against subsequent studies of comparable or larger sample size and similar or better controlled designs. The same analysis was also performed comparatively for matched studies that were not so highly cited.

Results Of 49 highly cited original clinical research studies, 45 claimed that the intervention was effective. Of these, 7 (16%) were contradicted by subsequent studies, 7 others (16%) had found effects that were stronger than those of subsequent studies, 20 (44%) were replicated, and 11 (24%) remained largely unchallenged. Five of 6 highly cited nonrandomized studies had been contradicted or had found stronger effects vs 9 of 39 randomized controlled trials (P < .009). Among randomized trials, studies with contradicted or stronger effects were smaller (P < .009) than replicated or unchanged studies although there was no statistically significant difference in their early or overall citation impact. Matched control studies did not have a significantly different share of refuted results than highly cited studies, but they included more studies with "negative" results.

Conclusions Contradiction and initially stronger effects are not unusual in highly cited research of clinical interventions and their outcomes. The extent to which high citations may provoke contradictions and vice versa needs more study. Controversies are most common with highly cited nonrandomized studies, but even the most highly cited randomized trials may be challenged and refuted over time, especially small ones.
How should research knowledge be translated?

Knowledge-to-Action Cycle

Monitor knowledge use
Evaluate outcomes
Sustain knowledge use
Knowledge creation
Knowledge inquiry
Knowledge synthesis
Knowledge tools/products
Identify problem
Identify, review, select knowledge
Action cycle (application)
Adapt knowledge to local context
Assess barriers to knowledge use
Select, tailor, implement interventions
Tailored interventions

- Emerging evidence
  - interventions tailored to prospectively identified barriers are more likely to improve professional practice than no intervention or interventions not tailored to barriers (guideline dissemination)

Baker et al, *CDSR* 2010

Designing interventions

Designing interventions: important features

1. Specifying the key behaviour/s you are trying to change
2. Using theory to understand barriers to change and to design research translation interventions
3. Using empirical evidence to inform the design of research translation interventions
4. Consideration of available resources, practicalities, logistics

1. Importance of specifying behaviours

- You need to be clear about the behaviour/s you are trying to change
- Identify and specify the key behaviours of interest in behavioural terms
  - *Who* needs to do *what* differently, *when*, *where* and *how*?
- Important because barriers and enablers can vary for different behaviours
Example: Target behaviours relating to evidence-based management of dementia (IRIS)

- Guideline recommendation:
  - In individuals with suspected cognitive impairment, the MMSE should be used in the diagnosis of dementia (Grade B recommendation)

- Defined in behavioural terms as:

<table>
<thead>
<tr>
<th>What</th>
<th>an assessment of cognitive function is undertaken in people with suspected cognitive impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who</td>
<td>by general practitioners (GPs)</td>
</tr>
<tr>
<td>How</td>
<td>using the MMSE (a validated scale)</td>
</tr>
<tr>
<td>When, where</td>
<td>within the first three consultations from when a suspicion of cognitive impairment or dementia is first identified, conducted in the GP practice</td>
</tr>
</tbody>
</table>

2. Using theory

- What is theory?
  - a set of statements that organizes, predicts and explains observations, describes how phenomena relate to each other, and what can be expected under unknown conditions

- Research translation requires behaviour change
- Theory useful in understanding how behaviour change occurs

1. Bem and Looren de Jong, 1997
Advantages of using theory

- To prevent overlooking factors that could be important determinants of behaviour change
- To inform design of research translation interventions
- To inform an explicit framework for evaluation along the causal pathway
- To contribute to accumulation of knowledge about the mechanisms of action of research translation interventions across behaviours, professional groups and settings

Many theories available...

- **Individual**
  - Theory of planned behaviour
  - Social cognitive theory
  - Health belief model
  - others...

- **Team**
  - Social learning theory
  - Social influence theory
  - Theory on team effectiveness
  - Theories of leadership
  - others...

- **Organisational**
  - Organisational culture
  - Organisational learning
  - Quality management
  - Complexity theory
  - others....

- **Health system**
  - Economic theories
  - others....

Grol, Wensing, Eccles, *Improving Patient Care* 2005
Michie, West, Campbell et al, *ABC of Behaviour Change Theories* 2014
Frameworks

- Theoretical Domains Framework (TDF)
- Behaviour Change Wheel (BCW)
- PARiHS: Promoting Action on Research Implementation in Health Services
- Consolidated Framework for Implementation Research (CFIR)
- Conceptual model for considering the determinants of diffusion, dissemination and sustainability of innovations in health service delivery and organisation
- and others...

An inclusive approach to the Theoretical Domains Framework

- Integrates and simplifies theories of change into a set of theoretical domains
- 128 explanatory constructs from 33 theories of change identified
- Theoretical constructs simplified into 12 domains
- Interview questions associated with each domain
- Recent validation
- Review of use


Example: Acute Low-back pain Implementing Guidelines into allied health practice (ALIGN) barriers study

<table>
<thead>
<tr>
<th>Domain</th>
<th>Beliefs about capabilities</th>
<th>Beliefs about consequences</th>
<th>Environmental context and resources</th>
<th>Social influences</th>
<th>Emotion</th>
<th>Behavioural regulation</th>
<th>Motivation and goals</th>
<th>Memory and decision processes</th>
<th>Nature of the behaviours</th>
<th>Beliefs about capabilities</th>
<th>Wills</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>To negotiate with patients and resist pressure for x-ray</td>
<td>Negative consequences: lose patient to another provider, cause harm if spine manipulated without prior x-ray</td>
<td>Positive consequences: x-ray reassures anxious patient</td>
<td>X-ray easily accessible, first-line diagnostic tool</td>
<td>Perceived expectation/pressure for x-ray from patients</td>
<td>Fear of missing underlying sinister pathology and litigation for misdiagnosis</td>
<td>Responsibility to diagnose and manage accurately: perceived negligent if don't x-ray</td>
<td>About diagnostic utility of x-rays and radiation exposure delivered</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BCT taxonomy: groupings of BCTs

1. Shaping knowledge
2. Goals and planning
3. Feedback and monitoring
4. Social support
5. Natural consequences
6. Comparison of behaviour
7. Associations
8. Repetition and substitution
9. Comparison of outcomes
10. Reward and threat
11. Regulation
12. Antecedents
13. Identity
14. Scheduled consequences
15. Self-belief
16. Covert learning
BCT taxonomy

1. Shaping knowledge

<table>
<thead>
<tr>
<th>Techniques</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction on how to perform the behaviour</td>
<td>Advise or agree on how to perform the behaviour (including skills training)</td>
</tr>
<tr>
<td>Information about antecedents</td>
<td>Provide information about social and environmental situations and events, emotions, cognitions that reliably predict performance of the behaviour</td>
</tr>
<tr>
<td>Re-attribution</td>
<td>Elicit perceived causes of behaviour and suggest alternative explanations</td>
</tr>
<tr>
<td>Behavioural experiments</td>
<td>Advise on how to identify and test hypotheses about the behaviour, its causes and consequences, by collecting and interpreting data</td>
</tr>
</tbody>
</table>

2. Using empirical evidence about effects of implementation interventions

<table>
<thead>
<tr>
<th>Intervention</th>
<th># studies</th>
<th>Effect size (median absolute improvement in desired practice)</th>
<th>Interquartile range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit and feedback (Ivers 2012)</td>
<td>140 RCTs</td>
<td>+4.3%</td>
<td>+0.5% to +16.0%</td>
</tr>
<tr>
<td>Computer-generated reminders (Arditi 2012)</td>
<td>27 RCTs, 5 NRCTs</td>
<td>+11.2%</td>
<td>+6.5% to +19.6%</td>
</tr>
<tr>
<td>Educational meetings (Forsetlund 2009)</td>
<td>81 RCTs</td>
<td>+6.0%</td>
<td>+1.8% to +15.9%</td>
</tr>
<tr>
<td>Educational outreach (O’Brien 2007)</td>
<td>69 RCTs</td>
<td>+5.6%</td>
<td>+3.0% to +9.0%</td>
</tr>
<tr>
<td>Local opinion leaders (Flodgren 2011)</td>
<td>18 RCTs</td>
<td>+12.0%</td>
<td>+6.0% to +14.5%</td>
</tr>
<tr>
<td>On-screen point of care computerised reminders (Shojania 2009)</td>
<td>28 RCTs</td>
<td>+4.2%</td>
<td>+0.8% to +18.8%</td>
</tr>
<tr>
<td>Printed educational materials (Giguere 2013)</td>
<td>14 RCTs, 31 ITS</td>
<td>+0.02%</td>
<td>-0.06% to +0.29%</td>
</tr>
</tbody>
</table>

Cochrane EPOC reviews: www.thecochranelibrary.com
# Designing interventions: mapping determinants to BCTs and delivery modes

<table>
<thead>
<tr>
<th>Identified barriers</th>
<th>Consider BCTs...</th>
<th>Consider delivery modes (and evidence about their effects)...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Instruction on how to perform the behaviour Information about antecedents etc</td>
<td>Local opinion leader Printed education materials Educational meeting Educational outreach</td>
</tr>
<tr>
<td>Skills</td>
<td>Behavioural practice/rehearsal Graded tasks etc</td>
<td>Educational meeting Educational outreach</td>
</tr>
</tbody>
</table>

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## Key messages

- Research translation should be a planned and active process that focuses on translating up-to-date synthesized knowledge products.

- Designing research translation interventions involves specifying the behaviours that need to change, assessing barriers to change and identifying intervention components that are most likely to be effective given this assessment.

- Theories and/or theoretical frameworks are useful for informing barrier assessment and intervention design.

- A substantial research translation evidence base exists, including evidence about the effects of implementation interventions, to inform the design of implementation activities.
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- Denise O’Connor
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Useful resources

- www.implementationscience.com
- www.thecochranelibrary.com

Thanks for listening

William Hughes, 1936

“Research must be actively pursued and developed and as fast as new knowledge is acquired it must be applied.”

Australian Commonwealth
Minister for Health