

INCREASING VALUE AND REDUCING WASTE IN IMPLEMENTATION RESEARCH

JEREMY GRIMSHAW
SENIOR SCIENTIST, OTTAWA HOSPITAL RESEARCH INSTITUTE
PROFESSOR, DEPARTMENT OF MEDICINE, UNIVERSITY OF OTTAWA
CANADA RESEARCH CHAIR IN HEALTH KNOWLEDGE TRANSFER AND
UPTAKE

6TH FEBRUARY 2018
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BACKGROUND

'All breakthrough, no follow through'

Woolf (2006) Washington Post op ed

- ▶ Much of the US \$240 billion/year worldwide investment in biomedical and health research is wasted because of dissemination and implementation failures



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BACKGROUND

- ▶ Consistent evidence of failure to translate research findings into clinical practice
 - 30-40% patients do not get treatments of proven effectiveness
 - 20–25% patients get care that is not needed or potentially harmful
- ▶ Suggests that implementation of research findings is fundamental challenge for healthcare systems to optimise care, outcomes and costs

Schuster, McGlynn, Brook (1998). *Milbank Memorial Quarterly*

Grol R (2001). *Med Care*



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IMPLEMENTATION SCIENCE

- ▶ Implementation is a human enterprise that can be studied to understand and improve implementation approaches
- ▶ Implementation science is the scientific study of the determinants, processes and outcomes of implementation.
- ▶ Goal is to develop a generalisable empirical and theoretical basis to optimise implementation activities



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IMPLEMENTATION SCIENCE

- ▶ Implementation science is a research relatively new applied field in health services research
- ▶ Inherently interdisciplinary
- ▶ Wide range of disciplines need to be engaged
 - Clinical
 - Health services research
 - Social sciences
 - Design and engineering
 - Informatics
 - Methodologists
- ▶ Broad range of forms of enquiry needed



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IMPLEMENTATION SCIENCE

- ▶ Knowledge synthesis (what care should we be providing, what do we know about the effectiveness of different implementation approaches);
- ▶ Research into the evolution of and critical discourse around research evidence;
- ▶ Research into knowledge retrieval, evaluation and knowledge management infrastructure
- ▶ Identification of implementation failures;
- ▶ Development of methods to assess barriers and facilitators to implementation;
- ▶ Development of the methods for optimising implementation programs;
- ▶ Evaluations of the effectiveness and efficiency of implementation programs;
- ▶ Sustainability and scalability of implementation programs;
- ▶ Development of implementation science theory; and
- ▶ Development of implementation science research methods.



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INCREASING VALUE, REDUCING WASTE IN THE RESEARCH ENTERPRISE

In 2009, Chalmers and Glasziou estimated that the that about 85% of research investment—equating to \$200 billion of the investment in 2010—is wasted.

Macleod (2014) Lancet



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CURRENT STATE OF IMPLEMENTATION SCIENCE – AUDIT AND FEEDBACK

- Cochrane 2012 review – 140 trials of audit and feedback, median absolute improvement +4%, interquartile range +1% to +16%
- Larger effects were seen if:
 - baseline compliance was low.
 - the source was a supervisor or colleague
 - it was provided more than once
 - it was delivered in both verbal and written formats
 - it included both explicit targets and an action plan

Ivers (2012) *Cochrane Library*



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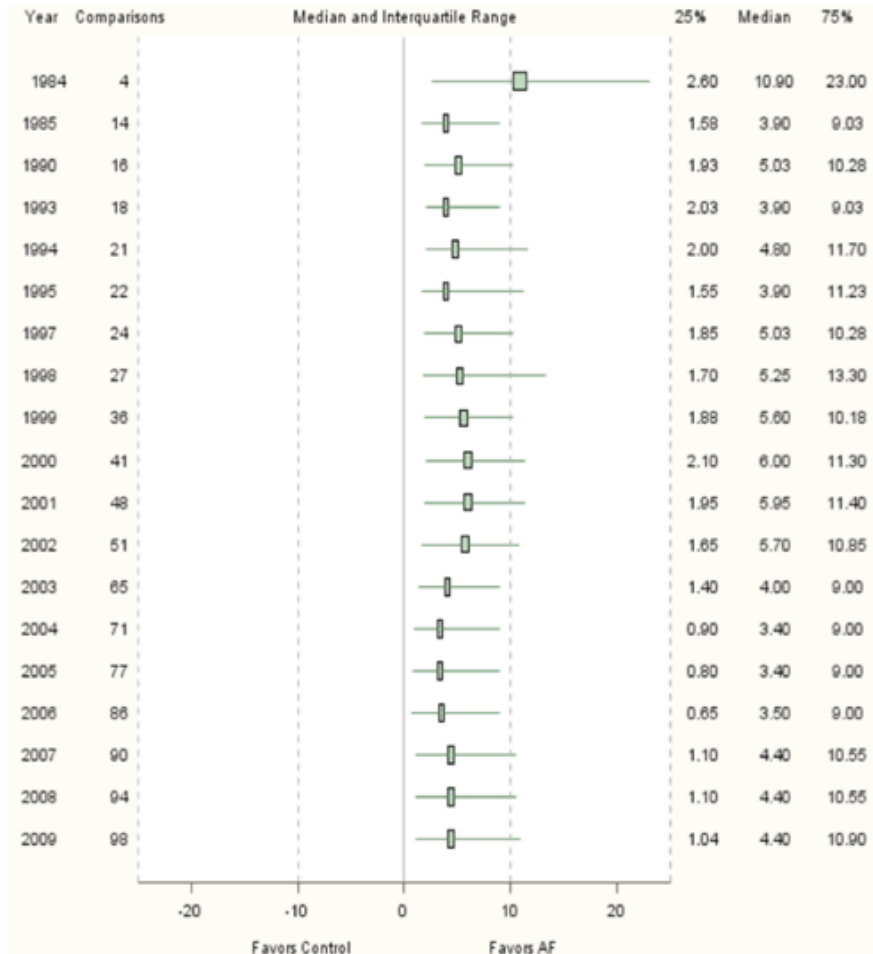
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CURRENT STATE OF IMPLEMENTATION SCIENCE – AUDIT AND FEEDBACK



Cumulative analysis – effect size of audit and feedback interventions over time

Little evidence of formal replication - only 6 studies reported testing an intervention from a previous study

Ivers et al (2014) *Journal of General Internal Medicine*



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CURRENT STATE OF IMPLEMENTATION SCIENCE – AUDIT AND FEEDBACK

Growing Literature, Stagnant Science? Systematic Review, Meta-Regression and Cumulative Analysis of Audit and Feedback Interventions in Health Care

Noah M. Ivers, MD, PhD¹, Jeremy M. Grimshaw, PhD², Gro Jamtvedt, PT³, Signe Flottorp, MD³, Mary Ann O'Brien, PhD¹, Simon D. French, PhD⁴, Jane Young, MD⁵, and Jan Odgaard-Jensen, PhD³

¹Family Practice Health Centre and Institute for Health Systems Solutions and Virtual Care, Women's College Hospital, Toronto, Ontario, Canada; ²Clinical Epidemiology Program, Ottawa Hospital Research Institute, Department of Medicine, University of Ottawa, Ottawa, Ontario, Canada; ³Norwegian Knowledge Centre for the Health Services, Oslo, Norway; ⁴School of Rehabilitation Therapy, Faculty of Health Sciences, Queen's University, Kingston, Ontario, Canada; ⁵Cancer Epidemiology and Services Research, Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia.

BACKGROUND: This paper extends the findings of the Cochrane systematic review of audit and feedback on professional practice to explore the estimate of effect over time and examine whether new trials have added to knowledge regarding how optimize the effectiveness of audit and feedback.

METHODS: We searched the Cochrane Central Register of Controlled Trials, MEDLINE, and EMBASE for randomized trials of audit and feedback compared to usual care, with objectively measured outcomes assessing compliance with intended professional practice. Two reviewers independently screened articles and abstracted variables related to the intervention, the context, and trial methodology. The median absolute risk difference in compliance with intended professional practice was determined for each study, and adjusted for baseline performance. The effect size across studies was

DISCUSSION: There is substantial evidence that audit and feedback can effectively improve quality of care, but little evidence of progress in the field. There are opportunity costs for patients, providers, and health care systems when investigators test quality improvement interventions that do not build upon, or contribute toward, extant knowledge.

KEY WORDS: audit and feedback; scientific progress; quality improvement; systematic review; cumulative analysis.

J Gen Intern Med

DOI: 10.1007/s11606-014-2913-y

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INCREASING VALUE, REDUCING WASTE IN IMPLEMENTATION RESEARCH

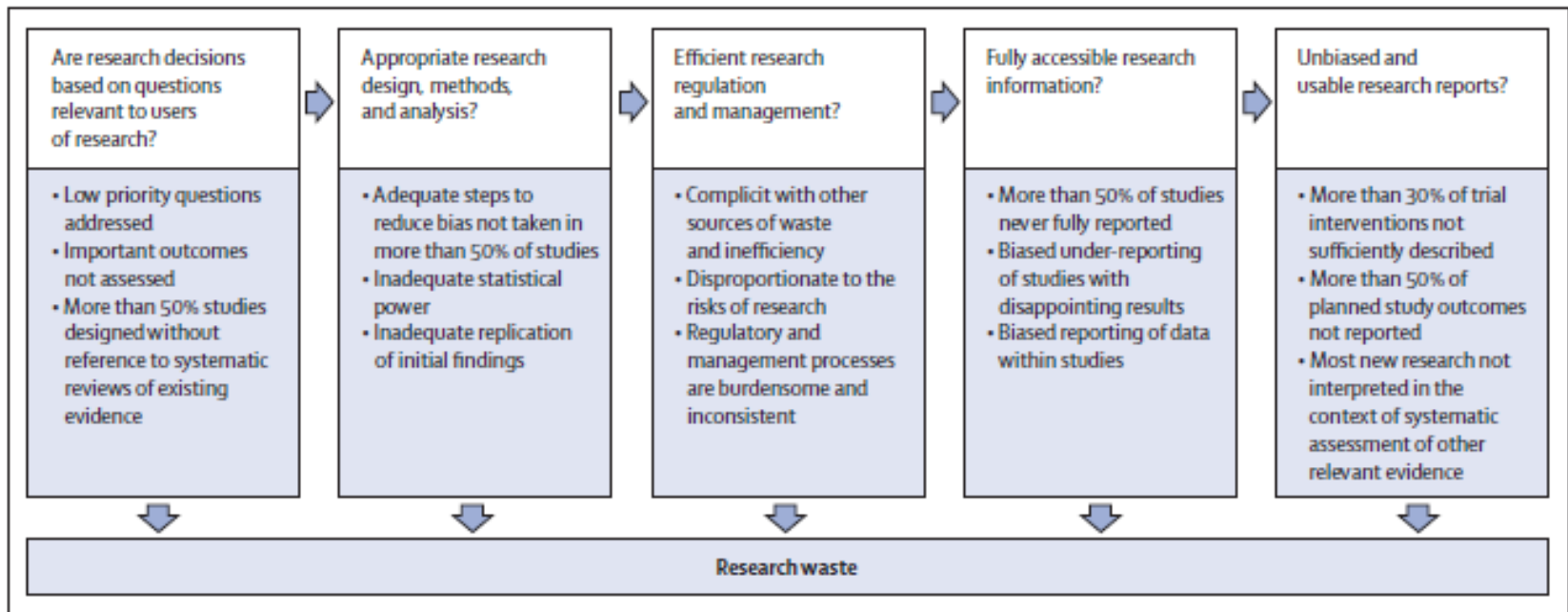


Figure: Avoidable waste or inefficiency in biomedical research

Macleod (2014) Lancet



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ARE RESEARCH QUESTIONS BASED ON QUESTIONS RELEVANT TO USERS OF RESEARCH?

- ▶ Balkanization in implementation research
- ▶ Poor intervention design
- ▶ Failure to plan future research based on current knowledge



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BALKANIZATION

‘...the process of fragmentation or division of a region or state into smaller regions or states that are often hostile or non-cooperative with one another.’

Wikipedia



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BALKANIZATION IN IMPLEMENTATION RESEARCH

applied health research

capacity building

co-optation - cooperation -
competing

diffusion*

dissemination*

getting knowledge into practice

impact

Implementation*

knowledge communication

knowledge cycle

knowledge exchange

knowledge management

knowledge translation

knowledge mobilisation

knowledge transfer

linkage and exchange

popularization of research,

research into practice

research mediation

research transfer

research translation

science communication

teaching

“third mission”

translational research

transmission

utilisation

BALKANIZATION IN IMPLEMENTATION RESEARCH

- ▶ Australia Research translation
- ▶ Canada Knowledge translation research
- ▶ Europe Implementation research
- ▶ US Quality improvement research
Dissemination and implementation
research (NIH)
- ▶ Global Implementation research
- ▶ Other Improvement science



BALKANIZATION IN IMPLEMENTATION RESEARCH

- ▶ Related streams of activity include:
 - Knowledge utilisation
 - Diffusion of innovation
 - Technology transfer
 - Social and organisational sciences
 - Quality assurance/quality improvement/patient safety
 - Evidence based medicine (including practice guidelines)
 - Medical education



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BALKANIZATION IN IMPLEMENTATION RESEARCH

International Journal for Quality in Health Care 2009, Volume 21, Number 3: pp. 153–159
Advance Access Publication: 21 April 2009

10.1093/intqhc/mzn012

Pseudoinnovation: the development and spread of healthcare quality improvement methodologies

KIERAN WALSH

Health Policy and Management Group, Herbert Simon Institute, Manchester Business School, Booth Street West, Manchester M15 6PB, UK

Abstract

Background. Over the last two decades, we have seen the successive rise and fall of a number of concepts, ideas or methods in healthcare quality improvement (QI). Paradoxically the content of many of these QI methodologies is very similar, though their presentation often seeks to differentiate or distinguish them.

Methods. This paper sets out to explore the processes by which new QI methodologies are developed and disseminated and the impact this has on the effectiveness of QI programmes in healthcare organizations. It draws on both a bibliometric analysis of the QI literature over the period from 1988 to 2007 and a review of the literature on the effectiveness of QI programmes and their evaluation.



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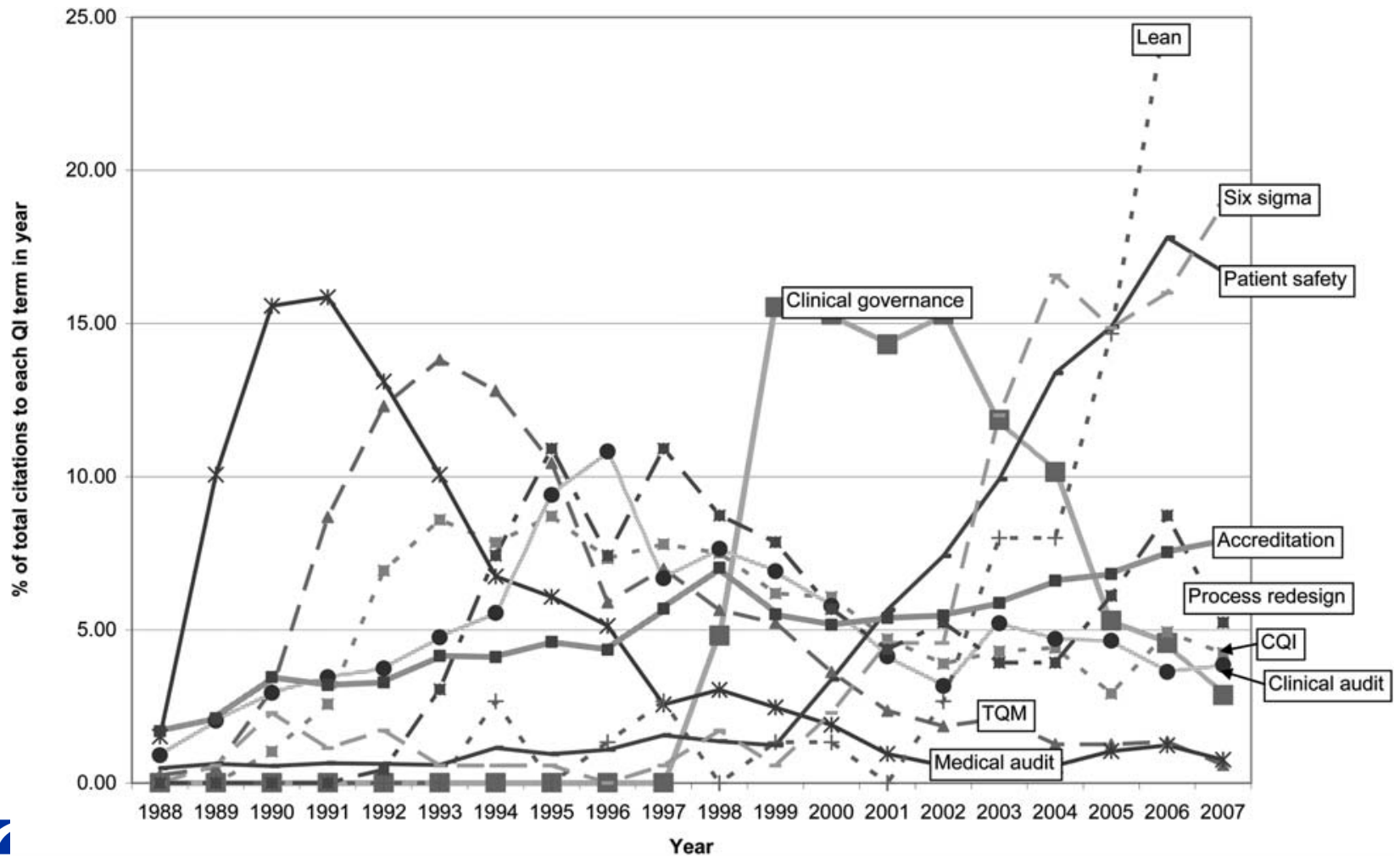
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BALKANIZATION IN IMPLEMENTATION RESEARCH



BALKANIZATION IN IMPLEMENTATION RESEARCH

Results. The repeated presentation of an essentially similar set of QI ideas and methods under different names and terminologies is a process of ‘pseudoinnovation’, which may be driven by both the incentives for QI methodology developers and the demands and expectations of those responsible for QI in healthcare organizations. We argue that this process has important disbenefits because QI programmes need sustained and long term investment and support in order to bring about significant improvements. The repeated redesign of QI programmes may have damaged or limited their effectiveness in many healthcare organizations.

Conclusions. A more sceptical and scientifically rigorous approach to the development, evaluation and dissemination of QI methodologies is needed, in which a combination of theoretical, empirical and experiential evidence is used to guide and plan their uptake. Our expectations of the evidence base for QI methodologies should be on a par with our expectations in relation to other forms of healthcare interventions.



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POOR INTERVENTION DESIGN

ISLAGIATT
principle

‘It Seemed
Like A Good
Idea At The
Time’

Martin P Eccles



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FAILURE TO PLAN FUTURE RESEARCH BASED ON CURRENT KNOWLEDGE

- ▶ Failure to build cumulative science - thousands of studies that do not optimally incorporate current state of knowledge when planning new studies
- ▶ 118 RCTs of audit and feedback published by 2006
 - Only 28% used elements that theory would suggest would optimise intervention
- ▶ 142 RCTs of diabetes QI strategies published by 2011 (up from 50 RCTs published by 2006)
 - Most appear local solutions for diabetes management that do not use available evidence to inform design
- ▶ 35 systematic reviews of reminders published by Sept 2009



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APPROPRIATE RESEARCH DESIGN, METHODS AND ANALYSIS?

- ▶ **Failure to build informative science - thousands of studies that provide flawed or limited information**
- ▶ Technical – clustering ignored, small numbers of units, unrealistic effect sizes, unit of analysis remain common
- ▶ Design – majority are two arm trials (intervention vs control)
- ▶ Intervention – little rationale provided for the choice of intervention, few explicitly theory based, insufficient feasibility testing
- ▶ Limited efforts to explore causal mechanisms of any observed changes
- ▶ Economic evaluation – largely ignored
- ▶ Reporting – insufficient details of context, intervention, and methods



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APPROPRIATE RESEARCH DESIGN, METHODS AND ANALYSIS?

Open Access

Research



Quality improvement needed in quality improvement randomised trials: systematic review of interventions to improve care in diabetes

Noah M Ivers,¹ Andrea C Tricco,² Monica Taljaard,³ Ilana Halperin,⁴ Lucy Turner,⁵ David Moher,⁵ Jeremy M Grimshaw⁵

To cite: Ivers NM, Tricco AC, Taljaard M, *et al*. Quality improvement needed in quality improvement randomised trials: systematic review of interventions to improve care in diabetes. *BMJ Open* 2013;3:e002727. doi:10.1136/bmjopen-2013-002727

► Prepublication history for this paper are available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2013-002727>).

Received 14 February 2013
Revised 11 March 2013
Accepted 12 March 2013

ABSTRACT

Objective: Despite the increasing numbers of published trials of quality improvement (QI) interventions in diabetes, little is known about the risk of bias in this literature.

Design: Secondary analysis of a systematic review.

Data sources: Medline, the Cochrane Effective Practice and Organisation of Care (EPOC) database (from inception to July 2010) and references of included studies.

Eligibility criteria: Randomised trials assessing 11 predefined QI strategies or financial incentives targeting health systems, healthcare professionals or patients to improve the management of adult outpatients with diabetes.

Analysis: Risk of bias (low, unclear or high) was assessed for the 142 trials in the review across nine domains using the EPOC version of the Cochrane Risk of Bias Tool. We used Cochran-Armitage tests for trends to evaluate the improvement

ARTICLE SUMMARY

Article focus

- Reliable quality improvement research is needed to make decisions about initiating or scaling up quality improvement strategies.
- The number of published quality improvement trials has increased rapidly over time.
- The quality of trials published in other areas of health seem to be improving over time but the risk of bias in the quality improvement literature is uncertain.

Key messages

- Nearly half of quality improvement trials for diabetes are at high risk of bias.
- The quality of quality improvement trials does not seem to be improving over time.
- Policy-makers, administrators, clinicians and research funders must carefully scrutinize the



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EFFICIENT RESEARCH REGULATION AND MANAGEMENT?

- ▶ Ethical issues
- ▶ Inefficient research models



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ETHICAL ISSUES

OPEN ACCESS Freely available online



Guidelines and Guidance

The Ottawa Statement on the Ethical Design and Conduct of Cluster Randomized Trials

Charles Weijer^{1,2,3*}, Jeremy M. Grimshaw^{1,4,5}, Martin P. Eccles⁶, Andrew D. McRae^{1,3,7}, Angela White¹, Jamie C. Brehaut^{4,8}, Monica Taljaard^{1,4,8}, the Ottawa Ethics of Cluster Randomized Trials Consensus Group[†]

1 Rotman Institute of Philosophy, Department of Philosophy, Western University, London, Ontario, Canada, **2** Department of Medicine, Western University, London, Ontario, Canada, **3** Department of Epidemiology and Biostatistics, Western University, London, Ontario, Canada, **4** Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada, **5** Department of Medicine, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada, **6** Institute of Health and Society, Newcastle University, Newcastle upon Tyne, United Kingdom, **7** Division of Emergency Medicine, University of Calgary, Foothills Medical Centre, Calgary, Alberta, Canada, **8** Department of Epidemiology and Community Medicine, University of Ottawa, Ottawa, Ontario, Canada



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INEFFICIENT RESEARCH MODELS

Research projects

- ▶ Majority of current implementation research studies involve one off projects requiring convening *de novo* research teams, seeking project by project funding, negotiating access with healthcare systems, conducting study, writing up (usually out of funding period)
- ▶ Creates problems with:
 - Efficiency (for research team, healthcare system)
 - Failure to maximise learning from individual projects
 - Failure to communicate learning from individual projects
 - Intellectual continuity (fails to develop cumulative knowledge)
 - Promoting interdisciplinarity



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UNBIASED AND USABLE RESEARCH REPORTS?

ANALYSIS

What is missing from descriptions of treatment in trials and reviews?

Replicating non-pharmacological treatments in practice depends on how well they have been described in research studies, say **Paul Glasziou** and **colleagues**

Have you ever read a trial or review and wondered exactly how to carry out treatments such as a “behavioural intervention,” “salt reduction,” or “exercise programme”? Although CONSORT and related initiatives have focused on the assessment of validity and presentation of results,^{1 2} less attention has been given to the adequacy of the description of the treatment used. For pharmacological treatments the description would need to include the dose, titration, route, timing, duration, and any monitoring used. For complex treatments the problems are even greater.

Why are full descriptions of treatment important?

The uptake of positive findings from trials is

receiving numerous requests for additional details from doctors and patients, the author of a randomised trial on graded exercise for chronic fatigue syndrome⁶ subsequently published a supplementary article with a more detailed “prescription.”⁷ Similarly, it is not possible to set up a stroke unit, offer low fat diets, or give smoking cessation advice without sufficient details on the components that were planned and delivered.⁸

Extent of the problem

To assess the extent of problems with descriptions of treatment we prospectively assessed 80 consecutive studies selected for abstraction in the journal *Evidence-Based Medicine* from October 2005 to October 2006. The journal is aimed specifically at doctors work-

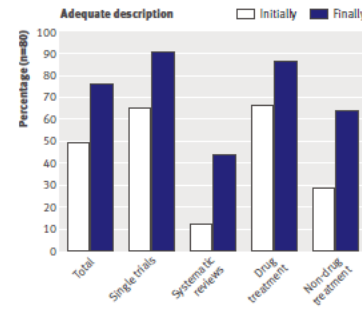


Fig 2 | Percentage of studies with sufficient description of treatment initially (based only on the published paper) and after supplementary information was obtained



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INCREASING VALUE, REDUCING WASTE IN THE RESEARCH ENTERPRISE

In 2009, Chalmers and Glasziou estimated that the that about 85% of research investment—equating to \$200 billion of the investment in 2010—is wasted.

Macleod (2014) Lancet



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INCREASING VALUE, REDUCING WASTE IN IMPLEMENTATION RESEARCH

- ▶ Intervention design and optimisation
- ▶ Implementation laboratories to test comparative effectiveness of implementation interventions at scale
- ▶ Enhancing informativeness of evaluations of implementation interventions
- ▶ Enhancing informativeness of systematic reviews of implementation interventions



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INTERVENTION DESIGN AND OPTIMISATION

French et al. *Implementation Science* 2012, 7:38
<http://www.implementation-science.com/content/7/1/38>



METHODOLOGY

Open Access

Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework

Simon D French^{1,2*}, Sally E Green¹, Denise A O'Connor¹, Joanne E McKenzie¹, Jill J Francis³, Susan Michie⁴, Rachelle Buchbinder^{1,5,6}, Peter Schattner⁶, Neil Spike⁶ and Jeremy M Grimshaw^{7,8}

Abstract

Background: There is little systematic operational guidance about how best to develop complex interventions to reduce the gap between practice and evidence. This article is one in a Series of articles documenting the development and use of the Theoretical Domains Framework (TDF) to advance the science of implementation research.

Methods: The intervention was developed considering three main components: theory, evidence, and practical issues. We used a four-step approach, consisting of guiding questions, to direct the choice of the most appropriate components of an implementation intervention: Who needs to do what, differently? Using a theoretical framework, which barriers and enablers need to be addressed? Which intervention components (behaviour change techniques and mode(s) of delivery) could overcome the modifiable barriers and enhance the enablers? And how can behaviour change be measured and understood?

Results: A complex implementation intervention was designed that aimed to improve acute low back pain management in primary care. We used the TDF to identify the barriers and enablers to the uptake of evidence into practice and to guide the choice of intervention components. These components were then combined into a cohesive intervention. The intervention was delivered via two facilitated interactive small group workshops. We also produced a DVD to distribute to all participants in the intervention group. We chose outcome measures in order to assess the mediating mechanisms of behaviour change.

Conclusions: We have illustrated a four-step systematic method for developing an intervention designed to change clinical practice based on a theoretical framework. The method of development provides a systematic framework that could be used by others developing complex implementation interventions. While this framework should be iteratively adjusted and refined to suit other contexts and settings, we believe that the four-step process should be maintained as the primary framework to guide researchers through a comprehensive intervention development process.



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INTERVENTION DESIGN AND OPTIMISATION

Who needs to do what differently?



Using a theoretical framework, which barriers and enablers need to be addressed?



Which intervention components could overcome the modifiable barriers and enhance the enablers?



How will we measure behaviour change?

INTERVENTION DESIGN AND OPTIMISATION

Who needs to do what differently?



Using a theoretical framework, which barriers and enablers need to be addressed?



Which intervention components could overcome the modifiable barriers and enhance the enablers?



How will we measure behaviour change?

THEORETICAL DOMAINS FRAMEWORK

Cane et al. *Implementation Science* 2012, **7**:37
<http://www.implementationscience.com/content/7/1/37>



RESEARCH

Open Access

Validation of the theoretical domains framework for use in behaviour change and implementation research

James Cane¹, Denise O'Connor² and Susan Michie^{3*}

Abstract

Background: An integrative theoretical framework, developed for cross-disciplinary implementation and other behaviour change research, has been applied across a wide range of clinical situations. This study tests the validity of this framework.

Methods: Validity was investigated by behavioural experts sorting 112 unique theoretical constructs using closed and open sort tasks. The extent of replication was tested by Discriminant Content Validation and Fuzzy Cluster Analysis.

Results: There was good support for a refinement of the framework comprising 14 domains of theoretical constructs (average silhouette value 0.29): 'Knowledge', 'Skills', 'Social/Professional Role and Identity', 'Beliefs about Capabilities', 'Optimism', 'Beliefs about Consequences', 'Reinforcement', 'Intentions', 'Goals', 'Memory, Attention and Decision Processes', 'Environmental Context and Resources', 'Social Influences', 'Emotions', and 'Behavioural Regulation'.

Conclusions: The refined Theoretical Domains Framework has a strengthened empirical base and provides a method for theoretically assessing implementation problems, as well as professional and other health-related behaviours as a basis for intervention development.

Keywords: Theoretical domains framework, Behaviour, Change, Implementation, Validation, Theory

THEORETICAL DOMAINS FRAMEWORK

Cane 2012

- ▶ Knowledge
- ▶ Skills
- ▶ Social/professional role and identity
- ▶ Beliefs about capabilities
- ▶ Optimism
- ▶ Beliefs about consequences
- ▶ Reinforcement
- ▶ Intentions
- ▶ Goals
- ▶ Memory, attention and decision processes
- ▶ Environmental context and resources
- ▶ Social influences
- ▶ Emotion
- ▶ Behavioural regulation



INTERVENTION DESIGN AND OPTIMISATION

Who needs to do what differently?



Using a theoretical framework, which barriers and enablers need to be addressed?



Which intervention components could overcome the modifiable barriers and enhance the enablers?



How will we measure behaviour change?

INTERVENTION DESIGN AND OPTIMISATION

ann. behav. med. (2013) 46:81–95
DOI 10.1007/s12160-013-9486-6

ORIGINAL ARTICLE

The Behavior Change Technique Taxonomy (v1) of 93 Hierarchically Clustered Techniques: Building an International Consensus for the Reporting of Behavior Change Interventions

Susan Michie, DPhil, CPsychol • Michelle Richardson, PhD • Marie Johnston, PhD, CPsychol • Charles Abraham, DPhil, CPsychol • Jill Francis, PhD, CPsychol • Wendy Hardeman, PhD • Martin P. Eccles, MD • James Cane, PhD • Caroline E. Wood, PhD

Published online: 20 March 2013

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V1 Behaviour change techniques taxonomy (Michie et al 2013)

Feedback and monitoring

Monitoring of behaviour by others without feedback
Feedback on behaviour/outcomes of behaviour
Feedback on outcomes of behaviour
Self-monitoring of behaviour
Self-monitoring of outcomes of behaviour
Monitoring of outcome(s) of behaviour without feedback

Biofeedback

Regulation

Conserving mental resources
Pharmacological support
Reduce negative emotions

Paradoxical instructions

Goals and Planning

Goal setting (behavior) OR Goal setting (outcome)
Problem solving
Action planning
Review behavior goal(s) OR Review outcome goal(s)
Discrepancy between current behavior and goal
Behavioral contract
Commitment

Repetition and substitution

Behavioural practice/rehearsal
Behaviour substitution
Habit formation
Habit reversal
Overcorrection
Generalisation of target behaviour
Graded tasks

Comparison of outcomes

Credible source
Pros and cons
Comparative imagining of future outcomes

Covert learning

Imaginary punishment
Imaginary reward
Vicarious consequences

Reward and threat

Incentive (outcome)
Material incentive (behaviour)
Social incentive
Non-specific incentive
Self-incentive
Self-reward
Reward (outcome)
Material reward (behaviour)
Non-specific reward
Social reward
Future punishment

Shaping Knowledge

Instruction on how to perform the behaviour
Information about Antecedents
Re-attribution
Behavioural experiments

Social Support

Social support (unspecified)
Social support (practical)
Social support (emotional)

Natural Consequences

Info about health consequences
Info about emotional consequences
Info re social and environment consequences
Salience of consequences
Monitoring of emotional consequences
Anticipated regret

Identity

Identification of self as role model
Framing/reframing
Incompatible beliefs
Valued self-identify
Identity associated with changed behaviour

Scheduled consequences

Behaviour cost
Punishment
Remove reward
Reward approximation
Rewarding completion
Situation-specific reward
Reward incompatible behaviour
Reward alternative behaviour
Reduce reward frequency
Remove punishment

Antecedents

Adding objects to the environment
Restructuring the physical environment
Restructuring the social environment
Avoidance/reducing exposure to cues for behaviour
Distraction

Body changes

Self-belief

Verbal persuasion about capability
Mental rehearsal of successful perform
Focus on past success

Self-talk

Associations

Prompts/cues
Cue signalling reward
Reduce prompts/cues
Remove access to the reward
Remove aversive stimulus
Satiation
Exposure
Associative learning

Comparison of behaviour

Demonstration of the behaviour
Social comparison
Information about others' approval

INTERVENTION DESIGN AND OPTIMISATION

(3) Repetition and substitution

Behavior substitution [8.2]

Habit reversal [8.4]

Habit formation [8.3]

Graded tasks [8.7]

Overcorrection [8.5]

Behavioral rehearsal/practice [8.1]

Generalization of a target behavior [8.6]

- ▶ **Graded tasks** - Set easy tasks, and increase difficulty until target behavior is performed.
- ▶ **Behavioural rehearsal/practice** - Prompt the person to rehearse and repeat the behavior or preparatory behaviors

INTERVENTION DESIGN AND OPTIMISATION

APPLIED
PSYCHOLOGY



APPLIED PSYCHOLOGY: AN INTERNATIONAL REVIEW, 2008, 57 (4), 660–680
doi: 10.1111/j.1464-0597.2008.00341.x

From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques

Susan Michie*

University College London, UK

Marie Johnston and Jill Francis

University of Aberdeen, UK

Wendy Hardeman

University of Cambridge, UK





Martin Eccles

Newcastle University, UK

Theory provides a helpful basis for designing interventions to change behaviour but offers little guidance on how to do this. This paper aims to illustrate methods for developing an extensive list of behaviour change techniques (with definitions) and for linking techniques to theoretical constructs. A list of techniques and definitions was generated from techniques published in two systematic reviews, supplemented by “brainstorming” and a systematic search of nine textbooks used in training applied psychologists. Inter-rater reliability of extracting the techniques and definitions from the textbooks was assessed. Four experts judged which techniques would be effective in changing 11 theoretical constructs associated with behaviour change. Thirty-five techniques identified in the reviews were extended to 53 by brainstorming and to 137 by

Technique for behaviour change	Techniques judged to be effective in changing each construct domain										
	1	2	3	4	5	6	7	8	9	10	11
Goal/target specified: behaviour or outcome	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Monitoring	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Self-monitoring	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Contract	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Rewards; incentives (inc. self-evaluation)	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Graded task, starting with easy tasks	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Increasing skills: problem-solving, decision-making, goal-setting	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Stress management	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Coping skills	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Rehearsal of relevant skills	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Role-play	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Planning, implementation	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Prompts, triggers, cues	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Environmental changes (e.g. objects to facilitate behaviour)	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Social processes of encouragement, pressure, support	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Persuasive communication	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Information regarding behaviour, outcome	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Personalised message	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Modelling/demonstration of behaviour by others	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Homework	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Personal experiments, data collection (other than self-monitoring of behaviour)	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Experiential: tasks to gain experiences to change motivation	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Feedback	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Self talk	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Use of imagery	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Perform behaviour in different settings	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Shaping of behaviour	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Motivational interviewing	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Relapse prevention	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Cognitive restructuring	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Relaxation	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Desensitisation	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Problem-solving	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Time management	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use
Identify/prepare for difficult situation/problems	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use	Agreed use

KEY^a:

	Agreed use
	Uncertain
	Disagreement
	Agreed non-use

Techniques judged to be effective in changing each construct domain

- 1 Social/Professional role and identity
- 2 Knowledge
- 3 Skills
- 4 Beliefs about capabilities
- 5 Beliefs about consequences
- 6 Motivation and goals
- 7 Memory, attention, decision processes
- 8 Environmental context and

IMPLEMENTATION LABORATORIES TO TEST COMPARATIVE EFFECTIVENESS AT SCALE

Implementation Research Laboratories

- ▶ Research teams integrated into healthcare systems undertaking program(s) of research directly relevant to healthcare systems' priorities
- ▶ Reduces problems relating to convening *de novo* research teams, seeking project by project funding, negotiating access with healthcare systems, conducting study, writing up (usually out of funding period)
- ▶ Opportunities for formal and informal linkages of mutual advantage to research team and healthcare system
- ▶ More explicitly recognise relative roles and responsibilities of research team and healthcare system



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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK

- Cochrane 2012 review – 140 trials of audit and feedback, median absolute improvement +4%, interquartile range +1% to +16%
- Larger effects were seen if:
 - baseline compliance was low.
 - the source was a supervisor or colleague
 - it was provided more than once
 - it was delivered in both verbal and written formats
 - it included both explicit targets and an action plan

Ivers (2012) *Cochrane Library*



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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK

- ▶ Future studies need to evaluate comparative effectiveness of different methods of delivering audit and feedback
 - Timing
 - Design
 - Content
 - Delivery
 - Sustainability
 - Co-interventions
- ▶ Need large sample sizes that are unlikely to be realised in one off research projects but opportunities to collaborate with health care systems already delivering audit and feedback programs



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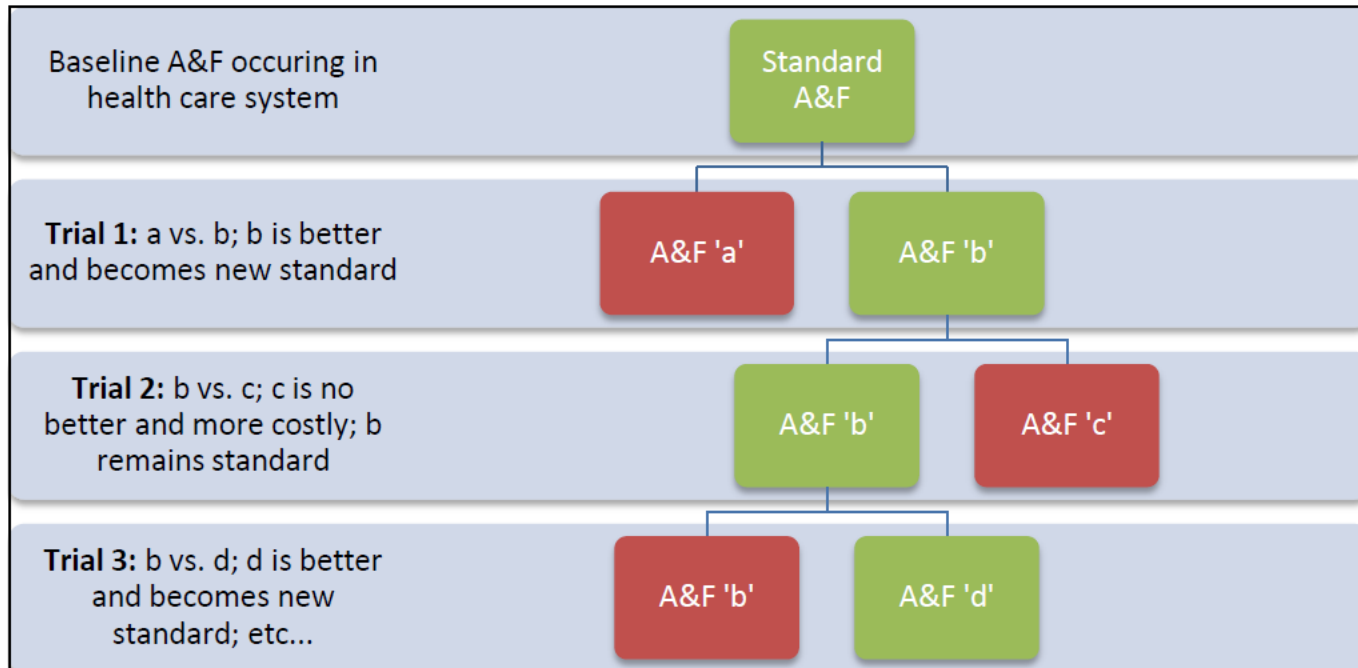
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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK



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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK

Role	Health system	Researcher
Develop priorities	X	
Develop prototype A&F	X	X
Delivery of A&F	X	
Data collection	X	
Analysis		X
Interpretation	X	X

Opportunities to seek research funding to cover additional marginal costs of research



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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK

- ▶ Benefits for health system – learning organisation; demonstrable improvements in its quality improvement activities; linkages to academic experts
- ▶ Benefits for implementation science – ability to test important (but potentially subtle) variations in audit and feedback that may be important effect modifiers



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IMPLEMENTATION LABORATORIES TO OPTIMISE AUDIT AND FEEDBACK



- UK NIHR funded 5 year research program
- 2x2 factorial trial testing different ways of designing and delivering blood utilisation audits
- Randomising 152 UK hospitals



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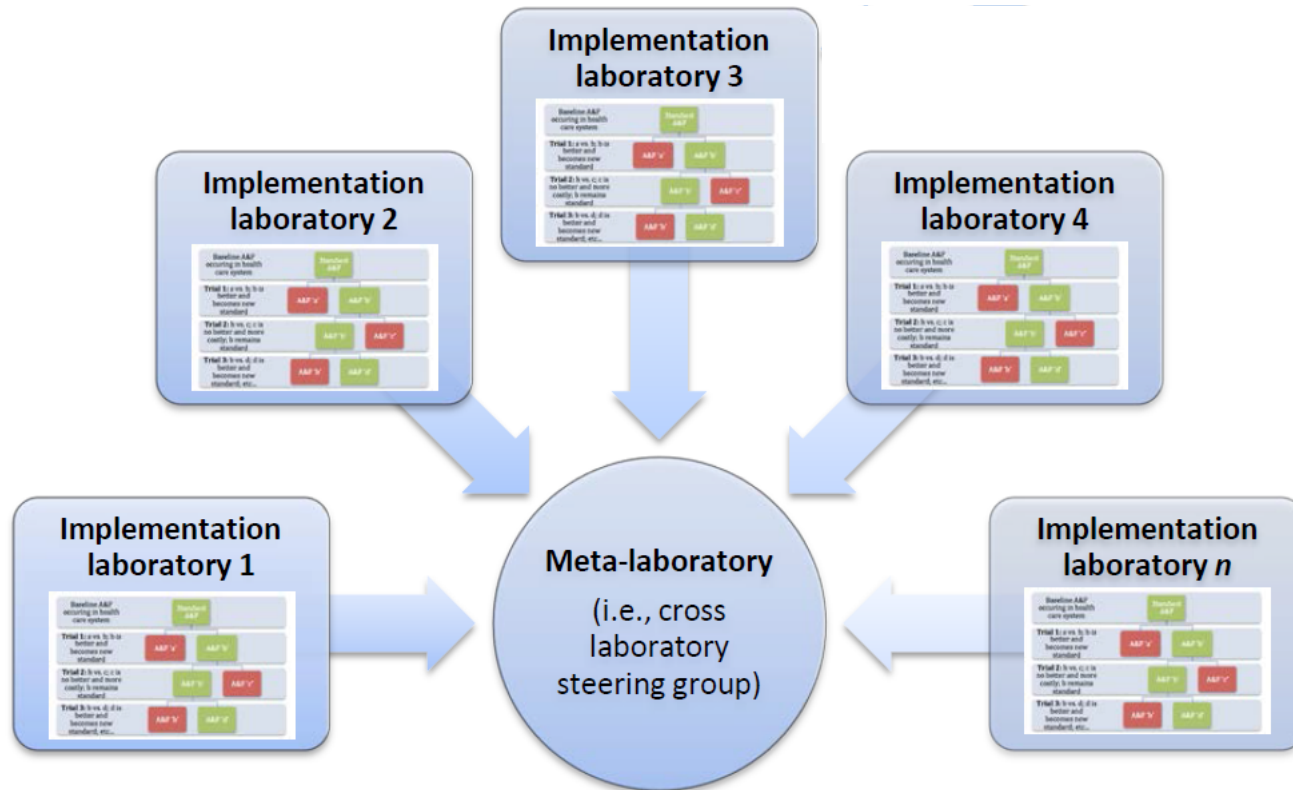
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META-IMPLEMENTATION LABORATORIES



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ENHANCING INFORMATIVENESS OF EVALUATIONS OF IMPLEMENTATION INTERVENTIONS

- ▶ Rigorous quantitative designs allow strong causal inferences to be made about the effects of a program (causal description)
- ▶ They provide relatively little information about the mechanisms through which a program operates (causal explanation)
- ▶ Better understanding of causal explanation likely to improve understanding about generalisability of study findings



ENHANCING INFORMATIVENESS OF EVALUATIONS OF IMPLEMENTATION INTERVENTIONS

- ▶ Design elements
- ▶ Process evaluations
 - Qualitative
 - Quantitative
 - Theory based
- ▶ Temporal evaluations



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SUMMARY

- ▶ Implementation research is about improving health outcomes and the quality of health services.
- ▶ Substantive evidence base on the effects of different implementation interventions; good news is that it is possible to change stakeholder decisions and behaviours!
- ▶ However current evidence base provides little practical guidance for health care systems about which interventions to use and how to optimise them



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SUMMARY

- ▶ Likely substantial waste in implementation research (as in other health research fields)
- ▶ Opportunities to add value and reduce waste
- ▶ Requires action from multiple stakeholders (funders/sponsor, institution, researchers etc)
- ▶ Significant risks if we do not grasp the nettle.



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CONTACT DETAILS

- ▶ Jeremy Grimshaw
jgrimshaw@ohri.ca
@GrimshawJeremy
- ▶ Centre for Implementation
Research
@TOH_CIR
<http://www.ohri.ca/cir/>