

ADVANCING IMPLEMENTATION SCIENCE EFFICIENTLY

THE ROLE OF IMPLEMENTATION LABORATORIES

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GREETINGS FROM CANADA!



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

- ▶ 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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WASTE IN RESEARCH

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

THE LANCET

Research: increasing value, reducing waste - January, 2014

www.thelancet.com

“By ensuring that efforts are infused with rigour from start to finish, the research community might protect itself from the sophistry of politicians, disentangle the conflicted motivations of capital and science, and secure real value for money for charitable givers and taxpayers through increased value and reduced waste.”



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WASTE IN RESEARCH

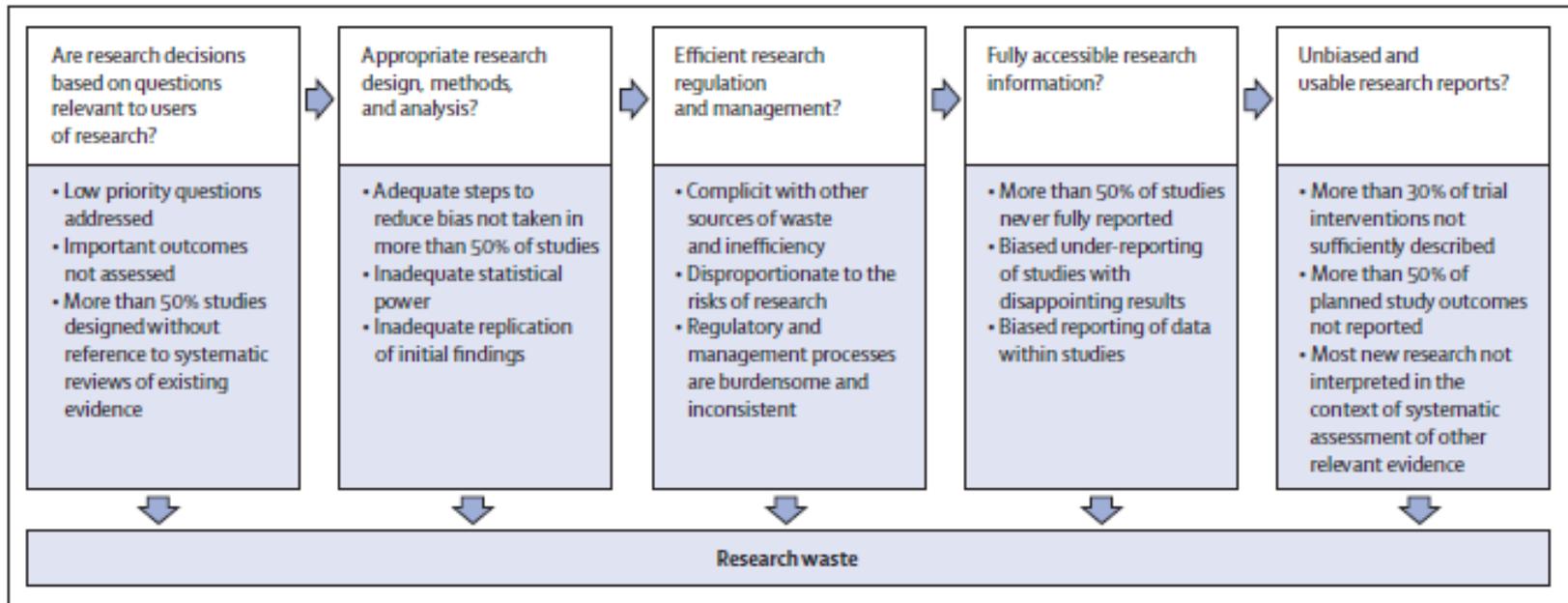


Figure: Avoidable waste or inefficiency in biomedical research



POLL QUESTION 1

- ▶ Research waste in implementation science is:
 - Worse than other areas of research
 - The same as other areas
 - Better than other areas
 - Don't know



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AUDIT AND FEEDBACK

EPOC definition

- ▶ Any summary of clinical performance of health care over a specified period of time. The summary may also have included recommendations for clinical action.



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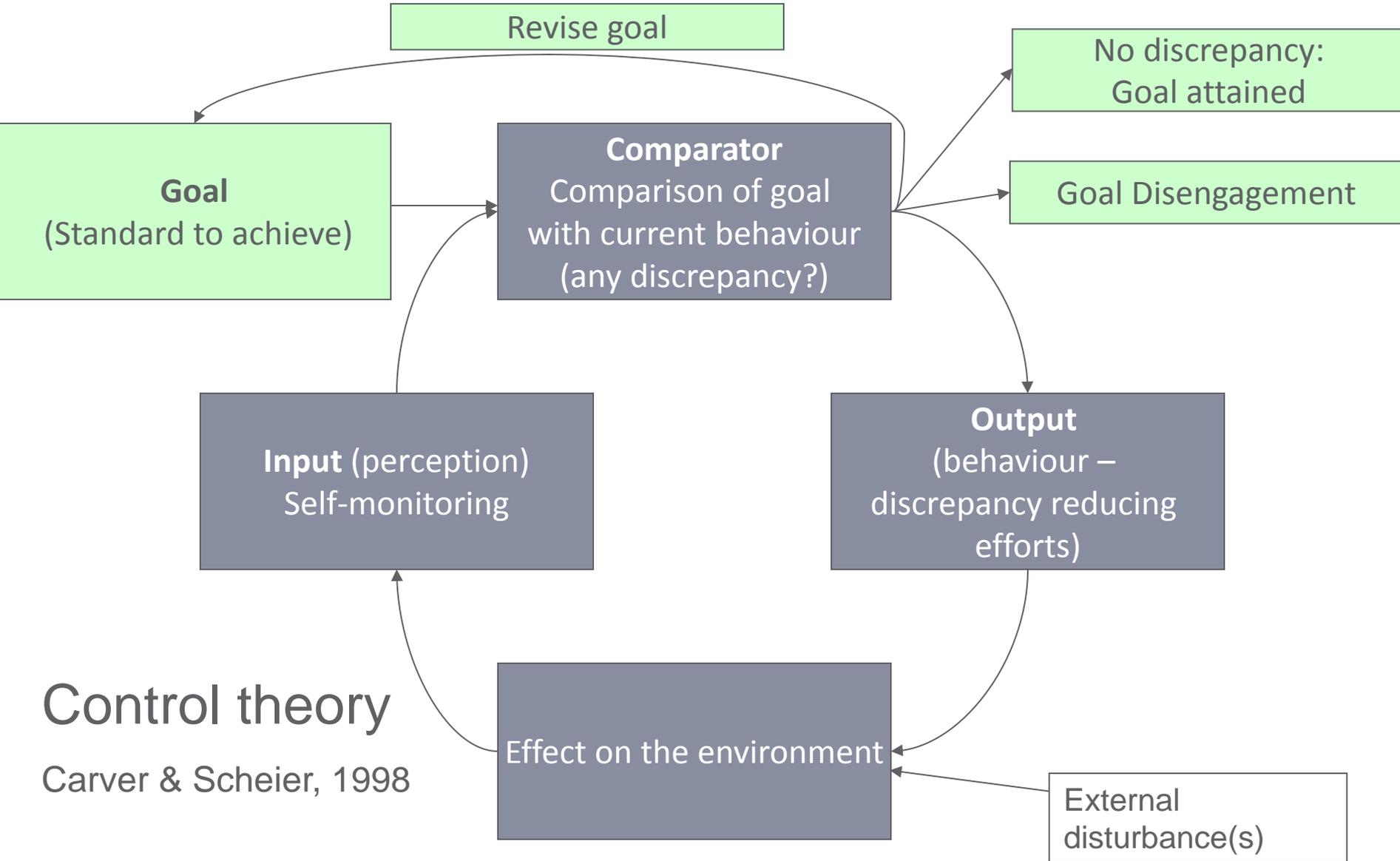
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Control theory

Carver & Scheier, 1998

POLL QUIZ 2

- ▶ What is the absolute effect of audit and feedback in research settings?
 - $\leq 0\%$
 - +1-3%
 - +4-6%
 - +7-9%
 - $> +10\%$



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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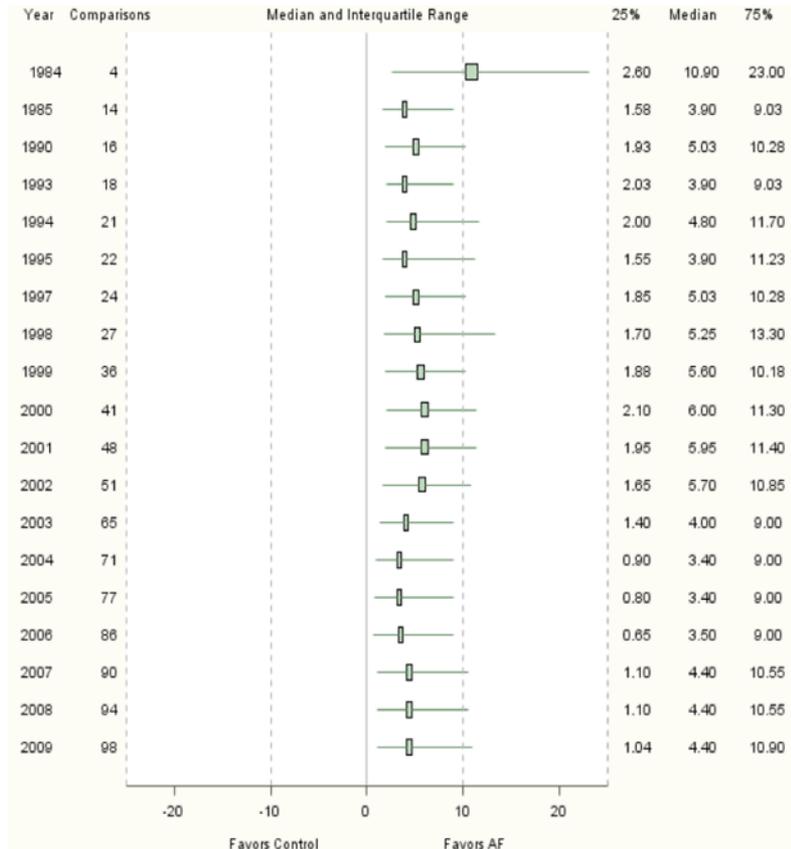
POLL QUIZ 2

- ▶ What is the absolute effect of audit and feedback in research settings?
 - $\leq 0\%$
 - 1-3%
 - 4-6%
 - 7-9%
 - $> 10\%$

ALL OF THE ABOVE!



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*

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

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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.

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COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

NEXUS

ARTICLES

Effect of audit and feedback, and reminder messages on primary-care radiology referrals: a randomised trial

Martin Eccles, Nick Steen, Jeremy Grimshaw, Lois Thomas, Paul McNamee, Jennifer Soutter, John Wilsdon, Lloyd Matowe, Gillian Needham, Fiona Gilbert, Senga Bond

Summary

Background Radiological tests are often used by general practitioners (GPs). These tests can be overused and contribute little to clinical management. We aimed to assess two methods of reducing GP requests for radiological tests in accordance with the UK Royal College of Radiologists' guidelines on lumbar spine and knee radiographs.

Methods We assessed audit and feedback, and educational reminder messages in six radiology departments and 244 general practices that they served. The study was a before-and-after, pragmatic, cluster randomised controlled trial with a 2×2 factorial design. A random subset of GP patients' records were examined for concordance with the guidelines. The main outcome measure was number of radiograph requests per 1000 patients per year. Analysis was by intention to treat.

Findings The effect of educational reminder messages (ie, the change in request rate after intervention) was an absolute change of -1.53 (95% CI -2.5 to -0.57) for lumbar spine and of -1.61 (-2.6 to -0.62) for knee radiographs, both relative reductions of about 20%. The effect of audit and feedback was an absolute change of -0.07 (-1.3 to 0.9) for lumbar spine of 0.04 (-0.95 to 1.03) for knee radiograph requests, both relative reductions of about 1%. Concordance between groups did not differ significantly.

Interpretation 6-monthly feedback of audit data is ineffective but the routine attachment of educational reminder messages to radiographs is effective and does not affect quality of referrals. Any department of radiology that handles referrals from primary care could deliver this intervention to good effect.

Introduction

General practitioners (GPs) can overuse radiological tests, particularly lumbar spine^{1,2} and knee radiographs.³ Such tests are frequently of little clinical use. Guidelines for use of these investigations are in the UK Royal College of Radiologists' publication *Making the best use of a radiology department*.⁴ However, few studies have been done of interventions designed to change GPs' behaviour. Although these studies showed that GPs altered their use of radiological tests, they were badly designed,^{5,6} used inappropriate analysis,⁷ had short duration of follow-up,⁸ or omitted cost considerations.⁹ Grol¹⁰ and Lomas¹¹ have summarised the theory of how to change doctors' behaviour, and Oxman and colleagues¹² have reviewed the effectiveness of interventions. Specific prompts at the time of consultation are a powerful strategy¹³ and have been shown to alter GPs' behaviour—eg, when referring patients for infertility investigations¹⁴—but the effect of the widely-used strategy of audit and feedback is not so certain.^{15,16}

We assessed two methods (audit and feedback, and educational messages) of reducing GPs' requests for radiological tests in accordance with the UK Royal College of Radiologists' guidelines. Our hypothesis was that either intervention alone would be more effective than a control and that both interventions together would be more effective than either alone.

Methods

Study design

The study was based in six radiology departments in the north-east of England and Scotland and in GPs' surgeries (practices) that referred patients exclusively to them. The study was a before-and-after, pragmatic, cluster randomised controlled trial, with a 2×2 factorial design—practices were the units of randomisation and analysis.¹⁷ Randomisation, stratified by radiology department and practice size, was done by the study

- ▶ RCT of audit and feedback to 240 general practices in the North East of England and Scotland to reduce unnecessary lumbar spine and knee x-rays.



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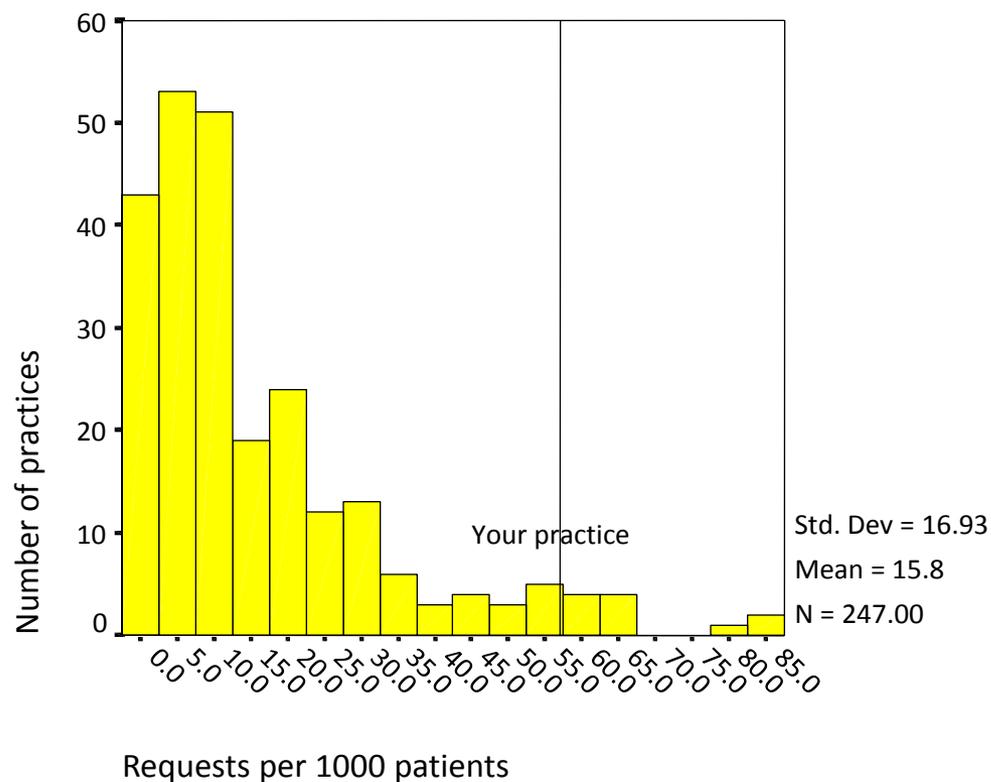
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COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

NEXUS feedback



Requests for
knee x-rays



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COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

DRAM

Articles

Effect of enhanced feedback and brief educational reminder messages on laboratory test requesting in primary care: a cluster randomised trial

Ruth E Thomas, Bernard L Lewis, Craig Ramsay, Martin Eccles, Jeremy Grimshaw

Summary

Background Laboratory services play an important part in screening, diagnosis, and management of patients within primary care. However, unnecessary use of laboratory tests is increasing. Our aim was to assess the effect of two interventions on the number of laboratory tests requested by primary-care physicians.

Methods We did a cluster randomised controlled trial using a 2x2 factorial design, involving 85 primary-care practices (370 family practitioners) that request all laboratory tests from one regional centre. The interventions were quarterly feedback of practice requesting rates for nine laboratory tests, enhanced with educational messages, and brief educational reminder messages added to the test result reports for nine laboratory tests. The primary outcome was the number of targeted tests requested by primary-care practices during the 12 months of the intervention. This study is registered as an International Standard Randomised Controlled Trial, number ISRCTN06490422.

Findings Practices that received either or both the enhanced feedback and the reminder messages were significantly less likely than the control group to request the targeted tests in total (enhanced feedback odds ratio 0.87, 95% CI 0.81-0.94, reminder messages 0.89, 0.83-0.93). The effect of the interventions varied across the targeted tests individually, although the number of tests requested for both interventions was generally reduced. Neither intervention was consistently better than the other.

Interpretation Enhanced feedback of requesting rates and brief educational reminder messages, alone and in combination, are effective strategies for reducing test requesting in primary care. Both strategies are feasible within most laboratory settings.

Introduction

Laboratory services play an important part in screening, diagnosis, and management of patients within primary care. Use of laboratory tests has increased substantially in recent years,¹ and a survey of UK laboratories showed an 83% increase in requests for tests from primary care between 2000 and 2004.²

There are many potential reasons for this rise, including the development of new useful tests and the effect of new guidelines and contracts.^{3,4} However, evidence suggests that unnecessary ordering of tests could be a component of this increase.^{5,6} Unnecessary test requesting is not only a burden on laboratory resources, but also can lead to subsequent unnecessary investigation and treatment of healthy individuals with false-positive results.^{7,8} Furthermore, unnecessary requests are an inappropriate use of the finite resources available for health-care provision as a whole.

The effectiveness of strategies to change the practice of health professionals in general, and test requesting in particular, has varied.⁹⁻¹² Reviews have suggested that audit and feedback of test ordering rates, educational messages, test request form changes, reminders, and computer-decision support are all potentially effective methods of changing test ordering behaviour.^{13,14} A systematic review¹⁵ that focused on studies evaluating

methods to improve diagnostic test requesting, including 49 studies with a control group, showed that most interventions assessed were effective. However, conclusions drawn from the study are limited by methodological flaws, such as lack of a randomised comparison group in 41 of the 49 studies. Additionally, few studies assessed the effectiveness of these interventions within a primary-care setting. A systematic review¹⁶ that included 85 randomised trials showed that audit and feedback have small to moderate effects on health professionals' practice; however, the evidence for test requesting within the primary-care setting is sparse since only two of the trials studied the effect of feedback on laboratory-test requesting within primary care. The authors concluded that their review does not provide support for unevaluated use of audit and feedback. Furthermore, current systematic reviews suggest that single-intervention strategies could be as effective as multiple complex interventions in changing health-profession practice.^{17,18} At the time of planning the current study, we had recently completed a cluster randomised trial of two strategies to reduce requests for lumbar spine and knee radiographs in primary care.¹⁹ We reported that although simple, comparative audit and feedback of request rates had no discernible effects, the provision of educational reminder messages led to a 20% relative

- ▶ RCT of audit and feedback to 90 general practices in the North East of Scotland (subset of NEXUS practices) to reduce nine unnecessary laboratory tests

1990

www.thelancet.com Vol 367 June 17, 2006



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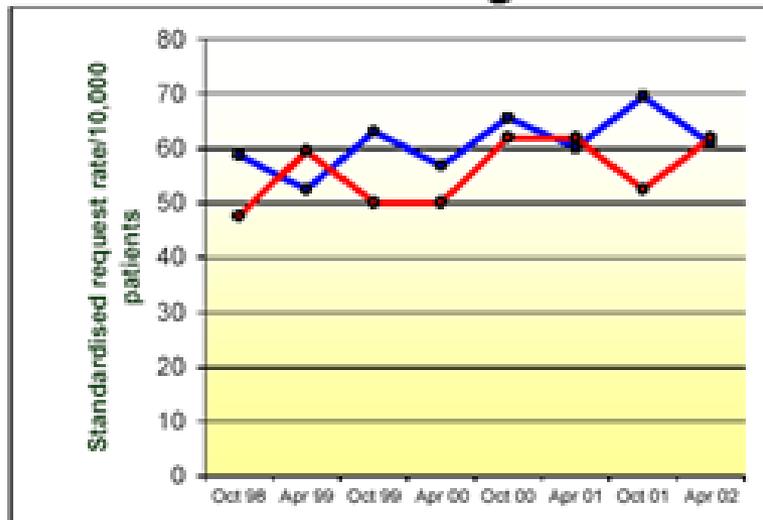
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COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

DRAM feedback

Follicle Stimulating Hormone



Grampian Average	60.7
Your Practice	61.9

Follicle Stimulating Hormone (FSH) is released by the pituitary gland and acts to stimulate sex hormone production and reproductive processes. **In general, FSH testing is of limited value in the assessment of menopausal status in women over 40 years of age, and so should not be requested for this purpose.** Menopausal/Peri-menopausal status is best confirmed retrospectively based on clinical symptoms, signs and frequency or absence of menstruation. Biochemical measurement adds little to this classification, and may mislead.



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POLL QUESTION 3

- ▶ Which feedback intervention(s) was/were effective?
 - NEXUS
 - DRAM
 - Both
 - Neither



COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

▶ NEXUS

- No effect

▶ DRAM

- 16% relative reduction
- Reductions seen in 8/9 tests (3/9 statistically significant)



COMPLEXITY OF FEEDBACK – A TALE OF TWO TRIALS

- ▶ Why are the results of the two trials different?
(Please write in your thoughts in comments box)
 - Differences in tracer conditions
 - Differences in number of tracer conditions
 - Differences in adopters
 - Differences in interventions
 - ?others



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COMPLEXITY OF FEEDBACK – POTENTIAL EFFECT MODIFIERS

Annals of Internal Medicine

ACADEMIA AND THE PROFESSION

Practice Feedback Interventions: 15 Suggestions for Optimizing Effectiveness

Jamie C. Brehaut, PhD; Heather L. Colquhoun, PhD; Kevin W. Eva, PhD; Kelly Carroll, MA; Anne Sales, PhD; Susan Michie, PhD; Noah Ivers, MD, PhD; and Jeremy M. Grimshaw, MD, PhD

Electronic practice data are increasingly being used to provide feedback to encourage practice improvement. However, evidence suggests that despite decades of experience, the effects of such interventions vary greatly and are not improving over time. Guidance on providing more effective feedback does exist, but it is distributed across a wide range of disciplines and theoretical perspectives.

Through expert interviews; systematic reviews; and experience with providing, evaluating, and receiving practice feedback, 15 suggestions that are believed to be associated with effective feedback interventions have been identified. These

suggestions are intended to provide practical guidance to quality improvement professionals, information technology developers, educators, administrators, and practitioners who receive such interventions. Designing interventions with these suggestions in mind should improve their effect, and studying the mechanisms underlying these suggestions will advance a stagnant literature.

Ann Intern Med. doi:10.7326/M15-2248 www.annals.org

For author affiliations, see end of text.

This article was published at www.annals.org on 23 February 2016.



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COMPLEXITY OF FEEDBACK – POTENTIAL EFFECT MODIFIERS

- ▶ Be provided multiple times
- ▶ Present feedback as soon as possible
- ▶ Provide individual rather than general data
- ▶ Include clear comparators that reinforce desired behaviour change
- ▶ Support an action perceived to be a priority for recipients
- ▶ Recommend actions that can improve and are under control of the recipient
- ▶ Recommend a specific action
- ▶ Tailor feedback interventions based on situation-specific barriers
- ▶ Closely link visual display and summary message
- ▶ Be presented in multiple ways
- ▶ Minimize cognitive load
- ▶ Address barriers that prevent use of the feedback
- ▶ Provide short, actionable messages followed by more detail
- ▶ Address credibility of the information
- ▶ Increase motivation to change practice
- ▶ Encourage social construction of feedback rather than passive delivery

'NO MORE BUSINESS AS USUAL'

Ivers et al. *Implementation Science* 2014, **9**:14
<http://www.implementationscience.com/content/9/1/14>



DEBATE

Open Access

No more 'business as usual' with audit and feedback interventions: towards an agenda for a reinvigorated intervention

Noah M Ivers^{1*}, Anne Sales², Heather Colquhoun³, Susan Michie⁴, Robbie Foy⁵, Jill J Francis⁶ and Jeremy M Grimshaw⁷

Abstract

Background: Audit and feedback interventions in healthcare have been found to be effective, but there has been little progress with respect to understanding their mechanisms of action or identifying their key 'active ingredients.'

Discussion: Given the increasing use of audit and feedback to improve quality of care, it is imperative to focus further research on understanding how and when it works best. In this paper, we argue that continuing the 'business as usual' approach to evaluating two-arm trials of audit and feedback interventions against usual care for common problems and settings is unlikely to contribute new generalizable findings. Future audit and feedback trials should incorporate evidence- and theory-based best practices, and address known gaps in the literature.

Summary: We offer an agenda for high-priority research topics for implementation researchers that focuses on reviewing best practices for designing audit and feedback interventions to optimize effectiveness.

Keywords: Audit and feedback, Synthesis, Best practice, Implementation, Optimization

Background

Audit and feedback (A&F) involves providing a recipient with a summary of their performance over a specified period of time and is a common strategy to promote the implementation of evidence-based practices. A&F is used widely in healthcare by a range of stakeholders, including research funders and health system payers, delivery organizations, professional groups and researchers, to monitor and change health professionals' behaviour, both to increase accountability and to improve quality of care. A&F is an improvement over self-assessment [1] or self-monitoring [2] as it can provide objective data regarding discrepancies between current practice and target performance, as well as comparisons of performance to other health professionals. The recognition of sub-optimal performance can act as a cue for action, encouraging those who are both motivated and capable to take action to reduce the discrepancy.

The effectiveness of A&F has been evaluated in the third update of a Cochrane review, which included 140 randomized trials of A&F conducted across many clinical conditions and settings around the world. The review found that A&F leads to a median 4.3% absolute improvement (interquartile range 0.5% to 16%) in provider compliance with desired practice [3]. One-quarter of A&F interventions had a relatively large, positive effect on quality of care, while another quarter had a negative or null effect. The challenge of identifying factors that differentiate more and less successful A&F interventions is exacerbated by poor reporting of both intervention components and contextual factors in the literature [4]. Furthermore, most A&F interventions tested in RCTs are designed without explicitly building on previous research or extant theory [5,6]. As a result, there has been little progress with respect to identifying the key ingredients for a successful A&F intervention or understanding the mechanisms of action of effective A&F interventions

Head-to-head arm trials evaluating:

- ▶ alternative ways of designing and/or delivering audit and feedback
- ▶ audit and feedback vs audit and feedback plus co-interventions
- ▶ audit and feedback versus alternative interventions



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'NO MORE BUSINESS AS USUAL'

- ▶ Need large sample sizes that are unlikely to be realised in one-off research projects
- ▶ Increasing delivery of large scale audit and feedback programs within healthcare systems
- ▶ Opportunities to collaborate with these programs to efficiently advance implementation science about how to optimise audit and feedback



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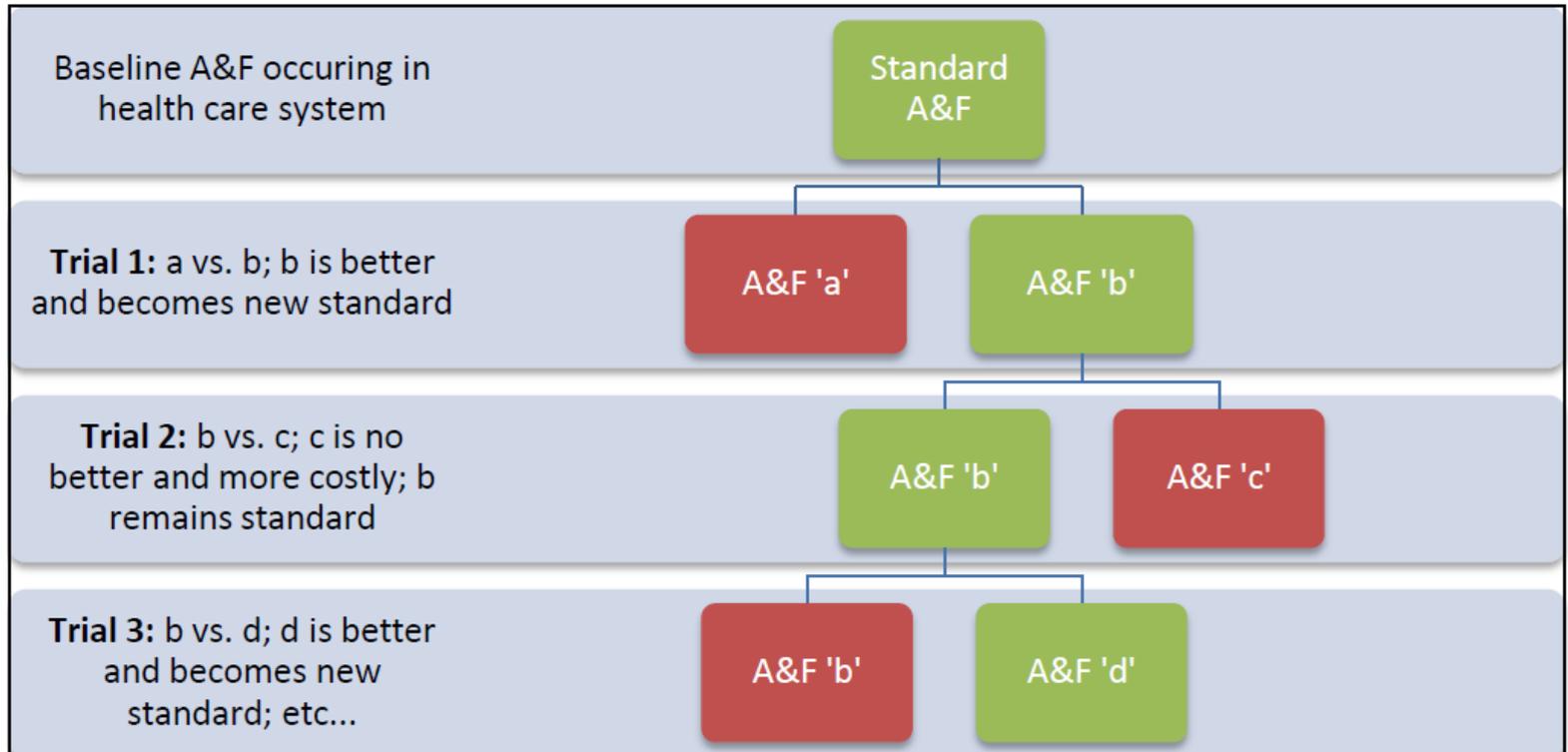
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- ▶ Rigorous quantitative designs allow strong causal inferences to be made about the effects of a program (causal description)
- ▶ They provide relatively little information about the mechanisms through which a program operates (causal explanation)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



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- ▶ Mixed methods approached to enhance informativeness of studies including:
 - Design elements
 - Process evaluations
 - Qualitative
 - Quantitative
 - Theory based
 - Temporal evaluations



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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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- ▶ 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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- 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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Gould *et al.* *Implementation Science* 2014, **9**:92
<http://www.implementationscience.com/content/9/1/92>



STUDY PROTOCOL

Open Access

Application of theory to enhance audit and feedback interventions to increase the uptake of evidence-based transfusion practice: an intervention development protocol

Natalie J Gould^{1*}, Fabiana Lorencatto¹, Simon J Stanworth², Susan Michie³, Maria E Prior⁴, Liz Glidewell⁵, Jeremy M Grimshaw^{6,7} and Jill J Francis¹

Abstract

Background: Audits of blood transfusion demonstrate around 20% transfusions are outside national recommendations and guidelines. Audit and feedback is a widely used quality improvement intervention but effects on clinical practice are variable, suggesting potential for enhancement. Behavioural theory, theoretical frameworks of behaviour change and behaviour change techniques provide systematic processes to enhance intervention. This study is part of a larger programme of work to promote the uptake of evidence-based transfusion practice.

Objectives: The objectives of this study are to design two theoretically enhanced audit and feedback interventions; one focused on content and one on delivery, and investigate the feasibility and acceptability.

Methods: Study A (Content): A coding framework based on current evidence regarding audit and feedback, and behaviour change theory and frameworks will be developed and applied as part of a structured content analysis to specify the key components of existing feedback documents. Prototype feedback documents with enhanced content and also a protocol, describing principles for enhancing feedback content, will be developed. Study B



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- ▶ Ontario Healthcare Implementation Laboratory
- ▶ 4 sequential trials embedded into routine feedback to family practices (n= \sim 140) and long term care homes (\sim 80)



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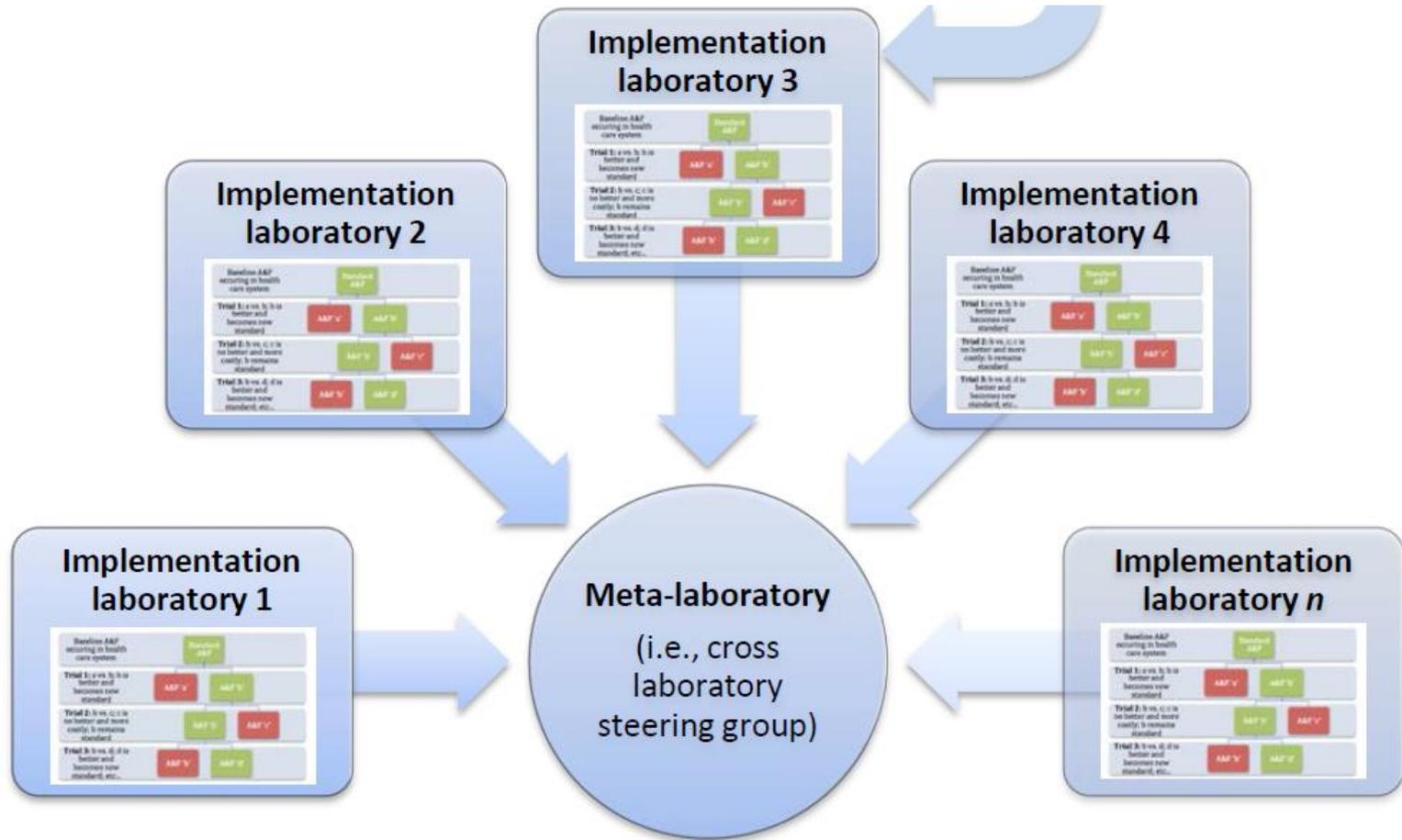
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META-IMPLEMENTATION LABORATORIES



META-LABORATORIES

- ▶ Shared learning across studies and laboratories
- ▶ Shared expertise
- ▶ Opportunities for planned replication to explore replicability and outer context issues
- ▶ Building international community of health care system organisations with shared interests



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A&F META-LABORATORY

- ▶ Established 14th April 2016

- ▶ **Mission**

International community of health researchers and health system partners that undertake shared activities to enhance the provision of audit and feedback to improve health care performance, patient outcomes and health system sustainability.

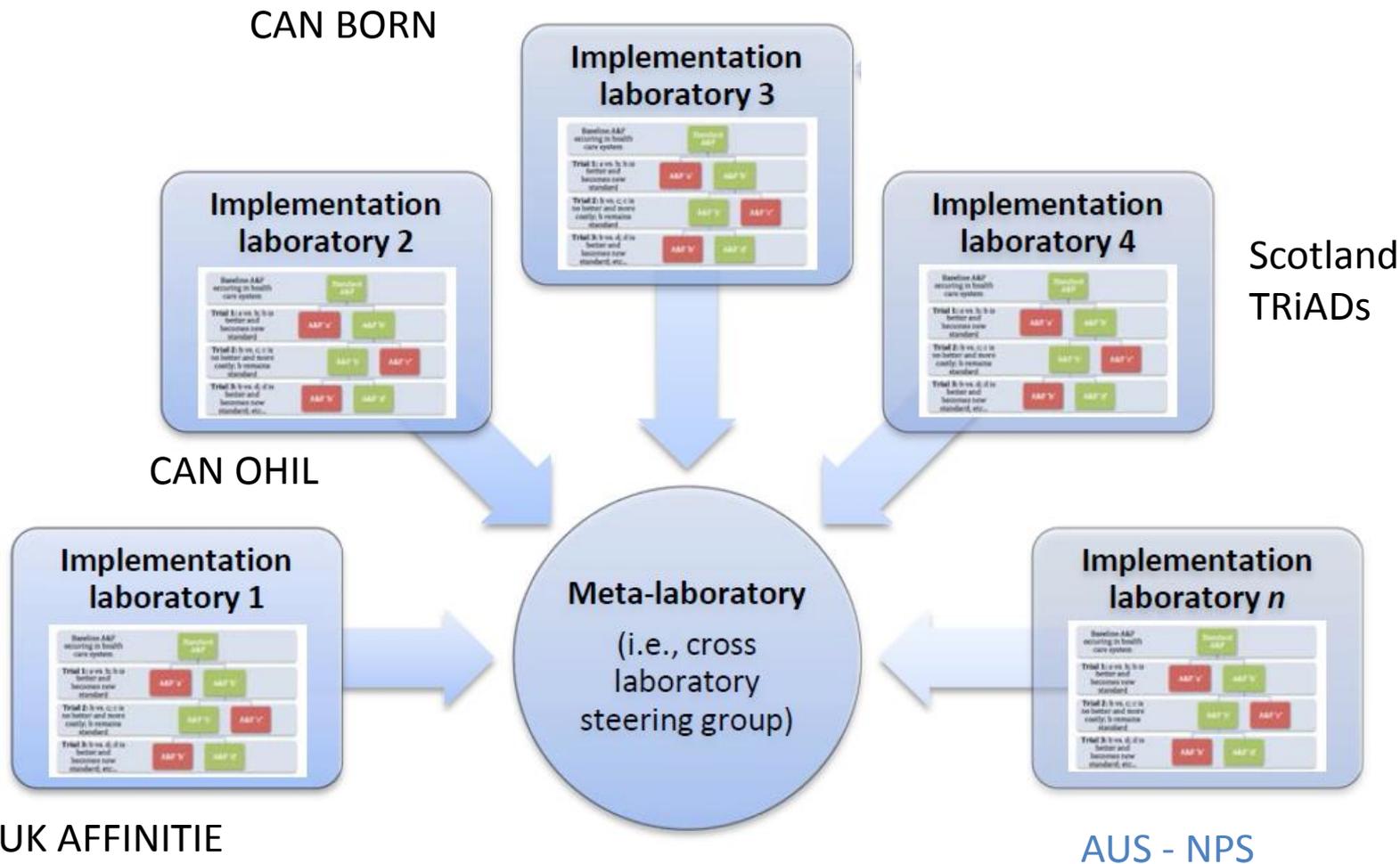


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A&F META-LABORATORY



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SUMMARY

- ▶ Significant waste in implementation research
- ▶ Substantial evidence base that many interventions are generally effective but considerable uncertainty about how to optimise interventions to maximise its effects
- ▶ Opportunities for collaborative partnerships between healthcare organisations delivering improvement programs and researchers to improve current feedback and our understanding of effect modifiers

Thanks!

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