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CHALLENGES AND OPPORTUNITIES FOR INTELLIGENT TOOLS TO SUPPORT THE CONDUCT OF LARGE COMPLEX SYSTEMATIC REVIEWS

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DIABETES CANADA

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SYSTEMATIC REVIEW OF DIABETES QI STRATEGIES

REVIEW

Articles

Effects of Quality for Type 2 Diabete
A Meta-Regression Ana

Kaveh G. Shojania, MD
Sumant R. Ranji, MD
Kathryn M. McDonald, MM
Jeremy M. Grimshaw, MBChB, PhD
Vandana Sundaram, MPH
Robert J. Rushakoff, MD
Douglas K. Owens, MD, MS

Contex the care clear.

Object ity impr

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Data E a meta- vention

Data S 13 cont vention 0.29%- than th larger t with me effects (of QI st team ch (0.52% egies co volving than th ues by (agemen cation a (95% C terventi

DIABETES MELLITUS HAS reached epidemic proportions in the United States.[1,2] Despite well-established processes of care to reduce morbidity associated with diabetes, widespread quality problems exist.[3-5] The literature contains numerous reports of interventions designed to remedy these problems, but their effectiveness remains unclear.[6]

Previous systematic reviews of quality improvement (QI) strategies for diabetes have provided only qualitative analysis[7] or have focused on single types of interventions,[8-15] leaving the relative effectiveness of different strategies unknown. This is particularly problematic, since many interventions include components of multiple QI strategies. Thus, some of the same trials[16-21] may appear in reviews of pa-

Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis

Andrea C Tricco, Noah M Ivers, Jeremy M Grimshaw, David Moher, Lucy Turner, James Galipeau, Ilana Halperin, Brigitte Vachon, Tim Ramsay, Braden Manns, Marcello Tonelli, Kaveh Shojania

Summary

Background The effectiveness of quality improvement (QI) strategies on diabetes care remains unclear. We aimed to assess the effects of QI strategies on glycated haemoglobin (HbA_{1c}), vascular risk management, microvascular complication monitoring, and smoking cessation in patients with diabetes.

Methods We identified studies through Medline, the Cochrane Effective Practice and Organisation of Care database (from inception to July 2010), and references of included randomised clinical trials. We included trials assessing 11 predefined QI strategies or financial incentives targeting health systems, health-care professionals, or patients to improve management of adult outpatients with diabetes. Two reviewers independently abstracted data and appraised risk of bias.

Findings We reviewed 48 cluster randomised controlled trials, including 2538 clusters and 84 865 patients, and 94 patient randomised controlled trials, including 38 664 patients. In random effects meta-analysis, the QI strategies reduced HbA_{1c} by a mean difference of 0·37% (95% CI 0·28–0·45; 120 trials), LDL cholesterol by 0·10 mmol/L (0·05–0·14; 47 trials), systolic blood pressure by 3·13 mm Hg (2·19–4·06, 65 trials), and diastolic blood pressure by 1·55 mm Hg (0·95–2·15, 61 trials) versus usual care. We noted larger effects when baseline concentrations were greater than 8·0% for HbA_{1c}, 2·59 mmol/L for LDL cholesterol, and 80 mm Hg for diastolic and 140 mm Hg for systolic blood pressure. The effectiveness of QI strategies varied depending on baseline HbA_{1c} control. QI strategies increased the likelihood that patients received aspirin (11 trials; relative risk [RR] 1·33, 95% CI 1·21–1·45), antihypertensive drugs (ten trials; RR 1·17, 1·01–1·37), and screening for retinopathy (23 trials; RR 1·22, 1·13–1·32), renal function (14 trials; RR 128, 1·13–1·44), and foot abnormalities (22 trials; RR 1·27, 1·16–1·39). However, statin use (ten trials; RR 1·12, 0·99–1·28), hypertension control (18 trials; RR 1·01, 0·96–1·07), and smoking cessation (13 trials; RR 1·13, 0·99–1·29) were not significantly increased.

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Li Ka Shing Knowledge Institute of St Michael's Hospital, Toronto, ON, Canada (A C Tricco PhD); Women's College Hospital and Department of Family and Community Medicine (N M Ivers M D) and Division of Endocrinology, Department of Medicine (I Halperin M D), University of Toronto, Toronto, ON, Canada; Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, ON, Canada (Prof J M Grimshaw PhD, D Moher PhD, L Turner M Sc, J Galipeau PhD, B Vachon PhD, T Ramsay PhD); Department of Medicine (Prof J M Grimshaw)

INCLUSION CRITERIA – TYPES OF INTERVENTIONS

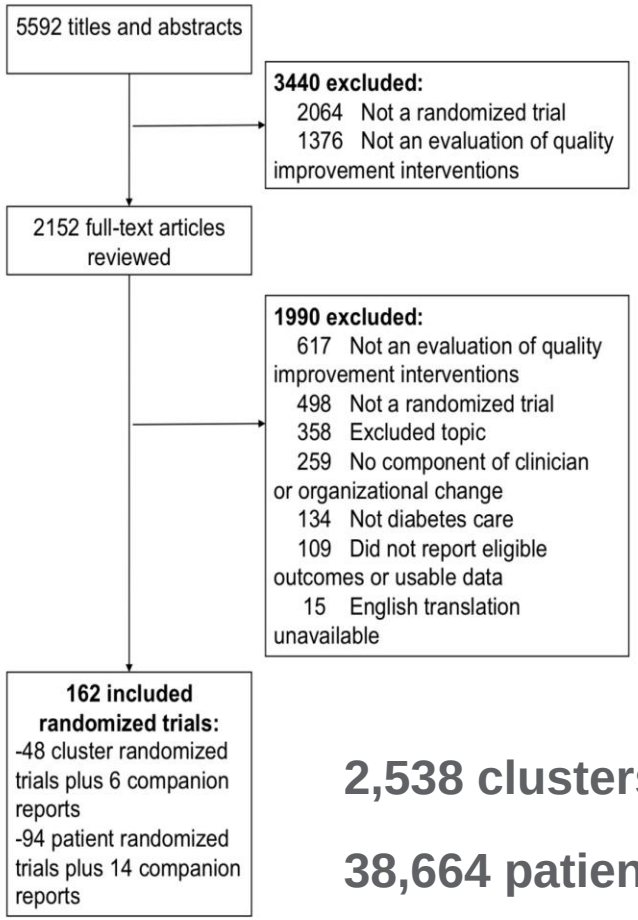
- Audit and feedback
- Case management
- Team changes (provider role changes)
- Electronic patient registry
- Clinician education
- Clinician reminders
- Facilitated relay of information to clinicians
- Patient education*
- Promotion of self-management*
- Patient reminder systems
- Continuous quality improvement
- Financial incentives

(* Only included if part of a multifaceted intervention including professional targeted interventions)

INCLUSION CRITERIA – OUTCOMES OF INTEREST

Domain	Process measure	Intermediate outcome
Glycemic control	HbA1c measurement	HbA1c levels
Vascular risk factor management	Patients on ASA, statins, anti hypertensives	Lipid levels BP
Retinopathy screening	Patients screened	
Foot screening	Patients screened	
Renal function	Patients monitored	
Smoking cessation	Patients on NRT	Patients successfully quitting

RESULTS: STUDY FLOW

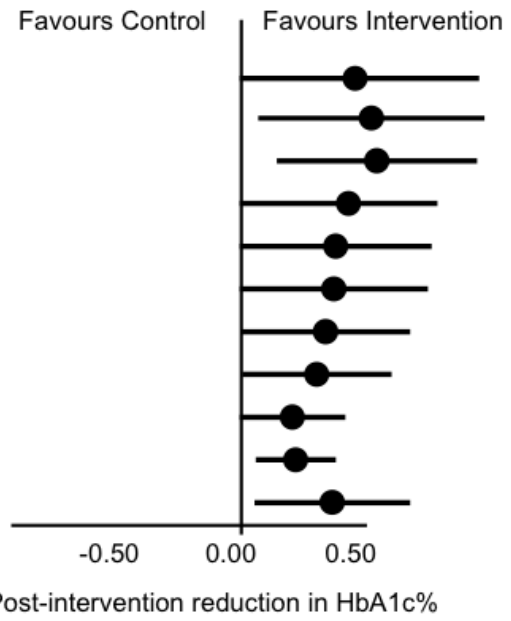


2,538 clusters and 84,865 patients

38,664 patients

RESULTS: HBA1C META-REGRESSION

Quality Improvement Strategy	# RCTs	MD	95% CI
Team Changes	47	0.52	0.00, 1.04
Facilitated Relay	31	0.49	0.02, 0.96
Promotion of Self-management	57	0.45	0.04, 0.87
Case Management	52	0.41	0.00, 0.82
Patient Education	52	0.40	0.00, 0.80
Electronic Patient Register	28	0.39	0.00, 0.78
Clinician Reminders	16	0.35	0.00, 0.70
Patient Reminders	20	0.31	0.00, 0.62
Audit and Feedback	9	0.22	0.00, 0.44
Clinician Education	12	0.16	0.01, 0.33
All Interventions	**117**	**0.33**	**0.01, 0.65**



A CASE STUDY IN COMPLEXITY

Articles

Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis

Andrea C Tricco, Noah M Ivers, Jeremy M Grimshaw, David Moher, Lucy Turner, James Galipeau, Ilana Halperin, Brigitte Vachon, Tim Ramsay, Braden Manns, Marcello Tonelli, Kaveh Shojania

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A CASE STUDY IN COMPLEXITY

Challenges

- Firstly, programs are usually complex, involving multifaceted approaches that may contain a mix of effective and ineffective (or even harmful) component KT/QI interventions that may (or may not) be interdependent and that may (or may not) interact synergistically (or antagonistically).
- Identifying the effective (and ineffective) components within programs is necessary to ensure sustainability and to facilitate replication.

A CASE STUDY IN COMPLEXITY

Challenges

- Secondly, the effects of complex KT/QI programs are likely modified by poorly recognised and ill-defined contextual factors making judgements about the applicability of the effects of interventions in different contexts more challenging.
- Traditional meta-analyses estimate the ‘average’ effect across studies, ignoring effect modification by contextual factors, which is of vital importance to health system decision makers trying to assess the applicability of the results of a systematic review to their context.

A CASE STUDY IN COMPLEXITY

Challenges

- Thirdly, the mechanisms of action of KT/QI programs (and component interventions) are poorly understood, resulting in lack of consensus about terminology
- Authors of syntheses often develop pragmatic (somewhat arbitrary) definitions of programs and interventions of interest.
- However that misclassification of interventions may lead to “noise” in a meta-analysis by artificially increasing the observed heterogeneity of comparisons by including studies testing different programs and/or reducing precision by artificially excluding studies that evaluate the same program from a comparison.

A CASE STUDY IN COMPLEXITY

Challenges

- Fourthly, these issues are exacerbated by poor reporting of interventions and contextual factors in primary studies.

SEEING THE FOREST AND THE TREES

Ivers *et al. Systematic Reviews* 2014, **3**:88
http://www.systematicreviewsjournal.com/content/3/1/88

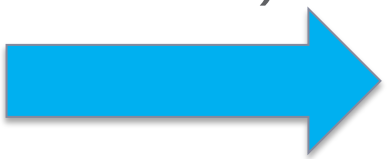
PROTOCOL Open Access

Seeing the forests *and* the trees—innovative approaches to exploring heterogeneity in systematic reviews of complex interventions to enhance health system decision-making: a protocol

Noah Ivers[1], Andrea C Tricco[2], Thomas A Trikalinos[3], Issa J Dahabreh[3], Kristin J Danko[4], David Moher[4,5], Sharon E Straus[2], John N Lavis[6], Catherine H Yu[2], Kaveh Shojania[7], Braden Manns[8,9], Marcello Tonelli[10], Timothy Ramsay[4,5], Alun Edwards[9], Peter Sargious[9], Alison Paprica[11], Michael Hillmer[11,12] and Jeremy M Grimshaw[4,5*]

SEEING THE FOREST AND THE TREES

- Challenge 1 (better specification of effects of components) and challenge 2 (better specification of effect modifiers)



Synthesis with hierarchical regression

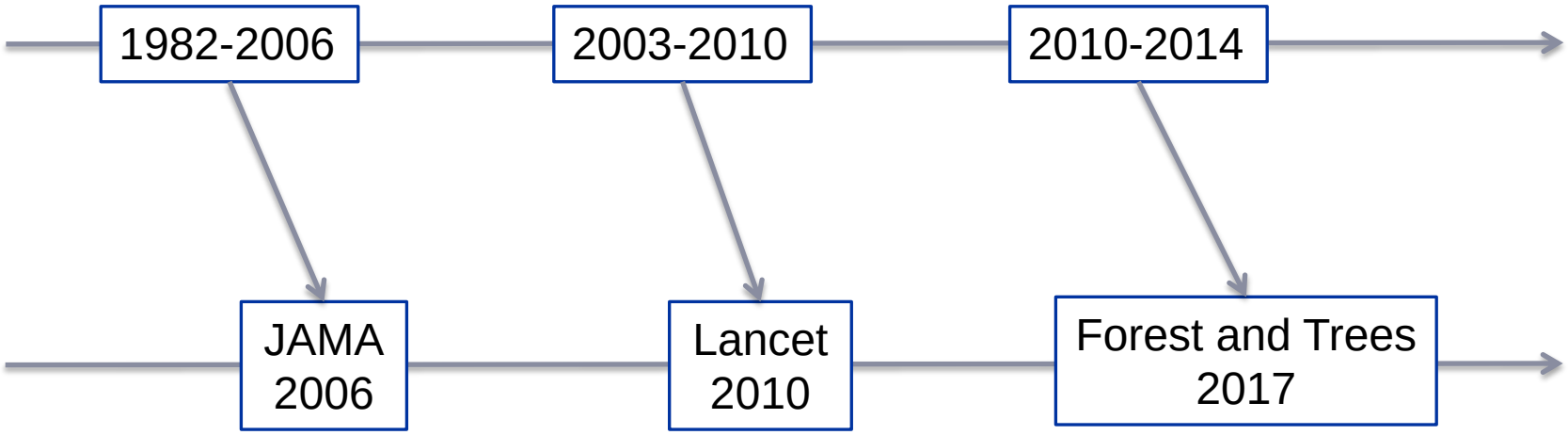
- Challenge 4 (poor reporting)

Author survey

- Challenge 3 (intervention description)

Author survey, alternative taxonomies

DIABETES QI: A RAPIDLY EVOLVING FIELD



Effects of Quality Improvement Strategies for Type 2 Diabetes on Glycemic Control
A Meta-Regression Analysis

66 included studies

Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis

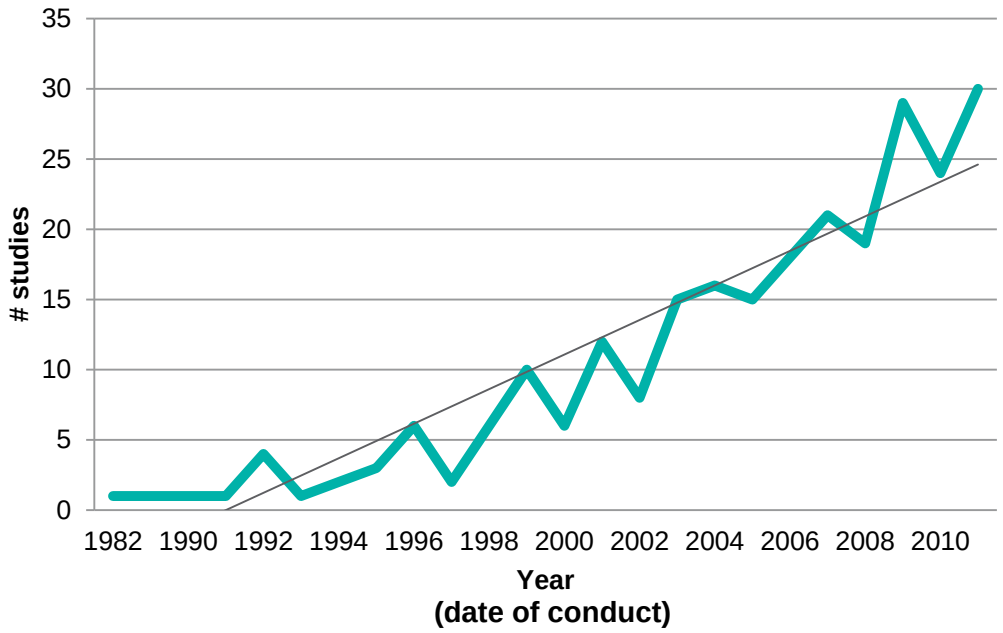
162 included studies

Seeing the forests *and* the trees—innovative approaches to exploring heterogeneity in systematic reviews of complex interventions to enhance health system decision-making: a protocol

278 included studies

DIABETES QI: A RAPIDLY EVOLVING FIELD

Number of trials over time



Time period	# Published papers	Annual rate of publication
Entire sample (1982-2014)	278	8.4 publications/year
Last 15 years (2000-2014)	243	16.0 publications/year
Last 10 years (2005-2014)	184	18.3 publications/year

TOWARDS LIVING SYSTEMATIC REVIEWS

Living Systematic Reviews are systematic reviews which are continually updated, incorporating relevant new information as it becomes available

OPPORTUNITIES FOR INTELLIGENT TOOLS

- Enhanced primary studies (linked data, curation)

- Detailed planning (registration, protocol development)
- Screening
  - Study design
  - All inclusion criteria
- Data abstraction
  - Risk of Bias
  - Broader data (inclusion criteria, context, results)
- Translation of primary studies
- Intervention classification/specification

OPPORTUNITIES FOR INTELLIGENT TOOLS

- Automated author survey
- Automated analyses (within living systematic reviews)
- Structured (data linked) write up
- Data linkage
- Curation and discoverability
- Customisable front ends
- Translation/linguistic accessibility

- Improved review quality
- Improved co-ordination of field

OPPORTUNITIES FOR INTELLIGENT TOOLS

PLOS | MEDICINE

RESEARCH ARTICLE

Epidemiology and Reporting Characteristics of Systematic Reviews of Biomedical Research: A Cross-Sectional Study

Matthew J. Page[1,2], Larissa Shamseer[3,4], Douglas G. Altman[5], Jennifer Tetzlaff[3], Margaret Sampson[6], Andrea C. Tricco[7,8], Ferrán Catalá-López[3,9], Lun Li[10], Emma K. Reid[11], Rafael Sarkis-Onofre[12], David Moher[3,4]*

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OPEN ACCESS

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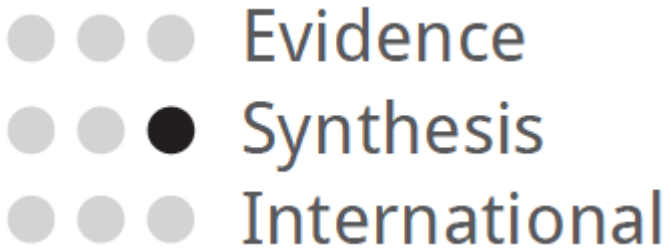
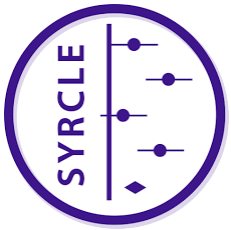
8,000 systematic reviews published annually

OPPORTUNITIES FOR INTELLIGENT TOOLS





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ebtc

Evidence-based Toxicology Collaboration

CHALLENGES FOR INTELLIGENT TOOLS

- It's difficult!
- Need tools that likely work across wide range of review questions - multiple, large diverse learning sets
- Promote innovation, reduce risks - standards
- Adapting to diverse and evolving SR methods
- Funding models – majority of review authors do not use SR tools
- Co-ordination of field – efficient production of systematic reviews

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