The science and practice of Audit and Feedback: data-driven quality improvement

Noah Ivers MD PhD CCFP
Family Physician, Women's College Hospital Family Health Team
Scientist, Women's College Research Institute
Innovation Fellow, Women's College Hospital Institute for Health Systems Solutions and Virtual Care
Adjunct Scientist, ICES and Assistant Professor, DFCM & iHPME, University of Toronto
noah.ivers@wchospital.ca @noahivers

WCHI
WOMEN'S COLLEGE HOSPITAL
Health care for women | REVOLUTIONIZED

2006 A&F Cochrane Review

116 Trials

88 comparisons from 72 studies were included comparing any intervention in which audit and feedback is a component compared to no intervention.

For dichotomous outcomes the median adjusted risk difference of compliance with desired practice was **0.05 (IQR = 0.03 to 0.11)**

Jamtvedt G et al. Cochrane Database of Systematic Reviews 2006, Issue 2. Art. No.: CD000259. DOI: 10.1002/14651858.CD000259.pub2.

2006 A&F Cochrane Review

"Intensity of audit and feedback might also help to explain variation in the absolute effect (p = 0.04)."

- "Intensive"(individual recipients) AND ((verbal format)OR (a supervisor or senior colleague as the source)) AND (moderate or prolonged feedback)
- "Non-intensive" ((group feedback) NOT (from a supervisor or senior colleague)) OR ((individual feedback) AND (writ- ten format) AND (containing information about costs or numbers of tests without personal incentives))
- "Moderately intensive"(any other combination of characteristics than described in Intensive or Non-intensive group).

Jamtvedt G et al. Cochrane Database of Systematic Reviews 2006, Issue 2. Art. No.: CD000259. DOI: 10.1002/14651858.CD000259.pub2.

Unclear how to "do" AF

"an <u>unreliable</u> approach to quality improvement <u>until we learn how and when it works best</u>"

Foy R. et al. BMC Health Services Research, 2005;*5*, 50.

Unclear how to "do" AF

Few head-to-head trials

"Although there are hypothetical reasons why some forms of audit and feedback might be more effective than others, there is not an empirical basis for deciding how to provide audit and feedback." Jamvedt et al. *Qual. Saf. Health Care* 2006;15;433-436

Poor description of interventions

"…it is often unclear what behaviour change processes are responsible for observed changes…" Michie et al. *Implementation Science* 2009, **4:**40.

Limited use of theory

"…it is necessary to understand and optimise the 'active ingredients' in professional behaviour change strategies…" Eccles et al. Implement Sci. 2007 Aug 16;2:27.

2012 A&F Cochrane Review

Audit and feedback: effects on professional practice and healthcare outcomes (Review)

Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD

THE COCHRANE COLLABORATION®

- 140 Randomized Trials as of Dec 2010
- Main analyses included:
  - 2310 groups of health professionals from 32 cluster-randomized trials and
  - 2053 health professionals from 17 trials allocating individual providers

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2012, Issue 6

http://www.thecochranelibrary.com

7

Methods: Study selection

Inclusion criteria:

- RCTs testing AF
- Health professionals responsible for patient care
- Outcomes: clinical (not simulations, skills, or cost)

Search:

- Developed MEDLINE strategy tested against known relevant studies from previous review: 89% sensitive
- Applied to MEDLINE, CINAHL, EMBASE, and Cochrane CENTRAL registry, December 2010

Changes in Methodology

Screening by two independent abstractors

Inclusion Criteria

1. AF alone
2. Multifaceted with AF as a core, essential component
3. AF not 'core and essential'

"Audit and feedback was frequently a minor component of multifaceted interventions."

8/282 full-texts reviewed had disagreements regarding inclusion due to differences in the assessment of whether or not the article was 'core' audit and feedback.

Methods: Meta-Analysis

"Median of Medians" Approach

Often multiple primary outcomes

- **Median effect** on compliance with desired practice across primary outcomes within a study
  - Adjusted by baseline performance = Adjusted risk difference

Cluster trials: unknown effective sample size, unit of analysis errors

- **Median adjusted risk difference** across studies, presented with interquartile range
  - *CHANGE IN METHODOLOGY:*

  Median of medians ***weighted by number of health professionals***

Grimshaw et al. Health Technology Assessment 2004;8(6):iii-iv, 1-72.

Shojania et al. CMAJ 2010;182(5):E216-225

Changes Methodology

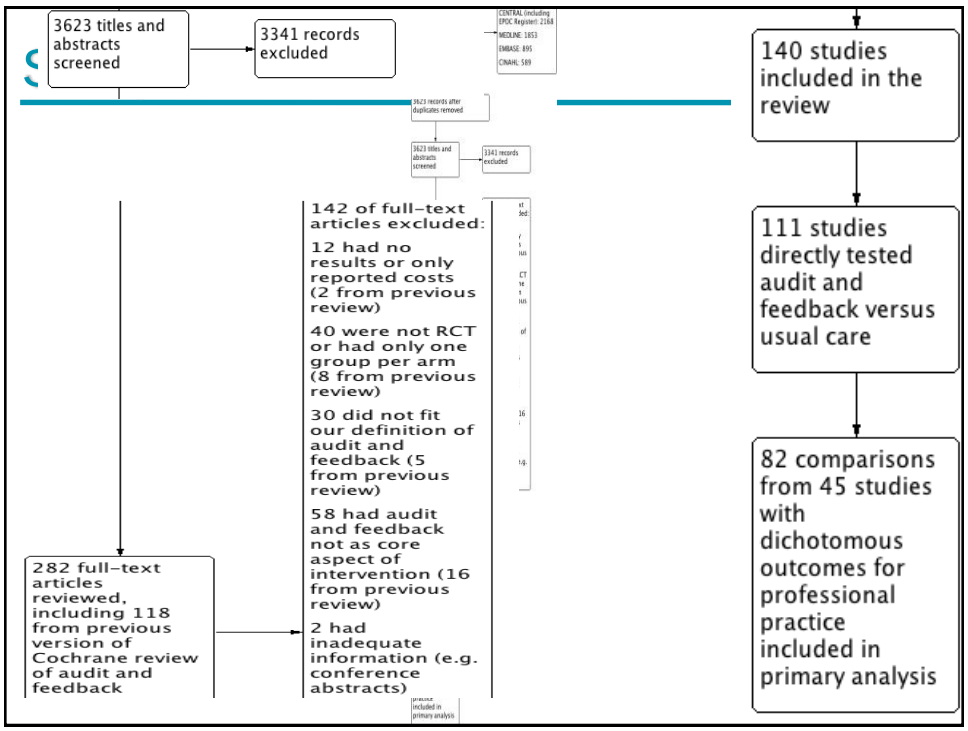
ANALYSIS OF HETEROGENEITY

Meta-regression

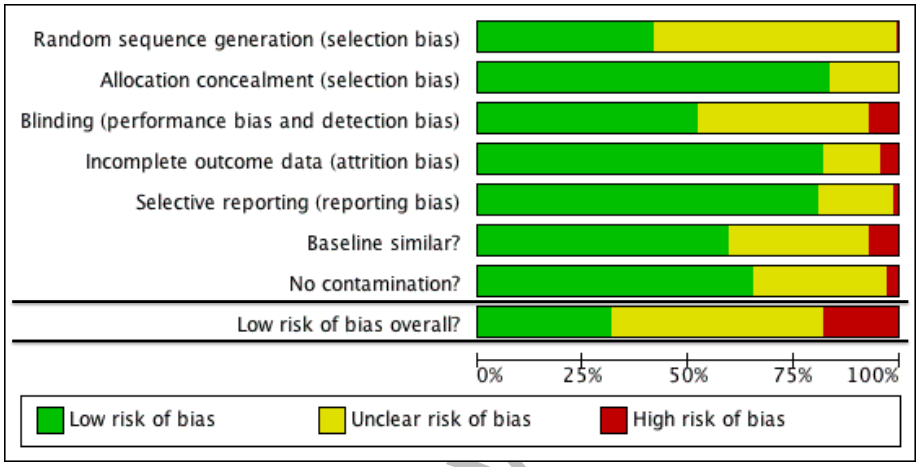
- Format (verbal; written; both; unclear)
- Source (supervisor or senior colleague; review organization or employer; investigators; unclear)
- Frequency (weekly; monthly; less than monthly; one-time)
- Instruction for improvement (explicit target/specific goal; action plan; both; neither)
- Direction of change required (increase behaviour; decrease; mix or unclear)
- Recipient (physician; other health professional)
- Baseline performance (continuous)
- Risk of bias (high; unclear; low)

Plus exploratory analyses:

- Targeted behaviour (prescribing; test ordering; dm/cvd)



Risk of Bias



Study Characteristics

Characteristic	N	%		Characteristic	N	%
Publication Year				**Classification of Intervention**		
2006-2010	32	23		AF alone	49	35
1996-2005	76	54		Multifaceted	91	65
1986-1995	20	14		case mgmt/team change	3	2
before 1986	12	9		clinician education (not outreach)	48	34
Risk of Bias				educational outreach	28	20
Low	45	32		clinician reminders, cdss	17	12
Unclear	70	50		patient intervention	8	6
High	25	18		continuous qi	9	6
Number of Arms in Trial				financial incentives	5	4
Two	98	70				
Three	22	16		**Targeted Behaviour(s)**		
Four	20	14		DM/CVD mgmt	30	21
Clinical Setting				Laboratory testing/radiology	21	15
Outpatient	94	67		Prescribing	31	22
Inpatient	36	26		Other	50	41
Other/unclear	10	7		**Targeted Health Professional(s)**		
Medical Specialty(s)				Physician	121	86
GP	84	60		Nurses	16	11
Internists	60	43		Pharmacists	5	4
Other	40	29		Other	3	2

Characteristics of A&F

Characteristic	N	%		Characteristic	N	%
Format						
verbal only	13	9				
written only	84	60				
both	32	23		**Instructions for Improvement**		
unclear	11	8		Goal-setting	11	8
Source				Action planning	41	29
supervisor/colleague	13	9		Both	4	3
employer	15	11		Neither	84	60
investigators/unclear	112	80		**Direction of Change Required**		
Frequency				Increase current behaviour	57	41
weekly	11	8		Decrease current behaviour	29	21
monthly	19	14		Mix or unclear	55	39
less than monthly	36	26				
once only	68	49				

Patient or population: Healthcare professionals
Settings: Primary and secondary care
Intervention: Audit and feedback with or without other interventions[1]
Comparison: Usual care

Outcomes	Absolute improvement[2]	Number of health professionals (studies)	Quality of the evidence (GRADE)
Compliance with desired practice (dichotomous outcomes)	Median 4.3% absolute increase in desired practice (IQR 0.5% to 16.0%)	82 comparisons from 49 studies.[3] 2310 clusters/groups of health providers (from 32 cluster trials) and 2053 health professionals (from 17 trials allocating individual providers)	⊕⊕⊕◯ **moderate**[4]

GRADE Working Group grades of evidence:
High quality: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

17

Meta-Regression

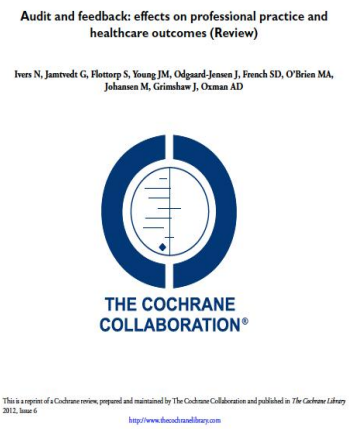
Characteristic	*Effect*
Format of feedback	***p=0.020***
Verbal	*3.4*
Written	*9.5*
Both Verbal and Written	*11.2*
Not clear	*5.3*
Unclear;	*18.1*
High risk of bias	*n/a*

Meta-Regression - Exploratory

Characteristic	*Effect*
Type of professional practice	***P<0.001***
Diabetes/CVD	*5.91*
Laboratory testing/radiology referrals	*4.21*
Prescribing	*11.11*
Other	*4.71*
Direction of change required	***P=0.525***
Increase current behaviour	*6.64*
Decrease current behaviour	*7.13*
Change behaviour or mix or unclear	*5.7*

…in addition to being indirect, findings are somewhat unstable…
FEW 'HEAD-TO-HEAD' TRIALS

How well does it work?


Audit and feedback: effects on professional practice and healthcare outcomes (Review)

Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD

THE COCHRANE COLLABORATION®

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2012, Issue 6

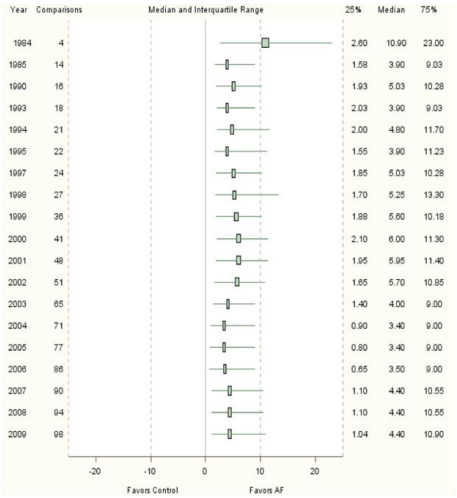
http://www.thecochranelibrary.com

- A&F improves compliance with desired professional behavior by 4% (IQR 0.5 - 16)
- A&F more effective when:
  - othe source is a respected colleague,
  - odelivered both verbally and written,
  - oprovided more than once,
  - oincludes explicit targets and action plan
- Targeted behavior plays an important role
  - omore effective when baseline performance is poor

20

Growing Literature, Stagnant Science

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



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

…Stagnant Science

Table 3. Factors Explaining Variability in Effectiveness of Feedback: Serial Meta-Regressions

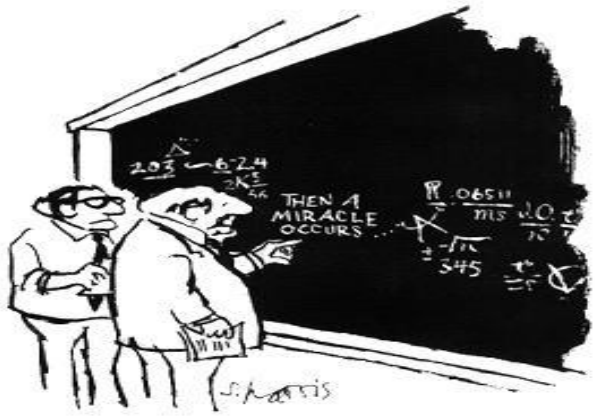
Characteristic of feedback	Estimated effect size*, (no. studies)		
	2010	2006	2002
Format of feedback	$p=0.386$	$p=0.731$	$p=0.729$
Verbal	12.77, (15)	14.85, (14)	17.02, (12)
Written	20.70, (50)	19.94, (41)	23.76, (19)
Both verbal and written	19.05, (27)	19.19, (26)	16.98, (18)
Not clear	16.90, (6)	13.58, (5)	2.94, (2)
Source of feedback	$p=0.006$	$p=0.034$	$p=0.300$
A supervisor or respected colleague	25.22, (10)	23.49, (8)	24.48, (4)
Standards review org. or representative of employer	9.16, (3)	9.38, (3)	0.90, (1)
The investigators	15.19, (52)	14.71, (42)	17.85, (13)
Not clear	19.85, (33)	19.99, (33)	17.47, (33)
Frequency of feedback	$p<0.001$	$p<0.001$	$p<0.001$
Frequent (up to weekly)	27.58, (5)	28.50, (3)	28.64, (2)
Moderate (up to monthly)	18.51, (10)	16.73, (9)	18.31, (4)
Infrequent (less than monthly)	14.04, (26)	13.32, (22)	1.06, (10)
Once only	7.49, (52)	7.75, (47)	9.96, (30)
Unclear;	19.15, (5)	18.17, (5)	17.92, (5)
Instructions for improvement	$p=0.044$	$p=0.068$	$p=0.325$
Explicit, measurable target, but no action plan	10.88, (5)	10.45, (5)	8.48, (1)
Action plan, but no explicit target	17.16, (32)	16.69, (31)	11.37, (18)
Both	23.19, (4)	23.06, (4)	22.01, (4)
Neither;	18.18, (57)	17.37, (46)	18.84, (28)
Nature of change required	$p=0.025$	$p=0.028$	$p=0.510$
Increase current behavior	15.55, (40)	15.65, (36)	19.34, (17)
Decrease current behavior	22.46, (11)	22.30, (11)	12.61, (4)
Change behavior to similar alternative or unclear	14.05, (47)	12.73, (39)	13.58, (30)
Profession of recipient (Physician yes/no)	$p<0.001$	$p<0.001$	$p<0.001$
Physician	10.99, (82)	10.19, (72)	4.80, (45)
Not physician	23.72, (16)	23.60, (14)	25.55, (6)
Risk of bias	$p=0.375$	$p=0.564$	$p=0.281$
Yes (low risk of bias)	14.85, (32)	14.92, (27)	21.34, (8)
Unclear	15.79, (51)	15.33, (48)	10.06, (34)
No (high risk of bias);	21.42, (15)	20.43, (11)	14.12, (9)
Baseline performance (continuous variable)	$p<0.001$	$p=0.003$	$p=0.021$

Absolute difference in compliance with intended professional behaviors

Ivers et al. J Gen Intern Med. 2014 Nov;29(11):1534-41

22

"To improve outcomes, we'll give them a report card"



"I think you should be more explicit here in step two."

Reprinted with permission from Sidney Harris

23

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

IMPLEMENTATION SCIENCE

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 Sales[2], Heather Colquhoun[3], Susan Michie[4], Robbie Foy[5], Jill J Francis[6] and Jeremy M Grimshaw[7]

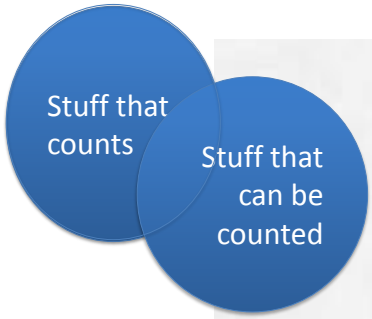
Abstract

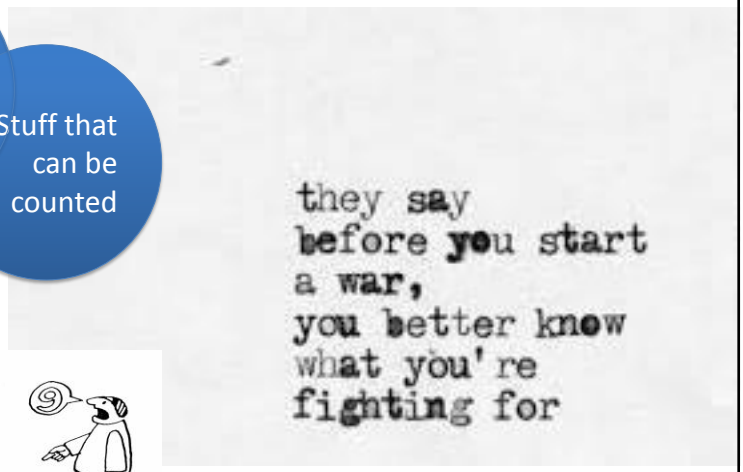
Background: Audit and feedback interventions in healthcare have been found to be effective, but there has been little progress with respect to understanding their mechanisms of action or identifying their key 'active ingredients.'

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.

Some caveats





Questions? Comments?

noah.ivers@wchospital.ca
@noahivers

Acknowledgements:

Mentors → Colleagues

Funding: Women's College Hospital, University of Toronto, and the Canadian Institutes of Health Research

Family & Community Medicine
UNIVERSITY OF TORONTO

WIHV WCHRI
Women's College Hospital Institute for Health System Solutions and Virtual Care

CIHR IRSC
Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

30