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Developing a research agenda for feedback: 389 hypotheses and counting…

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Cochrane review

"a summary of clinical performance over a specific period of time (audit), and the provision of that summary (feedback) to individual practitioners, teams, or healthcare organizations"

Cochrane review (Ivers et al 2012)

- 140 trials of A&F
- not improving over time; effect size hasn't changed since 2003
- 4% mean absolute improvement, IQR +.5% to 16%.

Brehaut t & Eva (2012). Implementation Science
Ivers et al (2014). Implementation Science.
Ivers et al. (2012) . Cochrane Database of Systematic Reviews

Research Project: Can theory help us develop generalizable knowledge about A&F?

1) To develop a list of clear, testable, and theory-motivated hypotheses about designing effective A&F interventions

2) To evaluate existing A&F interventions (from the Ivers Cochrane review) in light of these theory-motivated hypotheses

3) To achieve consensus on which theory-motivated hypotheses should be prioritized for future research

Types of Feedback

- Some feedback is inherent to any physical activity; ‘intrinsic feedback’
- But even when intrinsic feedback is available, there is still the need for coaching: ‘extrinsic feedback’

Examples of Health Provider Feedback

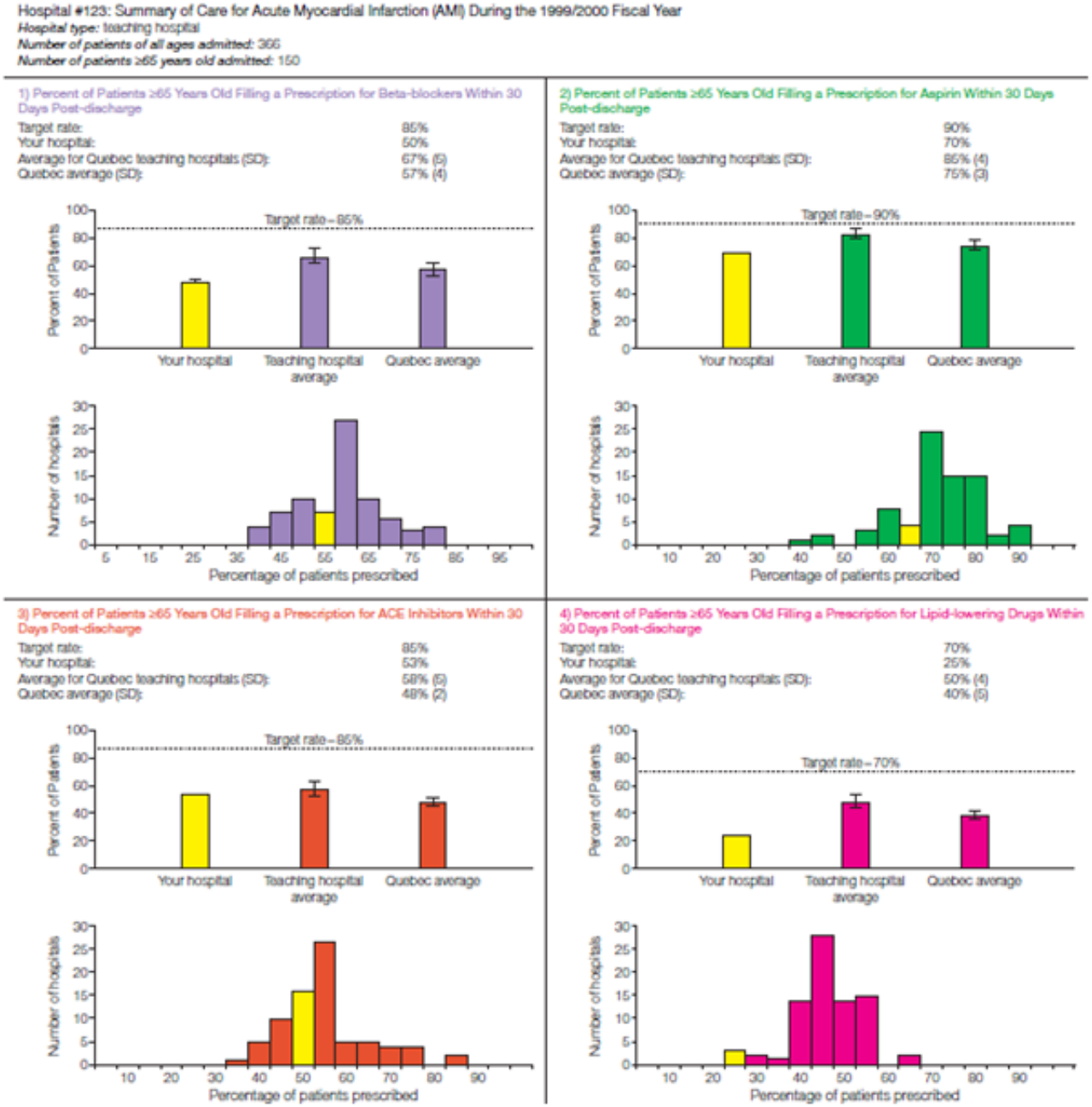
Intrinsic

Skills-based activities

- Phlebotomy, tube insertion, suturing
- Surgery

Extrinsic

- Formal Training
- Self-assessment
- Informal Patient / Peer Feedback
- Multisource feedback (e.g. Physician Achievement Review)
- **Outcome specific feedback*****

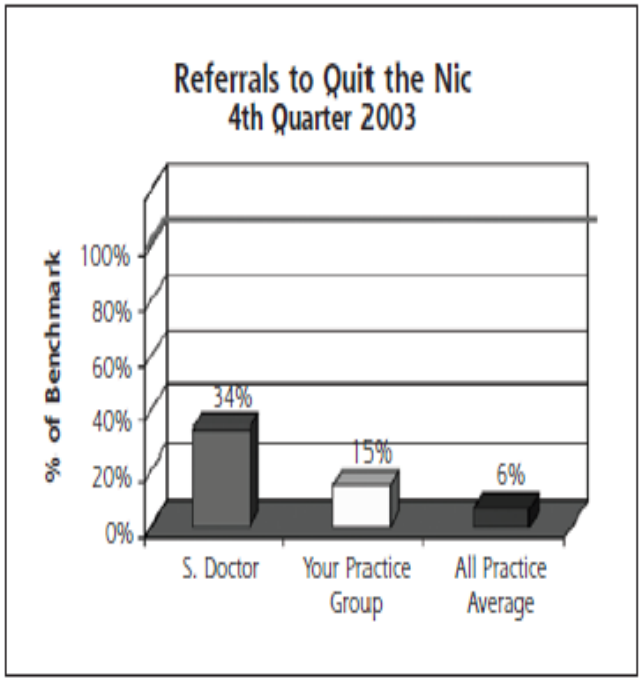


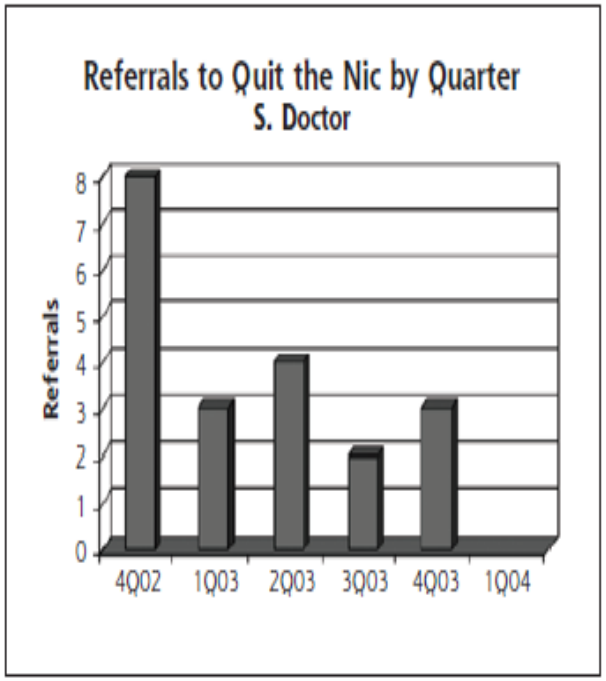
- Reported in JAMA
- Can Hospital admin data improve quality of cardiac care?
- Hospital report cards to 77 hospitals in Quebec
- 12 outcome, 2 histograms per
- Sent to directors of services
- Feedback sent once based on data from previous year

Figure 1. Example of a Quit Line referral report.

Susan Doctor, MD Quit Line Referral Report

Enhancing Smoking Cessation in Michigan Medical Practices
(A Study Funded by the Robert Wood Johnson Foundation)





Bold line indicates 100% benchmark performance.

You had 3 referrals for the quarter.
You needed 9 referrals to achieve the benchmark for this quarter.

Benchmark is based on the top 10% of practices referring patients to Quit the Nic and is recalculated for each quarter.

- Annals Fam Med
- FB vs general reminders to increase referrals to smoking cessation quit line
- 308 fam med docs from 87 practices
- Sent to physicians 6 times over 18 mon
- Update data from previous 3 months

PREVENTIVE CARE PERFORMANCE REPORT 31-Jan-85

Dr. TIERNEY, WILLIAM (594-2)

Intervention: HEMOCULT, O-4

Patient(s) needing Hemoccult as a yearly screen.

Patient	Hosp#	Phone#	Age	Next Appt	Last result
DEMONSTRATION, PATIENT	9999-4	630-7406	62	21-JUN-85	
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[6]					
SMITH, JANE	185185-1	630-7401	64	11-JUN-85	HEMOCULT, O-4 = O ON 07-OCT-83.
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[7]					
YOHANSON, HALLIE	123456-7	630-7402	82	10-JUL-85	HEMOCULT, O-4 = O on 18-SEP-81.
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[8]					

Intervention: PPD INT

Patients (30 years old; consider one-time PPD screen.

Patient	Hosp#	Phone#	Age	Next Appt	Last result
BAKER, DELORES	654321-0	630-7403	27		
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[9]					

Intervention: PNEUMO VAC

Patient(s) CRF, CHF, COPD, asthma, Hb-SS, s/p spenectomy, or ETOH abuse.

Patient	Hosp#	Phone#	Age	Next Appt	Last result
SMITH, CORA BETH	472876-6	000-0000	56	03-JUN-85	
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[10]					
VONAWAY, LORETTA	825161-4	555-7789	56	15-JUN-85	
Your response:	(1)Reschedule sooner, (2)Mark encounter form, (3)Not applicable, (4)Stop, (5)Pull chart.				
Comments:					
[11]					

FIG. 1. A typical performance feedback report.

- Medical Care
- FB vs reminders to improve Int Med preventative care strategies
- FOBT, Calcium supplementation, etc
- 135 Int med docs
- FB about specific patients
- Each month records scanned for patients that had an indication for, but didn't receive, a preventative care action.
- FB provided monthly over 7 months
- FB indicated patient name, action that was not taken, etc

Assumptions

- There are principles of feedback design that are likely to result in more effective feedback in many/most situations
- Knowledge about these principles is distributed across many areas/disciplines (e.g. various branches of psychology, education, economics, management)
- Reviewing all these literatures in detail would likely kill me
- Interviewing experts from these areas will yield testable hypotheses and guiding principles about effective feedback

DESIGN – Phase 1

- **Identify theory experts** from Psychology (social, health, cognitive, organizational), Education, Human Factors, Medical Education, Economics, Management, and related disciplines
- Show them representative **examples of A&F interventions** from the health literature
- Get them to **generate hypotheses about:**

  1) What should work about the interventions,

  2) What they would change/add,

  3) Theories/ theoretical mechanisms motivating these hypotheses

METHODS

- Contacted experts in theories of feedback (identified sample + snowball sampling + beer bribes)
- Provided interview protocol prior to interview
- 4 A&F examples; usually discussed at least 3 of them
- 90-minute telephone interviews

- Notes from interviews framed in terms of hypotheses
- Hypotheses member-checked
- Hypotheses organized into themes
- Themes organized into principles

Interviews audiotaped & transcribed

↓

Hypotheses generated

↓

Reviewed by Co-PIs

↓

Member checked

↓

Changes made

↓

Hypotheses organized & randomized

↓

First 50 hypotheses used to begin theme generation

↓

Hypotheses assigned to themes by 3 coders

↓

Consensus meetings held

Member Check Document

Ideas YOU Generated in the Interview	OUR Derived Hypothesis (Please edit as you see fit by using track changes, different font color etc.)	Mechanism of Action (how will your idea improve the feedback?)	Suggested Readings/References	Outcomes/Contextual Factors/Theories
Good that the text is not redundant with what information is included in the graphs.	Feedback will be more effective when different modes of information are complementary, not redundant.	If info is redundant, that affects cognitive load		
The coloring used in the text is confusing – the goal should be towards simplicity and clarity. The content of the messages are confusing.	Feedback will be more effective if there is little irrelevant colour variation.	Again, reduce cognitive load with fewer distracting colors, also reduce confusion.	(See above for cog load theory references/researchers.	Theory: Cognitive Load Theory
Discussion about the quit line service – why should I be increasing my referrals to this particular quit line? Is this a conflict of interest?	Feedback will be more effective if it is perceived to be without conflict of interest.	By increasing motivation By increasing trust & hence confidence	Motivational and engagement literature	

RESULTS

Participating Experts (*N* = 28)	
Sex	
Male	20
Female	8
Country	
US	18
Canada	5
Other	5
Expertise in	
Psychology(Cognitive, Social, Health, Organizational)	20
Human Factors	2
Education	8
Medical Education	5
Economics	3
Management	4
Methods/Assessment	8
Medical Decision Making	7

- Identified **46** theory experts for contact
- **14** unable to contact,
- **4** refused

RESULTS

- ~389 Hypotheses identified
  - Did NOT try to determine number of UNIQUE hypotheses
- 40 themes
  - 2 – 32 hypotheses per theme
- 15 Principles
  - NOT exhaustive; ‘low-hanging fruit’ approach

RESULTS – Themes

Nature of Action Sought:

- Goal setting
- Intention
- Enable action plans/coping strategies
- Recipient priorities
- Recipient characteristics
- Self-efficacy/control
- Practicing/automatizing behavior
- Modeling the behavior
- About aspects of behavior

About the data:

- Nature of the data
- Comparisons
- Feedback specificity
- Trustworthiness/creditability
- Outcomes

Display of Feedback:

- Cognitive load
- Cognitive Bias
- Sign of the feedback
- Attract/maintain attention
- Motivation issues
- Improving memory
- Multiple formats
- Guide reflection
- User guided experience
- Knowledge/learning

RESULTS – Themes

Delivery of Feedback:

- Feedback frequency
- Timing of feedback
- In person feedback
- Feedback to right target group
- Justify need for behavior change
- Avoid FB that can be seen as an attack on self-identity
- Persuasion
- Environment
- Remove barriers
- Opportunity costs
- Social discussion

- Responding to fb providers
- Development processes/conceptual model
- Accountability

- Other single themes

RESULTS - Hypotheses

Theme	# of Hypo-theses	Examples: *"Feedback will be more effective…"*
Cognitive Load	Lots	…when there is one clear criterion rather than several. … when data are presented as absolute numbers rather than percentages. …when colour changes are purposeful and convey meaning.
Action Plans/Coping Strategies	17	… if it has explicit steps the recipient can take. … if clear direction is provided on how to implement change. … if the corrective action is made immediately available.
Attention	6	… if important cues to behaviour are made salient. … when efforts are made to capture their attention.

RESULTS - Themes

Theme	# of Hypo-theses	Examples *"Feedback will be more effective…"*
Affect issues	6	… when measures are used to prevent a defensive response. … when NOT presented as consistently negative.
Comparison	26	… when multiple individual physician practice data are presented along with the recipients' data. … when a clear and explicit benchmark is provided.
Goal Setting	22	… when the goal of the intervention is made explicit. …when it involves goals set/agreed to by the participant.

RESULTS - Themes

Theme	# of Hypo-theses	Examples *"Feedback will be more effective…"*
Motivation	12	… if it is accompanied with positive reinforcement to those who have improved their performance.
Trustworthiness /Credibility	15	… when the origin of benchmarks is made clear. … when data are perceived as plausible by recipient.
Recipient characteristics	9	…for those with a mastery goal orientation if it involves comparison to others.
Involvement in Development	5	… if recipients are involved in the design/development of the feedback intervention.

RESULTS – 15 Principles

- In the process of working through the data, some ideas seemed basic/obvious.
- But when you look at the literature, aren't being consistently (or ever) applied
- These 'Low-hanging fruit' issues could be used to improve feedback interventions NOW, without further ado

Nature of the Action Sought

Feedback interventions should…	Example intervention changes	Evidence
1) recommend actions that have room to improve	Target FB to under-performers	Cochrane

Nature of the Action Sought

Feedback interventions should…	Example intervention changes	Evidence
2) Recommend specific actions	Implementation intentions	Interviews

Nature of the Action Sought

Feedback interventions should…	Example intervention changes	Evidence
3) Recommend actions consistent with established goals and priorities	Coordinating with ongoing initiatives; Collect pilot data on need, salience, justifiability of the behavior	Interviews

Nature of the Feedback Data

Feedback interventions should…	Example intervention changes	Evidence
4) be provided multiple times	Replace one-off feedback for regular feedback	Review: 24% once, 24% unclear

Colquhoun, H. et al. Reporting and design elements of audit and feedback interventions: an examination of the literature. (Submitted to BMJ Quality & Safety)

Nature of the Feedback Data

Feedback interventions should…	Example intervention changes	Evidence
5) be provided as soon as possible, dependent on number of patient cases	Increase frequency/decrease interval of feedback for outcomes with more patient cases	Review: Only 6% provided data within days

Nature of the Feedback Data

Feedback interventions should…	Example intervention changes	Evidence
6) be as specific to the individual as possible	Provide practitioner-specific rather than hospital-specific data	Review: 58% individual provider, 25% individual patient cases

Nature of the Feedback Data

Feedback interventions should…	Example intervention changes	Evidence
7) Include comparators that reinforce desired behaviour	Choose one comparator rather than several.	Cochrane: 49% others' performance only, 26% unclearly reported

Design of the Feedback Display

Feedback interventions should…	Example intervention changes	Evidence
8) closely link visual display and summary message	Put summary message in close proximity to the graphical or numerical data supporting it	Interviews; Human Factors literature

Design of the Feedback Display

Feedback interventions should…	Example intervention changes	Evidence
9) present feedback in multiple ways	Present key messages both textually and in person	Cochrane

Design of the Feedback Display

Feedback interventions should…	Example intervention changes	Evidence
10) minimize extraneous cognitive load placed on recipients	Eliminate unnecessary 3-D graphical elements, increase white space, clarify instructions, target fewer outcomes	Interviews; Human Factors literature

Delivery of the Feedback Intervention

Feedback interventions should…	Example intervention changes	Evidence
11) address barriers to use of feedback	Incorporating feedback into care pathway rather than providing it outside of care. Addressing barriers to use of feedback within the care setting	Cochrane: E.g. action plans, coping strategies;

Delivery of the Feedback Intervention

Feedback interventions should…	Example intervention changes	Evidence
12) provide short, actionable messages followed by more detail ('graded entry')	Put key messages/variables on front page; additional detail in subsequent materials	Interviews

Delivery of the Feedback Intervention

Feedback interventions should…	Example intervention changes	Evidence
13) explicitly address credibility of the information	Feedback from trusted local champion, colleague, rather than research team; increase transparency of data sources; disclose conflicts of interest.	Interviews

Delivery of the Feedback Intervention

Feedback interventions should…	Example intervention changes	Evidence
14) Prevent defensive reactions	Incentives for improved performance; positive messaging along with negative; ‘feedforward’ discussions	Interviews: e.g., prevent discounting of feedback

Delivery of the Feedback Intervention

Feedback interventions should…	Example intervention changes	Evidence
15) Encourage social construction of feedback	Engaging in self-assessment around target behaviors prior to receiving feedback; engaging in dialogue with peers as feedback is provided	Interviews: Medical education literature

Summary – Phase 1

- Theory experts can provide a wide range of testable hypotheses about how to improve A&F
- Initial 'low-hanging fruit' principles suggest straightforward ways to increase chances of effective feedback interventions

Brehaut J., Colquhoun H, Eva K, Carroll K, Sales A, Michie S, Ivers N, Grimshaw J. Making use of data to improve practice: 15 suggestions for better feedback. *Annals Internal Medicine* (in Press)

Phase 2 – Rate existing A&F interventions in terms of the hypotheses

- Of 140 trials, we have feedback forms for 33 of them
- May need a different sample frame of A&F forms
- 389 hypotheses have to be pared down, evaluated for clarity, feasibility, redundancy

Example Rating Question

1) Has there been any effort by study investigators to measure/describe/ characterise whether the target behavior is a priority for the FB recipients?

- ☐ **YES**
- ☐ **NO**
- ☐ **UNCLEAR**

Phase 3 – Delphi Process

Motivation Issues

Supporting Theory: Self-regulation Theory (e.g. Higgins 1998. Promotion and prevention: Regulatory focus as a motivational principle. In: Zanna M, ed. *Advances in experimental social psychology*. San Diego, CA: Academic press, 1998:1-4

Evidence from the Cochrane review sample: Of the 140 trials in the Cochrane review, X% characterised level of motivation…

What priority would you assign to each of the following proposed questions? (circle your response)	
1. Understanding the role level of motivation has in A&F effectiveness	1 2 3 4 5 6 7 8 9 ☐ Low priority … High priority; unable to judge
2. Understanding the role sign of the feedback has in A& F effectiveness	1 2 3 4 5 6 7 8 9 ☐ Low priority … High priority; unable to judge

THANKS

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Things to think about as you reflect on the A&F intervention

- Given your theoretical expertise, how do you think the intervention would work and/or how would you go about improving an intervention like this?

- **Reminder**: The goal of this exercise is *to* generate ***theory- informed hypotheses*** (as opposed to just general ideas) that you think should be considered in improving this kind of intervention.

Let's focus on a particular hypothesis your theory suggests…

- What would that be? Can you frame a clear **hypothesis** for us?
- What is the **theoretical mechanism of action**? (i.e. what makes this effective?)
- On what **outcomes** would this hypothesis show its effects?
- Are there any **contextual factors** that would affect the hypothesis? (i.e. for whom and under what circumstances would this be effective?)
- Can you identify a specific **theory or model** that motivates this hypothesis?
- Are there any **specific readings** you would point us to about these ideas?

Audit & Feedback Example #1: DRAM Trial

Reference: Effect of enhanced feedback and brief educational reminder messages on laboratory test requesting in primary care: a cluster randomised trial; Lancet 2006, 367:1990-96. Thomas RE., Croal BL., Ramsay C., Eccles M., Grimshaw J.

This study evaluated the effectiveness of audit and feedback (around ordering rates for various lab tests) enhanced with educational reminder messages describing what inappropriate use would look like for **nine laboratory tests** commonly used in primary care. The study involved 85 family physician practices (~370 family practitioners) in Scotland. Test ordering rates for the practice group (not the individual physicians), **enhanced with the educational messages** were sent to individual family physicians on four occasions.

Some key aspects of the Feedback (you might want to look at the graph on the next page as we go through these points):

- Feedback provided was at the level of the practice (not the individual)
- A 6- page colour booklet was sent to individual family physicians
- 12 graphs in total; 3 graphs summarized the laboratory test areas as a whole; 9 graphs summarized the specific lab tests. Two of the graphs are presented here.
- The graphs displayed the practices request rate for the lab test for every 10,000 patients for a 6-month period of time.
- Graphs compared the average of their practice group (red line) to the regional average (blue line)
- Educational messages describing inappropriate use of the specific lab test were presented alongside the graphs
- Feedback was sent four times over the course of 1 year

Audit & Feedback Example #3: Effective Cardiac Treatment

Reference: Administrative data feedback for effective cardiac treatment; JAMA 2005, 294: 309-317. Beck CA., Hugues R., Tu JV., Pilote L.

This study evaluated whether audit and feedback based on hospital and prescription administrative databases is effective for **improving quality of care for acute myocardial infarction** (AMI). Quality indicators reflecting patient outcomes for acute myocardial infarction (AMI) care were sent to 77 acute care hospitals in Quebec.

Some key aspects of the Feedback (you might want to look at the graph on the next page as we go through these points):

- Feedback was provided in the form of a hospital report card
- Feedback was mailed to directors of services (not the physicians who treated the patients) with the encouragement for them to share with those who treat the patients
- Educational materials to support this sharing were provided
- Hospital-specific feedback was compared to the average of all teaching hospitals
- And it was compared to all hospitals in the province of Quebec
- Feedback included 2 histograms for each of the 12 different aspects of care for acute myocardial infarction (24 histograms in total)
- Histogram 1: The percent of patients receiving appropriate care with the 2 comparators
- Histogram 2: Shows the distribution of hospital performance for that aspect of care
- A recommended target rate was included, but it's not clear what it was based on
- Feedback was sent once; based on data that was summarized from the previous year

Audit & Feedback Example #4: Preventive Care

Reference: Delayed Feedback of Physician Performance Versus Immediate Reminders to Perform Preventive Care: Effects on Physician Compliance; Medical Care 1986, 24(8): 659-666. Tierney WM., Hui SL., McDonald CJ.

This study evaluated the effectiveness of audit and feedback and reminders as approaches to increase compliance with preventive care actions (e.g fecal occult blood testing, oral calcium supplementation). The study involved 135 internal medicine interns and residents in Indianapolis. Thirteen preventative care actions were randomly divided into two feedback groups; half of the interns/residents were given monthly feedback for Group A actions, and the other half for Group B actions. Thus each feedback group acted as a control for the other. Within feedback groups, individuals were randomly assigned also to receive immediate reminders (given at time of patient visits) for either Group A or Group B actions.

Some key aspects of the Feedback (you might want to look at the sample feedback report on the next page as we go through these points):

- Feedback reports provided to the individual physician about their own patients
- Each month, records were searched for patients who had visited a physician in the clinic and had an indication for, but did not receive, one or more of the preventative care actions.
- The feedback reports sent to the physicians identified each patient by NAME, their age, the dates of the last and next scheduled appointments, the action that was NOT taken, and information that made the patient eligible for the action
- Each physician was required to indicate on the feedback report what action should be taken from five options: rescheduling the patient sooner, marking the form to suggest the physician perform the preventative care on the next visit, indicating the protocol was not applicable for that specific patient, stopping the reminder for that patient, or pulling the patients chart for review. The example on the next page is this feedback report.
- Feedback was sent monthly over the course of 7 months. The number of patients included in the feedback reports varied by how many patients had not received the preventative care actions
- Reminders for some patients were generated the night before the scheduled appointment and placed in the patients' charts. Reminders identified the patient, recommended relevant preventative care actions, data that made the patient eligible for the action, and supporting references.