

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.

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For author affiliations, see end of text.

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Health administrative data provide enormous opportunities for health care organizations and systems to incorporate practice feedback as part of regular and sustainable quality improvement initiatives. However, despite decades of experience, efforts to improve practice with such feedback have stagnated (1). The latest Cochrane review (2) saw a positive but variable effect on performance across 140 randomized trials of feedback interventions (the modest effect size became stable in 2003 after only 30 trials) (1). Knowledge distributed across disciplines exists to inform more effective interventions, but these lessons have not been assembled and organized concisely for quality improvement professionals, information technology experts, educators, and others seeking to provide effective feedback.

Over the past 10 years, our group has studied how to design better feedback interventions through systematic reviews (2-4); randomized, controlled trials (5-8); an international meeting of practice feedback developers and researchers (9); studies of the theory underlying feedback and behavior change (3, 10); and recent interviews of 28 experts in feedback theory from psychology (social, health, cognitive, and organizational), behavioral science, economics, management, and other related disciplines. Through discussions among members of the study team and by tapping its collective experience, we identified 15 suggestions that are likely to improve the effectiveness of feedback across a range of contexts and that are underutilized in the literature (2, 3, 11-13) (Table). Examples, potential underlying mechanisms, and relevant citations are drawn from the interviews and the literature. Our discussion is limited to provision of feedback intended to encourage best practice in a specific clinical area (for example, reduce ordering of tests) rather than broader approaches (such as practice-wide feedback and clinical decision-support systems).

In this article, we use the word *suggestions* to acknowledge the incomplete state of the literature, given

that their specific mechanisms of effectiveness have seldom been explored in detail. We intend for this work to serve both as initial guidance and a call for more detailed study. The relative importance and feasibility of these suggestions for any specific context should be determined through systematic design, pilot testing, and assessment of practice change barriers and drivers (14, 15).

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15 SUGGESTIONS FOR DESIGNING PRACTICE FEEDBACK INTERVENTIONS

Nature of the Desired Action

1. *Recommend actions that are consistent with established goals and priorities.* Feedback that supports actions that are consistent with established goals and priorities is more likely to be effective (2, 16, 17). Considerable theoretical work has outlined various mechanisms related to how goals encourage behavior change, including facilitating priority setting, directing attention and effort, and establishing intention or commitment (16, 17). Intention, in turn, is the most important general predictor of behavior (18, 19). Goals that are explicit, specific, time-bound, recipient-defined, and challenging but attainable are more likely to engage these mechanisms (2, 16, 17). Intervention designers should ensure that feedback is consistent with recipients' goals and priorities.

2. *Recommend actions that can improve and are under the recipient's control.* Feedback should recommend actions that have room for improvement (2, 9) and over which the recipient has control (18, 20). Controllable actions may differ among recipients. For example, providing feedback about a hospital's overall performance may not be useful for individual physi-

Table. 15 Suggestions for Designers of Practice Feedback and Examples of Implementation Strategies

Suggestion for Designers of Practice Feedback	Examples of Implementation Strategy
Nature of the desired action	
1. Recommend actions that are consistent with established goals and priorities	Consider feedback interventions that are consistent with existing priorities, investigate perceived need and salience of actions before providing feedback
2. Recommend actions that can improve and are under the recipient's control	Measure baseline performance before providing feedback, establish that the action is under the recipient's control
3. Recommend specific actions	Include functionality for corrective actions along with feedback, require recipient-generated if-then plans to overcome barriers to target action
Nature of the data available for feedback	
4. Provide multiple instances of feedback	Replace one-off feedback with regular feedback
5. Provide feedback as soon as possible and at a frequency informed by the number of new patient cases	Increase frequency/decrease interval of feedback for outcomes with many patient cases
6. Provide individual rather than general data	Provide practitioner-specific rather than hospital-specific data
7. Choose comparators that reinforce desired behavior change	Choose 1 comparator rather than several
Feedback display	
8. Closely link the visual display and summary message	Put summary message in close proximity to the graphical or numerical data supporting it
9. Provide feedback in more than 1 way	Present key messages textually and numerically, provide graphic elements that mirror key recommendations
10. Minimize extraneous cognitive load for feedback recipients	Eliminate unnecessary 3-dimensional graphical elements, increase white space, clarify instructions, target fewer outcomes
Delivering the feedback intervention	
11. Address barriers to feedback use	Assess barriers before feedback provision, incorporate feedback into care pathway rather than providing it outside of care
12. Provide short, actionable messages followed by optional detail	Put key messages/variables on front page, make additional detail available for users to explore
13. Address credibility of the information	Ensure that feedback comes from a trusted local champion or colleague rather than the research team, increase transparency of data sources, disclose conflicts of interest
14. Prevent defensive reactions to feedback	Guide reflection, include positive messaging along with negative, conduct "feedforward" discussions
15. Construct feedback through social interaction	Encourage self-assessment around target behaviors before receiving feedback, allow user to respond to feedback, engage in dialogue with peers as feedback is provided, engage in facilitated conversations/coaching about the feedback

cians, who probably control only their immediate practice. However, such feedback may be actionable for hospital executives. Designers should consider whether feedback suggests actions that recipients can take.

3. *Recommend specific actions.* Feedback that recommends specific rather than general actions is more likely to be effective (21). For example, feedback that preventive care tests have been missed implies that the physician should develop strategies to avoid such lapses in the future, but offers no guidance about which strategies will be effective. In contrast, specific corrective actions, such as providing patient names, allowing immediate reexamination of case files, or providing reminders, are more likely to encourage practice change (7). In many cases, facilitating the development of specific implementation plans in which "if X happens, I will do Y" strengthens the link between intention and actual practice (2, 21). Designers should enable specific actions of feedback recipients.

Nature of the Data Available for Feedback

4. *Provide multiple instances of feedback.* Feedback provided on several occasions is generally more effective than presenting it once (2). Multiple instances encourage a feedback loop (22), wherein the recipient can receive the initial feedback, make a change in the practice, and see whether the change has been effective

(23, 24). They may improve memory for and attention to the feedback among recipients (25). They may also help with sustainability of the desired practices by allowing regular monitoring of useful outcomes (26). Designers should implement interventions that involve multiple instances of feedback.

5. *Provide feedback as soon as possible and at a frequency informed by the number of new patient cases.* Few studies inform the optimal intervals to provide feedback in health care settings (27, 28). Overly frequent feedback has been argued to be less effective due to increased cognitive load, "alert fatigue" (29), and discounting (30). However, infrequent feedback about common procedures may also be less effective—the time lag may allow the recipients to discount the feedback as no longer relevant to their changing practice or may lead them to forget the lessons that it provided (31).

The education literature has examined the relative merits of immediate versus delayed feedback (11) but has primarily focused on delays of seconds or minutes rather than the weeks or months that are common in practice. One practice-based study (32) showed that immediate reminders were more effective than monthly feedback reports in terms of internal medicine specialists' adherence to preventive care protocols. In the absence of empirical work comparing feedback intervals

in real-world settings, designers should consider whether shorter intervals are more useful and whether the number of patient cases helps determine the frequency of feedback.

6. *Provide individual rather than general data.* Evidence from psychology shows that feedback data that are specific to an individual recipient are usually more effective than those that apply to a group (13, 28, 33). Although practice evidence is scant, our experts believed that feedback about one's own practice is usually more useful than feedback about one's team or unit, because group-level feedback can be more easily discounted and person-level data may be applied more readily to immediate corrective actions (such as reviewing patient charts and reexamining decision making). For similar reasons, feedback across small groups (such as units) may be preferable over larger groups (such as geographic regions). Even more specific feedback at the patient level can facilitate corrective actions in some cases (32). Designers should consider the specificity of available data and prioritize more specific rather than less specific feedback.

7. *Choose comparators that reinforce desired behavior change.* Although feedback without an explicit comparison is feasible (13, 34), practice feedback is most often given in the context of a comparator or benchmark. The comparator may be drawn from recipient performance (that is, how performance changes over time), formal guidance (that is, guideline-recommended target rates), or a peer group (that is, mean performance of similar persons or organizations). Although relatively little evidence informs health feedback designers about which comparators should be chosen under which circumstances (27), using several comparators can create mixed messages for recipients. For example, if a physician's percentage of patients with diabetes receiving foot examinations has improved over time but is lower than the top 10% of practices, a summary message suggesting that improvement is needed might be inconsistent with the physician's interpretation that "My numbers are improving, so I don't need to change." Without better evidence to inform comparator choice, designers should consider choosing comparators strategically with a preference for simple, clear comparisons that reinforce the desired behavior change.

Feedback Display

8. *Closely link the visual display and summary message.* Feedback should include a verbal summary message (12) and can often be effectively supported by visual or graphical elements. Feedback is more effective if the summary message and visual display are linked both conceptually and visually. If a summary message indicates that the recipient's current practice is below a target rate but the visual display shows performance above some benchmark, the effectiveness of the feedback may be compromised, leading the recipient to discount, misinterpret, or ignore it. Placing summary messages and graphics on separate pages may also compromise effectiveness. Designers should link

the displayed data and summary message through color, spatial proximity, or other common visual grouping techniques (35, 36).

9. *Provide feedback in more than 1 way.* Robust evidence suggests that feedback is more likely to be effective when it is presented in more than 1 way. Research in multimedia learning suggests that the combination of spoken words and pictures can enhance learning of complex concepts compared with pictures and written words (37). The Cochrane review showed that intervention effect sizes were larger when the feedback involved both written and verbal communication (2). Presenting feedback in different ways may help the recipients to develop a more complete and memorable mental model of the information presented (37), give them the choice of interacting with the feedback in a way that best suits them (38), reinforce memory by presenting material more than once, or simply attract and maintain attention on the information (37). Designers should present feedback data in more than 1 way whenever possible.

10. *Minimize extraneous cognitive load for feedback recipients.* Presenting feedback that is easily interpretable by a wide range of providers in different contexts can be challenging. Overly complex information is often misunderstood, incompletely understood, or entirely ignored by busy providers (39). Cognitive load generally refers to the effort required of short-term, working memory to process information; simpler, more easily processed information is believed to entail less cognitive load (40). Providing feedback that minimizes extraneous cognitive load might involve basic modifications, such as reducing the number of metrics audited, decreasing page counts, improving readability, and uncluttering visual displays. Cognitive load caused by text can be decreased by many factors, including clarifying instructions, placing instructions where they will be needed, using clear and comprehensible language, and summarizing only high-priority issues.

Graphical components in feedback displays can be used to reduce cognitive load by summarizing and condensing numerical information. However, poorly designed graphical elements can also add extraneous load. Unnecessary 3-dimensional graphical elements clutter the display and bias interpretation of the underlying information (41, 42). Ensuring that graphical elements are consistent with the message being conveyed (such as poor performance indicated by lower placement on the graph or in red, or good performance indicated by higher placement or in green) can also reduce load (42). Designers should seek to minimize the extraneous cognitive load that their interventions place on the recipients.

Delivering the Intervention

11. *Address barriers to feedback use.* Practice feedback interventions are likely to fail if they do not reach the intended target. For example, delivering feedback to a practitioner's inbox does not guarantee that the information will be read. Similarly, reading a feedback report will not necessarily ensure that the feedback is

mindfully considered, understood, deemed useful, or acted on by the recipient (43). As with any complex health care intervention, the effects of interventions can be maximized by using a systematic approach to assessing and addressing barriers to behavior change and monitoring and evaluating behavior change and outcomes. Such models as the Ottawa Model of Research Use (44), the Theoretical Domains Framework (45, 46), or the Behaviour Change Wheel (47) are widely used to provide guidance on this process. Designers should incorporate an assessment of barriers and drivers into their development process to optimize the effect of feedback on practice change.

12. *Provide short, actionable messages followed by optional detail.* Feedback designers face a difficult problem: How much information should be provided? When seeking to encourage practice change around effective cardiac treatments, feedback based on a single indicator might be discounted because it has oversimplified a complex clinical discipline. There may be dozens of relevant indicators, each potentially requiring justification, relevant benchmarks, and context to be properly understood. The result can be lengthy feedback documents that are onerous for recipients and of uncertain value for changing behavior.

We recommend providing short, actionable messages with optional information available for interested recipients. Those who only have the time or inclination to glean the main messages will do so; however, others may desire more detailed information or the justification underlying the main message. For this group, feedback involving only main messaging may lead recipients to discount the information because they believe that "the data are flawed" or "my patients are different." Allowing these recipients to "drill down" to access the specific information they want can lend credibility. Although little research has been done on this topic in the context of presenting practice feedback, such a strategy is consistent with a "graded-entry" approach to clinical guideline summaries (48, 49). Designers should consider feedback that presents key messages while allowing user-guided extraction of more detailed information.

13. *Address credibility of the information.* To enable practice change, feedback must be perceived as credible (31, 50, 51). The Cochrane review (2) showed that feedback delivered by a supervisor or colleague was associated with more effective interventions than those delivered by other sources, possibly because those persons lend credibility to the feedback process. Techniques for enhancing perceived credibility of health information include characterizing the quality of the data underlying the feedback, disclosing and highlighting the credibility of the source of the feedback (52), explicitly addressing possible issues with conflicts of interest, and clarifying the extent to which the feedback applies specifically to the provider's individual practice. Designers should consider clarifying the strengths and weaknesses of their feedback as a means to enhance credibility.

14. *Prevent defensive reactions to feedback.* Providing feedback often involves identifying performance limitations that may elicit a defensive reaction from the recipients. Such a reaction can decrease the effectiveness of the feedback, either by decreasing the recipients' motivation to improve or by inadvertently encouraging them to ignore the information (53). Feedback that is perceived as consistently negative, overtly directive, or potentially punitive may elicit such reactions (12, 54). Commonly used models for providing corrective feedback alongside more positive feedback (that is, the "feedback sandwich") have been criticized (55, 56). Discussions intended to encourage reflection on success with an emphasis on extending the success to other arenas (that is, "feedforward" [53]) may be more motivating, although few studies on health care providers exist. Actively guiding recipients' reflections on the feedback away from defensive reactions may also be beneficial (55, 57). Designers should consider the circumstances under which negative reactions to feedback might reduce motivation to change behavior.

15. *Construct feedback through social interaction.* Educational research has explored how learning from feedback can be improved if it is socially constructed rather than passively received. This approach argues that effective feedback requires the recipients to actively work with the material and construct and facilitate their own learning on the basis of the data provided, often through social interaction (58). Such close interaction between the feedback providers and recipients is uncommon in the practice feedback literature (2), although examples that merge this approach with clinical data are being explored (59). Activities consistent with this approach might include establishing rapport or trust between feedback providers and recipients (60, 61), engaging in self-assessment around target behaviors before receiving feedback (60, 61), developing feedback-seeking skills for the recipients (58), creating opportunities to both provide and receive feedback (58), engaging in dialogue with peers as feedback is provided (62), engaging in facilitated conversations or coaching about the feedback (60), and forming explicit plans to address feedback (60, 63). Designers should consider the feasibility and potential of incorporating these or similar activities as a means to develop more effective and sustainable interventions.

DISCUSSION

More health systems are developing and delivering large-scale feedback programs to health care providers. Such initiatives are often designed without guidance from the research literature (3). This article distills lessons from a wide range of sources, literature, and disciplines into a manageable set of suggestions that should be considered by designers of practice feedback interventions.

Not all of these suggestions apply to all feedback. For example, providing provider- or patient-specific data may not be possible or even warranted in all situations because available data may not allow it or busy

providers may simply not have the time to be well-served by such detailed information. In addition, these suggestions are not comprehensive. The process of changing behavior through complex health care interventions is the subject of considerable empirical and theoretical study (3, 10, 46, 64–66). Priority issues for further study include understanding the causal mechanisms relevant to feedback (67), affective responses to feedback by different recipients (34), social discussion as part of the feedback process (55, 58), and how feedback can most effectively be combined with the broader range of behavior change techniques (47, 65, 68).

These 15 suggestions constitute initial guidance on factors to consider when feedback interventions are being designed, but there is still much to be learned about optimum methods for implementation of such interventions as well as their underlying mechanisms. We should not expect a one-size-fits-all approach to delivering feedback effectively, but we can accelerate the understanding and effectiveness of interventions if they are designed systematically, reported transparently, and evaluated rigorously to determine which are most effective and what mechanisms guide their effectiveness.

From Ottawa Hospital Research Institute, The Ottawa Hospital, and School of Epidemiology, Public Health and Preventive Medicine, University of Ottawa, Ottawa, Ontario, Canada; Occupational Science and Occupational Therapy, University of Toronto, and Women's College Hospital, Toronto, Ontario, Canada; Centre for Health Education Scholarship, University of British Columbia, Vancouver, British Columbia, Canada; Veterans Affairs Ann Arbor Healthcare System and University of Michigan Medical School, Ann Arbor, Michigan; and University College London, London, United Kingdom.

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Requests for Single Reprints: Jamie C. Brehaut, PhD, Clinical Epidemiology Program, Ottawa Hospital Research Institute, Centre for Practice Changing Research, The Ottawa Hospital, General Campus, 501 Smyth Road, Box 201B, Ottawa, Ontario K1H 8L6, Canada; e-mail, jbrehaut@ohri.ca.

Current author addresses and author contributions are available at www.annals.org.

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Current Author Addresses: Dr. Brehaut and Ms. Carroll: Clinical Epidemiology Program, Ottawa Hospital Research Institute, Centre for Practice Changing Research, The Ottawa Hospital, General Campus, 501 Smyth Road, Box 201B, Ottawa Ontario K1H 8L6, Canada.

Dr. Colquhoun: Department of Occupational Science and Occupational Therapy, University of Toronto, 160–500 University Avenue, Toronto, Ontario M5G 1V7, Canada.

Dr. Eva: Centre for Health Education Scholarship, Department of Medicine, University of British Columbia, 910 West 10th Avenue, Vancouver, British Columbia V5Z 1M9, Canada.

Dr. Sales: Department of Learning Health Sciences, University of Michigan Medical School, 1111 Catherine Street, Ann Arbor, MI 48109.

Dr. Michie: Department of Clinical, Educational and Health Psychology, University College London, 1-19 Torrington Place, London WC1E 7HB, United Kingdom.

Dr. Ivers: Department of Family Medicine, Women's College Hospital, 77 Grenville Street, Toronto, Ontario M5S 1B3, Canada.

Dr. Grimshaw: Clinical Epidemiology Program, Ottawa Hospital Research Institute, Centre for Practice Changing Research, The Ottawa Hospital, General Campus, 501 Smyth Road, Box 711, Ottawa, Ontario K1H 8L6, Canada.

Author Contributions: Conception and design: J.C. Brehaut, H.L. Colquhoun, K.W. Eva, K. Carroll, A. Sales, S. Michie, J.M. Grimshaw.

Analysis and interpretation of the data: J.C. Brehaut, H.L. Colquhoun, K.W. Eva, K. Carroll, A. Sales, N. Ivers, J.M. Grimshaw.

Drafting of the article: J.C. Brehaut, H. Colquhoun, A. Sales, S. Michie, J.M. Grimshaw.

Critical revision of the article for important intellectual content: J.C. Brehaut, H.L. Colquhoun, K.W. Eva, K. Carroll, A. Sales, S. Michie, N. Ivers, J.M. Grimshaw.

Final approval of the article: J.C. Brehaut, H.L. Colquhoun, K.W. Eva, K. Carroll, A. Sales, S. Michie, N. Ivers, J.M. Grimshaw.

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Collection and assembly of data: J.C. Brehaut, H.L. Colquhoun, K. Carroll.