Optimising the outputs of national clinical audits to improve the quality of health care: a multi-method study

Key words

Clinical audit; implementation; quality improvement; randomised controlled trial; factorial; user-computer interface; behavioural sciences.

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Declared competing interests of authors

Thomas Willis, Sarah Alderson, Fabiana Lorencatto, Jillian Francis, Jamie Brehaut, Heather Colquhoun, Noah Ivers, Benjamin Brown and Robbie Foy are members of the Audit and Feedback MetaLab, which is led by Jeremy Grimshaw. The MetaLab is an international collaboration to advance learning and expertise on Audit and Feedback, and promotes the development of A&F implementation laboratories internationally. Sarah Alderson reports grants from National Institute of Health Research during the conduct of the study, as well as grants from Academy of Medical Sciences, National Institute of Health Research, Royal College of General Practitioners, Health Data Research UK, and Yorkshire Cancer Research

outside the submitted work. Steph Wilson reports grants from National Institute of Health Research during the conduct of the study. Fabiana Lorencatto reports grants from National Institute of Health Research during the conduct of the study. Su Wood reports grants from National Institute of Health Research, and West Yorkshire Research and Development Research Capability Funding during the conduct of the study, as well as grants from Royal College of General Practitioners, and National Institute of Health Research outside the submitted work. Amanda Farrin was a member of the National Institute of Health Research Health Technology Assessment Programme's Clinical Evaluation & Trials Board, and Commissioning Strategy Group during the conduct of the study. Robbie Foy reports grants from National Institute of Health Research during the conduct of the study. He is a member of a sub-panel for the National Institute of Health Research Programme Grants for Applied Research.

Please contact the corresponding author for any detailed queries on competing interests.

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A final version (which has undergone a rigorous copy-edit and proofreading) will publish as part of a fuller account of the research in a forthcoming issue of the Health Services and Delivery Research journal.

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The research reported in this 'first look' scientific summary was funded by the HS&DR programme as project number 16/04/13. For more information visit https://www.journalslibrary.nihr.ac.uk/programmes/hsdr/160413/#/

The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HS&DR editors have tried to ensure the accuracy of the authors' work and would like to thank the reviewers for their constructive comments however; they do not accept liability for damages or losses arising from material published in this scientific summary.

This 'first look' scientific summary presents independent research funded by the National Institute for Health Research (NIHR). The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, NETSCC, the HS&DR Programme or the Department of Health and Social Care. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, NETSCC, the HS&DR Programme or the Department of Health and Social Care.

Scientific Summary

Background

Audit and feedback aims to improve patient care by reviewing health care performance against explicit standards. Ideally, where a discrepancy between performance and standards is detected, changes are implemented at one or more of individual, team, and service levels. It is widely used to monitor and improve National Health Service (NHS) care, including in national clinical audit (NCA) programmes. Feedback generally has small to moderate and variable effects on patient care, although potentially substantial population impacts. Yet, cumulative meta-analysis of feedback trials indicates that effect sizes stabilised over 10 years ago, suggesting a lack of learning on how to improve effectiveness. There is a need for a systematic approach to identify and evaluate ways of making feedback more effective. Moreover, how healthcare organisations respond to national audits is highly variable, further limiting the impact of feedback. There are opportunities to embed experimental work evaluating methods to enhance feedback within NCAs.

We aimed to improve patient care by optimising the content, format and delivery of feedback from NCAs.

Objectives

1. To develop and evaluate, within a web-based randomised screening experiment, the effects of modifications to feedback on intended enactment, user comprehension,

experience, preferences and engagement. This offers an efficient way of identifying leading candidate modifications for further 'real world' evaluation.

2. To evaluate how different modifications of feedback from national audit programmes are delivered, perceived and acted upon in healthcare organisations. We had originally planned to evaluate feedback modifications identified in Objective 1 and more organisationally-focused modifications less amenable to web-based experimentation in 'real world' NHS settings. However, the Covid-19 pandemic forced us to abandon fieldwork and adopt a revised objective: *to identify the strengths of the two national audit programmes, how their planned changes would strengthen their feedback cycles, and further scope for strengthening their feedback cycles*.
3. To explore the opportunities, costs and benefits of national audit programme participation in a long-term international collaborative to improve audits through a programme of trials.

Research questions

- Out of a set of recent, state-of-the-science, theory-informed suggestions for improving feedback, which are the most important, feasible and acceptable to evaluate further within NCAs? (Objective 1)
- What is the effect of modifications to feedback on intended enactment, comprehension, engagement amongst clinicians and managers targeted by national audits, and user experience under 'virtual laboratory' conditions? (Objective 1)
- What are the strengths of the two national audit programmes, how would their planned changes strengthen their feedback cycles, and is there further scope for strengthening their feedback cycles? (*revised* Objective 2)
- What are the opportunities, costs and benefits of national audit programme participation in an international collaborative to improve audits through a programme of trials? (Objective 3)

Methods

We worked in partnership with five national programmes: the National Comparative Audit of Blood Transfusions (NCABT); the Paediatric Intensive Care Audit Network (PICANet); the Myocardial Ischaemia National Audit Project (MINAP); the Trauma Audit & Research Network (TARN); and the National Diabetes Audit (NDA). These programmes offered diversity in audit methods, topics and targeted audiences, thereby allowing us to assess whether effects of feedback modifications were general or specific and increasing confidence that our outputs would be relevant to the wider range of national audit programmes. All participated in Objectives 1 and 3, whilst Objective 2 focused on TARN and the NDA.

Objective 1. We began with a set of 15 evidence- and theory-informed suggestions for effective feedback. We added a further suggestion of incorporating 'the patient voice' within feedback. We used a structured consensus process with an 11-member Reference Panel to guide the selection of suggestions to develop into a set of feedback modifications for an online experiment. We selected modifications based upon current evidence and need for further research, feasibility of adoption by NCAs, user acceptability, and feasibility of delivery within the online experiment. We engaged professionals typically involved in developing or targeted by NCAs in user-centred design to develop the modifications and a web portal for the online experiment.

We invited feedback recipients from the aforementioned five NCAs to participate in the online experiment, aiming for 500 individual participants. The online experiment used a fractional factorial design, whereby participants were randomly allocated to receive and respond to different combinations of feedback modifications. Outcomes, assessed immediately after working through the online modifications, included intended enactment to adhere to audit standards (primary outcome), comprehension, user experience, and engagement. Analysis was by intention-to-treat.

Objective 2. We had originally planned a case study approach to examine how four purposively sampled, linked pairs of healthcare provider and commissioner organisations (two for each of two national audit topics) responded to 'real world' feedback modifications. The NHS halted all non-essential research in the advent of the Covid-19 pandemic. We therefore abandoned this objective during early fieldwork and, with funder approval, modified our investigation. We drew upon our available collective 'expert' resources (international co-

investigators, Reference Panel members, Patient and Public Involvement Panel members, and Steering Group members) to deliver actionable findings for our partner audits. We interviewed them using Clinical Performance Feedback Intervention Theory (CP-FIT) to help identify the strengths of the two NCA programmes (the NDA and TARN), how their planned changes would strengthen their audit cycles, and further scope for strengthening their audit cycles. We undertook a rapid, structured content analysis of interviews.

Objective 3. We conducted qualitative semi-structured interviews, guided by behavioural theory (the Theoretical Domains Framework), with feedback researchers, audit programme staff and healthcare professionals to explore understanding, experience and expectations of integrating research within NCA programmes. We purposively recruited participants with varied experience in embedded experiments in audit programmes. We recorded and transcribed interviews prior to thematic analysis.

Results

Objective 1. We selected and developed six online feedback modifications through three rounds of user testing and iterative refinement involving a total of 17 participants:

- Recommend specific actions;
- Choose comparators that reinforce desired behaviour change;
- Provide feedback in more than one way;
- Minimize extraneous cognitive load for feedback recipients (i.e. making feedback easier to read and understand);
- Provide short, actionable messages followed by optional detail; and
- Incorporate the patient voice.

We considered and dropped one modification (i.e., Recommend actions that can improve and are under the recipient's control) which was unfeasible to operationalise.

We randomised 1241 participants (clinicians, managers and audit staff) from five NCAs. We then detected suspicious activity associated with repeated (duplicate) participant completion during a defined 'contamination period'. Our primary analysis population conservatively excluded 603 (48.6%) participants during the 'contamination period' and included 638 (51.4%) participants with 566 (45.6%) having completed the outcome questionnaire.

Participants in the primary analysis set spent a median of 66.5 seconds (interquartile range 31-136) on the page presenting the feedback report comprising of randomised modifications, and a median 159 seconds (97.5-255.5) on the questionnaire.

Most participants were from hospitals (414; 64.9%) or general practice (189; 29.6%). Over half of participants (352; 55.2%) had clinical roles whilst others had management (174; 27.3%) and audit or administrative (112; 17.6%) roles.

None of six feedback modifications had an independent effect on the primary outcome, intended enactment to meet audit standards, across clinical and non-clinical recipients of the five NCAs. We did however observe both synergistic and antagonistic effects when different feedback modifications were combined across all outcomes, including the primary outcome and secondary outcomes of intention (bring to the attention of colleagues, set goals, action plan, review performance), comprehension and user experience.

The magnitude of dependent effects of each modification on outcomes was generally small, but their combined cumulative effect, across all possible modification combinations and versions of feedback, showed more substantial heterogeneity and greater effects on outcomes. Indeed, the most effective combination of modifications for the primary outcome resulted in predicted intended enactment (on a scale of -3 to +3) of 2.40 (95% confidence interval 1.88, 2.93) vs 1.22 (0.72, 1.72) for the least effective combination in clinical participants in the NDA. Intended enactment for clinical participants was optimised when multimodal feedback, specific actions, and patient voice were provided whilst also reducing extraneous cognitive load. In contrast, including multimodal feedback whilst also reducing cognitive load led to the lowest intention when optional detail was also provided.

In addition to modification effects, we found that the national audit programme itself and whether recipients had a clinical role had major influences on recipient intentions. Participation in the NCABT was associated with lower intended enactment of audit standards relative to the NDA ($p<0.001$) as was having a non-clinical role ($p<0.001$).

Objective 2. Our analysis of two national audit programmes drew upon 18 interviews. We identified innovations likely to increase effectiveness, mainly moves towards more frequent data release and interactivity with feedback, which enabled recipients to verify and accept data. These augmented existing strengths, such as automated data collection, the use of accepted indicators, and recognised credibility of feedback sources. Suggested areas for

improvement included better targeting of feedback recipients, incorporating specific action plans to guide improvement activities, considering whether comparators other than national averages might be more motivating, and providing evidence that the audit had demonstrable impacts on patient care and outcomes.

Objective 3. We interviewed 31 participants (9 feedback researchers, 14 audit staff and 8 healthcare professionals, many having dual roles). We identified wide-ranging barriers to and enablers of embedded research within national audit programmes. We identified four conditions for optimal and sustainable collaboration between clinical audit programmes and researchers:

- Compromise between audit programmes and researchers is needed. Audit programmes need capacity to take part in research, with adequate resources and staffing to make changes to feedback within the timelines and constraints of both audits and research.
- Logistical issues regarding data sharing and quality, research funding and trial contamination need to be resolved. However, we identified no major ethical barriers to embedded experimentation, with some arguing that not embedding may be unethical.
- Audit programme leaders who understand research equipoise (sufficient uncertainty to justify research) and can motivate a research-interested team as well as engage local healthcare leaders.
- Collaborations between research teams and audit programme staff need to be underpinned by a trusting and sustained relationships through identifying shared priorities and balancing research and pragmatic considerations.

Perceived risks of embedded experiments in clinical audits include alienating end users and fears of jeopardising future recommissioning with ‘negative’ experiments. Participants generally considered benefits of participation outweighed risks.

Conclusions

Taken together, our three studies have contributed to the optimisation of feedback by demonstrating good practice and areas for improvement by NCAs, identifying promising combinations of feedback modifications for implementation and further evaluation, and

delineating the necessary conditions for successful collaborations to advance the science and impact of audit and feedback.

Implications for healthcare

Different ways of providing feedback can influence recipients' intentions to act on audit standards. None of the six feedback modifications evaluated in the online experiment improved intended enactment in isolation. However, we observed important synergistic and antagonistic effects in various combinations of feedback modifications, audit programmes and recipients. This suggests that feedback design needs to explicitly consider how different features act together.

Specific findings of synergistic and antagonistic effects can guide feedback design. For example, given that recipients spend relatively brief periods assessing feedback, it is notable that minimising extraneous cognitive load was effective when optional detail was excluded (effectively further reducing cognitive load), improving intended enactment, intention to review performance and ease of understanding. Minimising cognitive load also improved intention to bring audit findings to colleagues' attention when accompanied by multimodal feedback.

However, the dominant influences on recipient enactment were whether recipients had clinical roles, suggesting the importance of ensuring that feedback actually reaches those who can act on it, and the audit programme itself. Whilst modest changes to feedback delivery may enhance effectiveness, attending to and strengthening *all aspects* of the audit cycle is likely to make a critical difference to impact. The audit cycle is only as strong as its weakest link. We found a number of ways that two national audit programmes could achieve this by addressing specific gaps in feedback cycles, such as making feedback data easier to understand, incorporating specific action plans to guide improvement, and demonstrating programme impacts on patient care and outcomes. We suggest that a structured self-assessment tool may be of value to national audit programmes in identifying ways to optimise their effectiveness.

We found that national audit programmes and their recipients are willing to engage with experimentation embedded within their audit programmes to achieve cumulative

improvements if expectations about commitments, equipoise, and timelines are managed. Successful collaborations are likely to depend upon mutual compromises between researchers and audit programmes, logistical expertise and resources, leadership, and trusting relationships.

Recommendations for research

1. Embedded randomised trials evaluating different ways of delivering feedback within national clinical audit programmes are acceptable to both programmes and recipients.
2. Several ways of enhancing feedback show promise, individually or combined, including minimising cognitive load and incorporating the patient voice.
3. Identifying and engaging key feedback recipients, such as clinicians and managers, is likely to be a major challenge for most audit programmes and merits further investigation.
4. Whilst online experiments offer an appeal in their ability to test multiple feedback interventions efficiently and identify candidates for further real world application, further work is needed to amplify the effects of online interventions and delineate predictors of behaviour relevant throughout the whole audit cycle.
5. Practical suggestions to protect the integrity of online research include considering what is essential to meet ethical safeguards and data protection, assessing the balance between study security and ease of participation, regularly monitoring data collection, manual rather than automated delivery of incentives unless there is high confidence in study security, visualising problematic scenarios, and being prepared to act rapidly to protect study integrity.

This study was funded by the National Institute for Health Research (NIHR) [Health Services & Delivery Research programme (project reference 16/04/13)] and will be published in full in XXX Journal; Vol. XX, No. XX. The randomised trial conducted in Objective 1 was registered with the ISRCTN registry (ISRCTN41584028).