DESIGN AND EVALUATION OF A QUALITY DASHBOARD FOR NATIONAL CLINICAL AUDIT DATA: A BIOGRAPHY OF ARTEFACTS STUDY

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Competing interests: Rebecca Randell, Dawn Dowding, and Robert West are members of the Health Services and Delivery Research Funding Committee. Mamas Mamas is a member of the HTA Prioritisation Committee and the HTA IP Panel. Amanda Farrin was a member of the HTA Clinical Evaluation & Trials Board (2014-2018) and the HTA Commissioning Strategy Group (2014-2018). Chris Gale is a member of the MINAP Academic and Steering Groups. Richard Feltbower is Principal Investigator for PICANet. The authors have no other competing interests to declare.

Keywords: Dashboard, audit and feedback, quality improvement, realist evaluation

This report contains transcripts of interviews conducted in the course of the research, or similar, and contains language that may offend some readers.

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The research reported in this 'first look' scientific summary was funded by the HS&DR programme as project number HS&DR 16/04/06. For more information visit https://www.journalslibrary.nihr.ac.uk/programmes/hsdr/160406/#/

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

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Scientific summary

Background

A key function of national clinical audits is to reduce variations in care quality by stimulating quality improvement. However, variation in provider engagement means the potential for national audit data to inform quality improvement is not being realised. This study sought to develop and evaluate a quality dashboard, QualDash, to support clinical teams and managers to better understand and make use of national audit data.

Objectives

1. Develop a programme theory that explains how and in what contexts use of QualDash will lead to improvements in care quality;
2. Use the programme theory to co-design QualDash;
3. Use the programme theory to co-design an adoption strategy;
4. Understand how and in what contexts QualDash leads to improvements in care quality; and
5. Assess the feasibility of conducting a cluster randomised controlled trial.

Methods

The study design drew on realist evaluation and the Biography of Artefacts approach. In Phase 1, we conducted 54 interviews with staff across five NHS Trusts. Participants included clinicians, audit support staff, Quality and Safety Committee members, Trust Board members, and those who commission healthcare services. Interviews explored use of a range of national audits but focused on the Myocardial Ischaemia National Audit Project (MINAP) and the Paediatric Intensive Care Audit Network (PICANet). Framework analysis was used to analyse the interview data. We developed a programme theory explaining how and in what contexts

national clinical audit data stimulated quality improvement and identified initial dashboard requirements. Requirements were prioritised in a workshop with suppliers of other audits using a variation of the nominal group technique. Twenty-one participants attended, representing 19 national clinical audits.

In Phase 2, QualDash was developed in collaboration with staff from one Trust. The first co-design workshop was held with seven people, including clinicians and audit support staff who worked with MINAP and PICANet data and representatives from other Trust groups, e.g. Information Managers. In groups, participants undertook a 'story generation' activity, an approach from information visualisation design. Participants then sketched out a dashboard that would provide minimally sufficient information to answer their most pressing questions at a glance. As an additional source of data to inform dashboard design, seven meetings where audit data are discussed were observed across four Trusts. Findings from the workshop and observations were used to develop a QualDash prototype.

In a second co-design workshop, feedback on the prototype was obtained from seven participants, first using a paper-based activity and then the think-aloud technique and System Usability Scale questionnaire. The think-aloud technique was also used with five staff from another Trust, who also rated the usability using the System Usability Scale questionnaire. Additionally, dashboard usability was assessed using heuristic evaluation, undertaken by four participants with expertise in human-computer interaction, health informatics, visualisation, and clinical audit. A heuristic evaluation checklist developed and validated for evaluating healthcare dashboards and a set of heuristics from the visualisation literature that seek to assess the potential utility of a visualisation were used.

Development of QualDash confirmed what functionality would be available to staff, from which a programme theory was developed that explained how and in what contexts QualDash might stimulate quality improvement. Theory construction drew on the Phase 1 situation analysis that provided insight into current supports and constraints on use of national clinical

audit data and enabled theorisation about how the impact of QualDash would be influenced by these existing factors.

In Phase 3, we developed an adoption strategy through focus groups with 23 participants from the five Trusts, including clinicians, audit support staff, information and IT staff. Transcripts were analysed thematically. For each Trust, data were indexed and we summarised the discussion of each strategy, including how it should be delivered at each Trust and why participants felt it might work to support QualDash uptake and use. Ideas about the mechanisms through which QualDash would be adopted were added to the QualDash programme theory.

In Phase 4, we made QualDash available in the five Trusts. QualDash evaluation involved a multi-site case study and interrupted time series analysis. We collected data across the five Trusts using observations, interviews, a questionnaire based on the Technology Acceptance Model, and logfiles. We undertook 148.5 hours of observations. At the end of the evaluation, the questionnaire was distributed to 35 participants known to have used QualDash or seen it demonstrated or used in meetings. Twenty-three questionnaires were completed. Qualitative data collection and analysis was iterative, enabling ongoing testing and refinement of the QualDash programme theory. We gathered further data in light of revisions and refined QualDash in response to participants' feedback. Fieldnotes were analysed thematically. Logfiles were analysed to determine number of uses of QualDash per audit per month, broken down by role. We produced summary statistics for each Technology Acceptance Model item. An interrupted time series analysis of the effect of QualDash on data quality was undertaken with data from four Trusts.

In Phase 5, feasibility of conducting a cluster randomised controlled trial of QualDash was assessed, using pre-defined progression criteria. We also considered, in the context of COVID-19, how QualDash would need to be adapted to support different scenarios, specifically daily monitoring of national clinical audit data and, using a different dataset, population health

monitoring. Seven interviews were conducted and transcripts were analysed using framework analysis.

Findings

Phase 1 interviews revealed that use of national clinical audit data is largely by clinical teams, while staff at the organisational level (Board and sub-committees that report to the Board, such as Quality and Safety Committees) perceived an imbalance between the benefits of national clinical audit participation and the resources consumed by participation, leading them to question their legitimacy. There was significant variation between Trusts in the extent to which clinical teams engaged with national clinical audit data, with data more likely to be used in Trusts where there are greater resources, particularly technology for accessing data and audit support staff with the skills and time to produce data visualisations. Also important were data timeliness and quality and features of the audits themselves, such as whether they were mandatory and perceived importance of metrics; nursing staff perceived PICANet to be of little relevance to them because it did not capture what they considered to be important markers of care quality. The majority of tasks undertaken using national clinical audit data involved only two variables, suggesting QualDash should use simple visualisation techniques users were already familiar with, such as bar graphs and pie charts. Other key requirements included: presentation of all important metrics when first accessing the dashboard, and ability to 'drill down', e.g. selecting to view the data by certain groups; ability to customise visualisations, e.g. selecting the time period over which data are displayed; and support for creating reports and presentations.

In Phase 2, the first co-design workshop revealed several key findings:

- For each metric, there are 'entry point tasks', the primary tasks a user will want to undertake in relation to the metric, that involve monitoring a small number of measures over time;
- Investigation of further detail of a metric involves one or more of three sub-tasks: (1) Breaking down measure(s) for patient sub-categories; (2) Linking with other metric-related measures; (3) Expanding in time to include different temporal granularities; and

- Metrics have independent task sequences, i.e. what a user will want to explore after the entry point tasks will vary according to the metric.

The QualDash prototype was designed with the intention of addressing key constraints on use of national clinical audit data captured in our national clinical audit programme theory, whilst also incorporating requirements from the Phase 1 interviews and the learning about task sequences gathered from the first co-design workshop. To provide more equal opportunity for sites currently not resourced to produce visualisations, QualDash provides immediate visualisations of key metrics. A visualisation called a QualCard is generated for each key metric, providing a quick view of all such metrics on accessing QualDash. The QualCards can be expanded, providing three customisable visualisations to support tasks associated with the key metric. QualDash sought to improve access to timely data, providing users with a means to visualise data they collect for the national clinical audits, without having to wait for data to be returned to them from audit suppliers. To this end, QualDash was located on site servers, giving users control over how often data were uploaded. Usability scores from the two think-aloud participant groups were 74 in the first session and 89.5 in the second, indicating very good usability.

In Phase 3, attitudes about what was needed for adoption of QualDash were consistent with suggestions from Phase 1 and similar across sites: the need for a 'champion', raising awareness through eBulletins and demonstrations at meetings, and quick reference tools. Through discussion, details of the strategies evolved and we gathered further ideas from participants regarding why these strategies would work. In particular, it was suggested that, while multiple people may work together as champions, a clinical champion was needed, who would have the authority to encourage dashboard use.

In Phase 4, locating QualDash on local servers led to challenges in dashboard installation. QualDash was installed in four Trusts by the end of July 2019 and in the fifth in December 2019. There were variable levels of use across sites. In some cases, old computers and difficulties in getting Google Chrome or RStudio installed constrained uptake and use. Issues

arose as staff explored their site data using QualDash. This revealed that not all measures were configured as users expected, which constrained QualDash use where data reporting routines were already established. This also highlighted the need for additional labelling to make users aware of which measures they were interacting with and how they had been configured. That QualDash could easily be customised was important in addressing some of these concerns. QualDash provided greatest benefit for teams constrained in their ability to use national clinical audit data; in such contexts, QualDash increased data engagement by facilitating access and interaction and reduced time spent in preparation of reports. QualDash was used to support improvements in data quality, although the interrupted times series analysis did not provide evidence of improved data quality. The questionnaire revealed positive attitudes to QualDash in terms of ease of use and usefulness, although these results should be treated with caution due to the small and possibly biased sample. Observations in this phase also revealed the labour-intensive work involved in data collection for national clinical audits, with use of paper data collection forms and time-consuming cross-checking.

In Phase 5, a trial of QualDash was assessed as feasible and designed, with a stepped wedge factorial design. Interviews with individuals associated with Gold Command revealed they were used to working with data and saw it as essential to decision making, working with a wide range of data sources and tools to support their use of data. Data timeliness was reported as especially important for population health monitoring. There was a desire to bring together different data sources, with participants wanting a dashboard that would help them identify priorities to focus on.

Conclusions

Implications for national clinical audits:

Our study suggests the following strategies may be beneficial for national clinical audits in increasing engagement beyond doctors:

- Involving a range of professional groups in the choice of metrics, to ensure the metrics have relevance to all members of the multidisciplinary team, with careful consideration of the volume of data to be collected.
- Moving from an emphasis on cumulative, retrospective reports to real-time reporting, clearly presenting the "headline" metrics important to organisational level staff.
- Wider use of routinely collected clinical data to populate national clinical audit data fields.
- Further use of technologies such as dashboards that help staff explore and report national clinical audit data in meaningful ways.

Implications for quality dashboard design:

Our study suggests those designing quality dashboards to support engagement with national clinical audit data may find it beneficial to include the following:

- 'At a glance' visualisation of key metrics considered markers of safe and effective care on first logging into the dashboard.
- Simple visualisations such as bar graphs and pie charts, configured in line with existing visualisations used by teams, with clear labelling of metrics.
- Functionality that supports current queries and tasks, including creation of reports and presentations.
- Ability to explore relationships between variables and drill down to look at specific sub-groups of patients.
- Low requirements in terms of computing resources, including the ability to work on any web browser.

Implications for practice:

For healthcare organisations seeking to introduce a quality dashboard, our study suggests the following strategies may be beneficial:

- Clinical champion: If a clinical champion promotes use of the dashboard, highlighting its benefits, staff who trust the champion's opinion may be more willing to use it.

- Avoiding the 'dodgy brush': Dashboards should be tested with real data prior to roll out, by staff who already use those data and are expert in their interpretation, enabling revision prior to rollout so metric configurations fit with user expectations. This will give champions confidence that metrics are calculated appropriately, so they are willing to promote dashboard use.
- Routines for using audit data: If data presented by the dashboard are not already used routinely, routines for integrating dashboard use into the work practices of clinical teams should be established.
- Involvement of audit support staff: If clinical teams are already using the data the dashboard displays, supported by audit support staff, adoption activities should focus on engaging and training audit support staff, promoting not just features of the dashboard but showing how it allows audit support staff to undertake their work more easily or quickly.
- Customisation as design: The process of customising the dashboard to meet local user expectations should be seen as part of the adoption strategy.

Recommendations for research:

Future research should include:

1. Investigation of the extent to which national clinical audit dashboards are used and strategies national clinical audits are using to encourage uptake;
2. Realist review of the impact of computer-based dashboards on quality and safety of care;
3. Rigorous evaluation of the impact of computer-based quality dashboards on the processes and outcomes of care; and
4. Rigorous evaluation of the effectiveness of different strategies for encouraging use of dashboards.

Study registration: ISRCTN18289782

Funding details: The National Institute for Health Research Health Services and Delivery Research programme.