HS&DR PROJECT 13/07/68

INFORMATION SYSTEMS: MONITORING AND MANAGING FROM WARD TO BOARD

STUDY PROTOCOL

AIMS AND OBJECTIVES

This research project has two aims. The first and principal aim is to establish whether ward teams in acute NHS Trusts have the information systems they need to manage their own work, and report on that work to Trust boards and other stakeholders, in the post-Francis environment. The research will focus on the design and implementation of a key technology, ward level dashboards. Dashboards are already the preferred NHS vehicle for integrating information from diverse sources, and are being actively promoted by NHS England and the Health and Social Care Information Centre – but will need to be re-designed in the light of the Francis, Keogh and Berwick reports, published in 2013.

The second aim is to establish the extent to which ward level dashboards provide a basis for achieving the openness, transparency and candour envisaged by Francis, and supported by Keogh and Berwick. As the reports emphasise, while there are examples of excellent practice, the NHS as a whole needs to undergo a culture change, moving from low to high trust working practices. The extent of sharing of detailed information about performance will be an important source of evidence about that culture change.

There are four research objectives. We will:
1: Design. Assess the extent to which Trusts are able to integrate activity, quality, outcome and cost information in dashboards, to enable ward teams to manage their services effectively and to improve services over time;
2: Implementation and Use. Evaluate the impact of the use of dashboards on clinical and management practices at ward level;
3: Governance. Assess the extent to which dashboards provide data that are valuable to other local stakeholders, including Trust Boards, HealthWatch and commissioners;
4: Barriers and Facilitators. Identify the barriers and facilitators to the effective re-design and use of dashboards.

In order to achieve these objectives we will address and answer a number of research questions, generated by using Normalisation Process Theory, which is discussed in the next section.

RESEARCH PLAN/METHODS

There are two implicit assumptions underpinning the comments made by Francis, Keogh and Berwick about information systems, namely that, (i) it will be possible to design and implement tools – dashboards - with substantial and diverse information that are used by clinical teams

and, (ii) the tools will provide a basis for reporting openly and candidly to Trust boards, patients and other stakeholders. Between them, the diversity of dashboards currently in use, and the limited evidence of effectiveness, have substantially shaped our study design and methods. We need strong theoretical foundations to guide us in the early stages, and an exploratory phase of work, where we can address key questions about current designs and uses of dashboards, and the nature of the challenges ahead in responding positively to the major reports, as viewed by clinicians and managers. We start with the theoretical framework, and then set out our methods.

Normalisation Process Theory
A number of established theoretical frameworks have been used to guide the design of studies of the implementation of technologies in organisations, including health care oganisations, and might in principle be used in this study. These include sociological theories, such as Actor-Network Theory and Science and Technology Studies (STS), and approaches developed in software engineering, including Computer Supported Co-operative Work (CSCW). Given the context of this call, the framework needs to focus on the implementation of new ways of working, and on the reasons why implementation efforts lead to the embedding of those new ways of working in routine practice, or to failure to embed. Normalisation Process Theory provides the appropriate focus and has a track record of successful use in case studies in the NHS (Finch et al 2012, Murray et al 2011). It will be used in this study as a framework for guiding the early stages of the study. When we analyse our findings, we will take account of a wider range of theories, including those noted above, and also theories of knowledge creation and mobilisation.

Normalisation Process Theory rests on three main arguments. First, it proposes that practices become embedded in social contexts as the result of people working, individually and collectively, to implement them. Second, implementation is operationalized through four generative mechanisms – coherence, cognitive participation, collective action and reflexive monitoring (Finch et al 2012, Murray et al 2010). If those involved in the implementation of dashboards can identify coherent arguments for adopting them, are engaged in the process of implementation, are able to adapt their work processes to use dashboards (or dashboards to fit in with practices), and judge them to be valuable once they are in use, then they are more likely to become embedded in routine practice. Third, embedding new ways of working is not a 'one off' process, but requires continuous investment by the parties involved in implementation. Figure 1 shows how the components of the Theory are related to one another.

<u>Figure 1</u>
Model of the components of normalisation process theory (from May and Finch 2009, page 541)
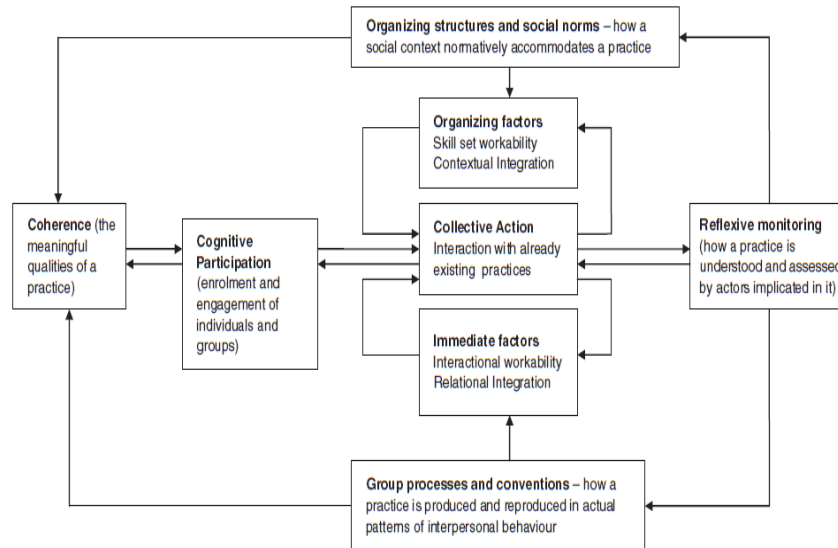
May and colleagues argue that each of the four generative mechanisms suggests possible research questions:

1. Coherence – What is the work? How is a new way of working conceptualized by participants?
2. Cognitive participation – Who does the work? How do they decide whether to engage, and what do they hope to achieve?
3. Collective Action – How does the work get done? How are activities structured, and how are they constrained?
4. Reflexive Monitoring – How are new ways of working – or attempts to introduce them - interpreted by those involved? How do they evaluate new working practices?

Given the aims and objectives of the study, and the relative paucity of evidence about dashboards in clinical settings, we will explore each of the four generative mechanisms, in order to establish the processes involved in their re-design and implementation. The lower half of Figure 1 emphasises the importance of understanding these processes in local contexts, and we will accordingly focus our research efforts on the re-design of dashboards and their use on wards in acute Trusts.

The upper half of Figure 1 draws attention to institutional arrangements, i.e. the ways in which

prevailing values and norms influence the behaviour of ward teams. It is these norms that, all three reports emphasise, need to change across the NHS. Developments in the design and use of dashboards, over the next three years, will occur against a backdrop of policies that encourage this change, away from performance management and towards high trust, clinically driven and patient-focused services. We will assess the influence of prevailing values and norms on the design and use of dashboards – and conversely the influence of dashboard use on values and norms – in two ways. First, we will assess the extent to which ward level dashboards provide an effective basis for reporting 'upwards' to Trust boards and external stakeholders. A key point here is that dashboards are not discrete technologies, which work in the same way whatever organisational context they are used in. They are, rather, likely to be designed and used in different ways depending on the prevailing institutional arrangements. We will therefore investigate the extent to which dashboards are used for new purposes, i.e. used in ways that are consistent with supporting experimentalist governance, rather than top-down performance management.

Second, while the major reports focus on the need to change values and norms across the NHS, the implementation of new dashboards will also depend on other infrastructure developments. These include investment in the expertise needed to design and use dashboards – which Keogh and Berwick make clear is currently in short supply – and in information technologies. We will assess the extent to which expertise in manipulating and interpreting data, in developments in information technology platforms, and other associated developments (e.g.in data protection practices following the Caldicott report), facilitate or inhibit the design and use of dashboards.

Study Design
There will be four main phases in the study – scoping and selection, field research at four sites, analysis and interpretation, and dissemination (see Figure 2). We will use a prospective, iterative case study design, focusing on two specialities – one surgical and one medical – in each of four sites. There are many different types of case study, ranging from Yin's scientific approach to more naturalistic approaches (George and Bennett 2006). Our approach is at the naturalistic end of spectrum, on the basis that the only way to understand implementation is to spend time observing the people doing the implementing (Campbell 1978).

Figure 2
Sequence of Research Activities

Iteration
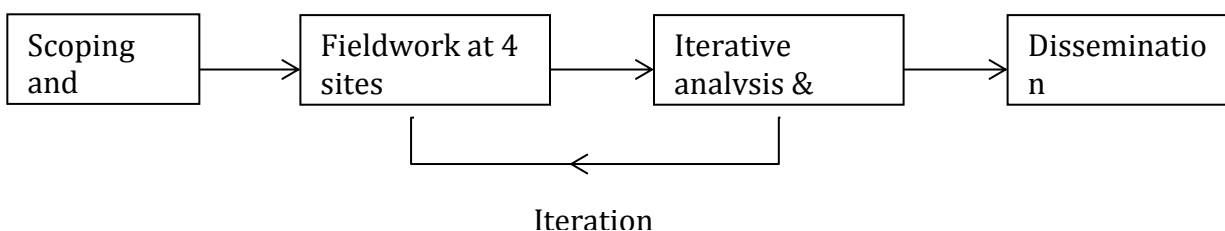
The commissioning brief implies the need to ask two types of question in parallel. The first question is specific to the participating Trusts, and reflected in the methods set out below. The second type of question is more general – what do their experiences tell us about the prospects for the implementation of new systems and for system integration? It could be argued that this twin strategy, identifying both an empirical and a more general theoretical question, is a defining characteristic of well designed case studies (Keen 2010).

The main unit of analysis for the study, corresponding to the main objective, is the acute hospital ward using one or more dashboards to manage services, observed over time. We can exclude two classes of dashboard at this point. We will not study dashboards that are used in the diagnosis and treatment of individual patients, of the kind reported in some US studies, on the basis that they are not relevant to the commissioning brief. Similarly, we will not study the NHS Safety Thermometer or Friends and Family data, because the commissioning brief excludes studies of regulatory bodies, key users of these data.

We are, conversely, particularly interested in examples of dashboards that are used at handovers and at routine review meetings (e.g.multi-disciplinary team meetings, weekly Gemba rounds). We envisage that these dashboards will be the 'building blocks' upon which upwards reporting to Boards and other stakeholders will be based. We will, though, keep the focus of fieldwork open early on, in case dashboards are not used in these contexts, allowing us to explore other ways in which dashboards are integrated into local practices. In order to address the second objective, a secondary unit of analysis is the governance of wards by Trust boards, and by other stakeholders. The substantial literature on change programmes suggests that implementation is unlikely to proceed in a predictable, linear fashion. Field research should therefore focus on the unfolding stories at study sites.

PHASE 1: Scoping and Selection
Telephone Survey
We will undertake a telephone survey of the use of dashboards in NHS acute Trusts. All NHS acute Trusts that could in principle participate in the main field study will be surveyed by telephone. The sample will include Trusts that are in the Northern region (i.e.the former North East, North West and Yorkshire and Humber regions), and can be reached in 75 minutes travelling time from Leeds (i.e.it will be possible to get to the site and back in a day during the field study phase). We estimate that there will be 20 acute Trusts.

In the first instance Trust board members responsible for quality and safety will be contacted by letter, followed up if necessary by telephone contact, and asked whether they are prepared to be interviewed - or to nominate a colleague with relevant knowledge of dashboards in their Trusts - and share copies of dashboards and supporting documentation with us. Those who agree to be interviewed will be asked about current usage of dashboards in medical and surgical specialties, the metrics used, the length of time in use, the extent to which dashboards are embedded in enterprise-wide IT systems or shared by email/on paper, local evidence of benefits of using them, problems encountered, and plans for re-designing them in the light of

the major reports. Interviewees will be asked whether they would be prepared to consider being a case study site.

The telephone interviews will be semi-structured, recorded and transcribed. The key information will be descriptive: transcripts will be reviewed to identify basic information about the design and use of dashboards at each Trust, to provide a basis for site selection. We will also compare and contrast passages in transcripts covering more interpretive topics, e.g.local definitions of dashboards, and barriers and facilitators to the effective use of dashboards, in order to identify potential topics for further investigation in the field study. This will allow us to identify a working definition of a dashboard, for use in later phases of the study.

We aim to maximise response rates. In the initial letter, the national policy significance and practice relevance of the research fieldwork will be emphasised. Telephone interviews with the named contact point should result in a high contact rate. Targeting named individuals also enables greater ease of follow-up in case of a non-reply or slow response.

Site Selection and Tracer Conditions
Site selection will be both pragmatic and purposive, and informed by the telephone survey. It will be pragmatic because we can only select from sites that are willing to participate. As Phase 2 will involve a substantial number of site visits, they must also be within a reasonable travelling distance. We will sample purposively to ensure inclusion of:

- Sites that have formally agreed plans for re-designing dashboards to monitor performance in the light of the major reports, and have also agreed plans for implementing dashboards for monitoring the quality of services;
- A mix of acute Foundation and non-Foundation Trusts, and teaching and non-teaching Trusts;
- At least one site being a participant in the North West Transparency Project, noted above.

We will visit candidate sites, to talk to relevant staff about their participation in the detailed fieldwork of Phase 2, and to obtain further information about their uses of, and plans for, dashboards. We will use this process to make further detailed decisions about Phase 2, notably about the specialties that should be studied, and about the numbers of meetings to be observed and semi-structured interviews conducted. Given our focus on dashboards, our assumption at this point is that surgical specialties will find it easier to identify and collect activity, outcome and cost data than medical specialties. They are likely to be reviewing clinical outcome data, given that they are now publishing it routinely, in the wake of the initiative led by Sir Bruce Keogh. Medical specialties are less likely to be able to identify clear-cut outcomes, and find it more difficult to cost their activity, and hence monitor budgets effectively (Allen et al 2012).

Outputs of Phase 1

1) The results of the telephone survey – descriptive evidence about the current uses of dashboards in a sample of Trusts, and views about barriers and facilitators to effective use of dashboards;

2) Working definitions of clinical and quality dashboards, used at ward level and for 'ward to board' monitoring and evaluation;

3) Four sites that agree to take part in Phase 2 of the study, and associated decisions about tracer specialties and the numbers of meetings to be observed and interviews conducted.

PHASE 2: Data Collection at Field Study Sites

Work will be undertaken at four NHS Trusts, using a case study approach. Data collection, and the design of data collection strategies, will be informed by Normalisation Process Theory. Table 1 matches the study objectives to components of the Theory and to our methods. As Figure 2 indicates, we will use an iterative approach to data collection, informed by the insights into the key issues emerging in the fieldwork settings, in order to maximise exploration of emerging issues and of divergent views.

Objective 1: Design

There is limited empirical evidence about both the design of dashboards, and we will therefore focus on fundamental questions about their design, as well as on the ways in which they are used. Dashboards will not be 'black boxes' in this study: we will focus on the measures that are included or excluded in them, and the reasons for inclusion and exclusion. We assume, here, that the re-design of dashboards will involve the creation of one or more project teams at each site, which may focus on the content, design and integration of dashboards into local IT systems.

Table 1
Relationship between objectives, research questions and methods

Objective	Questions	Methods
Design	Generative mechanisms – What is the work? How is it conceptualized? Who does it? How do participants decide whether to engage? How does the work get done? How are activities structured/constrained? How are new ways of working interpreted and evaluated by participants?	Observation of meetings Semi-structured interviews with staff involved in design processes Analysis of documents
Implementation and Use	Generative mechanisms – As box above	Observation of use of dashboards, e.g. during handover, weekly review Observation of handling of adverse events Semi-structured interviews with ward staff Analysis of documents Quantitative analysis of routine data
Governance	Generative mechanisms – As box above	Semi-structured interviews with Trust staff Analysis of documents
Barriers and Facilitators	As above	Iterative, inductive analysis of materials collected using methods above

Observation of Meetings: Project meetings will be observed. The number of meetings to be observed will be finalised in Phase 1, but for costing purposes we make the assumption that key meetings of each project team at a site will be held monthly, and we will observe up to 15 project meetings at each site. We will observe the ways in which the design and content of dashboards is negotiated and communicated, in the same way that the negotiation of the design and content of care pathways was observed by Allen (2009). We anticipate that meetings will be attended by specialist designers of dashboards, members of ward teams, and possibly also by representatives of IT suppliers. Experience suggests that it is difficult to record meetings successfully: transcribers find it difficult to understand passages when people are a long way from a microphone, or when they talk over one another. Contemporaneous notes will therefore be taken by a member of the research team, focusing both on the substance of

negotiations and on the ways in which different participants shape the discussions, and hence the design of dashboards.

We will also observe one-off planning meetings, product demonstrations and training sessions if appropriate. Care will be taken to not disrupt meetings by arriving late or leaving early, or interceding in the business of the events.

Semi-Structured Interviews: Face-to-face interviews will be conducted with purposively selected individuals, partly to complement data obtained from meetings, but also to elicit the private views of individual participants, which might not be articulated in meetings. Interviewees will be selected to give us an overview of both strategic thinking and the more detailed planning and negotiation involved in each project. Thus most of our interviews are likely to be with staff in one of four broad categories - project managers, key clinicians, members of Trust informatics teams, project sponsor (e.g.Trust board member). We will also interview representatives of IT and other external suppliers if appropriate.

The interviews will be semi-structured, based on topic guides developed by the research team, and developed iteratively, continuing throughout the research process, building on what is learned in Phase 1 and then in the early stages of observation. Audio recordings will be made with the permission of participants and will be transcribed verbatim to ensure accuracy.

Sample Size: The number of interviews to be undertaken will be finalised following Phase 1. We estimate that up to 5 interviews will be undertaken in each surgical and medical ward within each of the 4 sites, i.e.a total 10 per site, and a total sample size of around 40 participants in the course of the study. This sample size, focusing on carefully purposively selection of individuals, and with the opportunity to compare findings with those from other methods – particularly the ethnographic observation - will be be sufficient to provide insight into perceptions of developments in each setting (Richie et al 2003).

Site documents: Local staff will be asked to provide relevant documentation. This is likely to include Trust or divisional strategy documents, programme initiation documents, minutes of project team meetings, and drafts of dashboard designs.

Objective 2: Implementation and Use

We will focus on practices, and in particular on the relationships between dashboards and the work of ward teams, and their evolution over time. Put another way, will focus on the use of dashboards 'as performed' rather than 'as imagined', and accordingly we will use methods that allow us to observe practices directly where feasible. We will use semi-structured interviews and analysis of site documentation to capture information about practices that we cannot observe directly, e.g.key decisions made in meetings that we are not able to attend. The combination of methods draws, in part, on the work of Crosson and colleagues (2005) who used an ethnographic approach, spanning the use of direct observation and key informant interviews to evaluate the process of implementing an electronic medical record in a primary care setting; Ventres and colleagues (2006) who observed the effects of an electronic health record on physician patient encounters; and, observation used to study working practices in primary care settings (Crabtree, Miller and Strange 2001).

We will focus on two wards in each of the four sites, one surgical and one medical: decisions about appropriate specialties will be made at the end of Phase 1. A key feature of the methods

is that they will allow us to follow the unfolding of events over time, i.e.experiences of the implementation, and subsequent use of – or failure to use – dashboards.

Observation of implementation and use of dashboards: There will be an initial phase of general ethnographic observation, which will allow us to understand working practices on wards, and to observe the current uses of dashboards in the context of the use of other sources of information. An initial phase of familiarisation at each site will also help the researchers to get to know staff and build up rapport with them. Researchers will record their observations in field notes which will be written up in detail as soon after data collection as possible.

The field notes from each ward will be collated, and used to refine our method, e.g. enable us to make detailed decisions about processes that are feasible and valuable to observe, and where to observe them. Once these decisions have been made, the observation strategy will be discussed and agreed with local staff. We will focus, particularly, on periods when new, or re-designed, dashboards are introduced, so that that we can capture initial reactions to them. The subsequent use – or failure – of those dashboards will then be observed over time. Attention will be paid not just to when and how the dashboards are used but also to activities that arise in response to data provided by the dashboard. This will include the use of 'soft intelligence', where staff combine information from dashboards with other, typically informally sourced information, e.g.on the extent to which particular members of staff get on with one another. Following in the ethnographic tradition, the researchers will, at least in the early stages of the study, keep the scope of the notes wide on the basis that what previously seemed insignificant may come to take on new meaning in light of subsequent events (Hammersley and Atkinson 2007). We will also give special attention to the indigenous meanings and concerns of the people studied (Emmerson, Fretz and Shaw 1995). The subsequent use – or failure – of those dashboards will then be observed over time. In addition, the researchers will record incidents of observer effects (e.g. participants asking 'What are you writing?') to allow analysis of whether participants' awareness of the researchers' presence changed over time. Field notes will be written up as soon after data collection as possible.

Semi-structured interviews: The method will be the same as for Objective 1. The number of interviews to be undertaken will be finalised at the end of Phase 1, but for costing purposes we estimate that there will be 10 interviews per site over the course of the study, or 40 interviews in total. Interviewees will include nurses, doctors and allied health professionals, and focus on their experiences of implementation and use of dashboards, and barriers and facilitators to effective use.

Documents: Local staff will be asked to provide relevant documentation. This is likely to include examples of dashboards – the design of which we anticipate will change over time – and minutes/notes of meetings where the implementation of dashboards is discussed, or where dashboard information is used, or is not acted upon.

Quantitative data: It is not clear, in advance of Phase 1, how much quantitative data will be available about the use of dashboards. In principle, though, it should be possible to collect three types of data from the sites. First, where dashboards are integrated into Trust IT systems, there may be data on access – who has accessed a dashboard and when*.* Second, it should be possible to collect the data presented on dashboards, whether these are embedded in IT systems or shared by some other means, e.g.email. We will pay particular attention to patient

experience and outcome data – to the types of data that are included in dashboards, and whether they are perceived to be useful. Third, we will collect routine data that sheds light on relevant trends in our study wards, e.g.activity, adverse events, complaints, patient experience and outcomes.

Objective 3: Governance
Observation of meetings, semi-structured interviews and site documents: The methods for this Objective, concerning developments in the governance arrangements in the four Trusts and their local health economies, and the evolving role of dashboards within those arrangements, will be same as for Objective 1.

Sample size: The number of meetings to be observed and interviews to be undertaken will be finalised following Phase 1. We are unlikely to be able to attend the private parts of Trust board meetings, or key parts of commissioners' meetings, but may be able to attend other relevant meetings in the course of the study, e.g. *ad hoc* meetings to discuss issues identified via dashboards. We estimate that we will attend up to 6 meetings per site, i.e.a maximum of 24 meetings.

With regard to interviews, we will undertake up to 8 interviews in each of the 4 sites, i.e.a total of 32 interviews in the course of the study. Interviewees may include Trust chief executives, directors of quality and directors of informatics, and representatives of local commissioners and HealthWatch.

Quantitative data: We will identify relevant local datasets for assessment of the use of dashboards, and moves towards experimentalist governance in Phase 1, paying particular attention to uses of patient experience and outcome data. We will ask Trusts to provide *ad hoc* data that become available during the study, e.g.local staff surveys. We will also explore the potential of using national datasets. Initial indications are that some patient experience/outcome datasets, including Friends and Family data, cannot be used in analyses of individual wards or departments in Trusts. Conversely, it possible that the NHS Staff Survey results will provide valuable contextual information, e.g.in relation to general trends in openness and candour reported by NHS staff.

PHASE 3: Analysis and Interpretation
It has already been noted that we will undertake iterative analysis of data: the analysis phase is presented separately for clarity of presentation, but will in practice be inter-twined with data collection.

Objective 1: Design
Ethnographic field notes, interview transcripts, site documents: Field notes, interview transcripts and documents provided by the sites, for Objective 1, will be entered into a qualitative software programme, NVivo 9, for analysis, during the course of the fieldwork. The data will be analysed thematically, following accepted good practice guidelines for ensuring quality in qualitative research (Pope, Ziebland and Mays 2006). Two members of the research team will read an initial selection of texts, and develop a coding frame. We anticipate that this will be in month 12 of the study, when there will be sufficient material to analyse. The coders will produce detailed thematic summaries using a flexible template that covers the research

questions, and barriers and facilitators to effective use of dashboards, while allowing for the emergence of further themes. The initial summary will be shared and discussed among the research team, where discussion will focus particularly on evidence about the implementation and use of dashboards at ward level, and more generally on the development of trust, and hence openness and candour, across the study sites. Implications for future fieldwork, e.g. the emergence of issues or problems that were not anticipated at the start of the fieldwork, will be discussed, and our field methods modified accordingly. It is anticipated that there will be three rounds of identification of emerging themes, and subsequent modification of field methods.

The output of the coding/refining process will be a final, stable set of themes, at the end of the fieldwork. The emerging themes will be mapped their themes onto the four generative mechanisms (coherence, cognitive participation, collective action, reflexive monitoring). Heeding their advice, it is important to avoid shoe-horning themes into constructs, but there is value in investigating the data by asking questions prompted by each mechanism, e.g.asking 'who's who and what's what?' is prompted by the coherence mechanism.

Once all the data has been coded, matrix displays will be created, to build up a picture of the data as a whole (Miles, Huberman and Saldana 2013). This involves abstraction and synthesis of the data, in a way that retains referencing to the original text. The matrices will be used to support both within-case comparisons (similarities and differences) and between-case comparisons, returning to the original data where necessary. Similarities and differences between sites will be identified and used to further refine the emerging themes. Because of the range of participants involved in the interviews, we anticipate that we might encounter conflicting accounts and interpretations. Elements of similarity and difference will be drawn out, as well as exploring the views against the range of observational and documentary data collected.

Overall interpretation: To interpret the entirety of our data in this Phase, we will combine two analytical strategies, which (after Hammond 1996) we can call correspondence and coherence strategies. A correspondence test is one where the truth or falsity of a claim is judged against the available evidence. For example, the claim that a new dashboard is being used by all staff on a ward can be tested empirically. The thematic analysis described above provides this link between primary data and any interpretation we place on it. In a coherence test, in contrast, the internal logic of a claim is tested. Put another way, it is a search for the best single explanation for the available evidence. Coherence accounts are important because they are the starting point for theory development, and for explaining (rather than describing) events. George and Bennett (2006) argue that:

> "An important advantage of typological theorising is that it can move beyond earlier debates between structural and agent-centred theories by including within a single typological framework hypotheses on mechanisms leading from agents to structures and those leading from structures to agents. This allows the theorist to address questions of how different kinds of agents … behave in and change various kinds of structures."

We will also analyse our data inductively, then, in order to identify a coherent account of events, both in single wards and across all of the settings, that makes sense of our evidence.

Normalisation Process Theory will be used to support this interpretive process. The coherence of the resulting account is important, in the context of this study, because it will provide us with the best available explanation – overall – of our data. Case studies employ a 'twin track' analytical method, which seeks to explain both the events at the study sites and themes which are general across them, and hence potentially generalizable to other sites. It will therefore allow us to identify actions that clinicians and managers in other Trusts can take to improve the design, implementation and use of dashboards (see below).

Outputs:
- The analysis will be used to produce a coherent narrative account of events, over time, which best 'fits' the available facts about the processes of designing dashboards, and identifies themes that can be generalised to other sites. We will comment on the designs of dashboards that are successful, in the sense that they are technically feasible, contain most or all of the components recommended by Berwick, and are successfully embedded in routine practice.
- The analysis will achieve Objective 1 of the study, i.e. answer questions about who is involved in the design of dashboards, and how they go about their work.
- The analysis will shed light on Objective 3, concerning the governance arrangements within Trusts, e.g.by allowing us to assess the extent to which project teams are supported by Boards in designing dashboards as part of a general move to the high trust environments envisaged in the three major reports.
- The analysis will also contribute to achieving Objective 4, by identifying barriers and facilitators in the design process.

Objective 2: Implementation and Use
Ethnographic field notes, interview transcripts, site documents: The ethnographic observational data, transcripts of the semi-structured interviews and site documentation will be analysed in the same way as the material for Objective 1, i.e. iterative analysis, coding of transcripts, identification of emerging themes, and mapping onto the Normalisation Process Theory model. The analysis will be used to produce a coherent narrative account of events, over time and across wards and sites, which best 'fits' the available facts.
Quantitative data analysis: It is not possible to say, with any confidence, what quantitative analyses will be undertaken. We propose to develop a protocol for quantitative analysis when we are clear what datasets are available from the four sites, and agree the protocol with HS&DR before proceeding. We can, though, say that quantitative data will play an important role in testing claims about changes in processes or outcomes.

Outputs:
- A coherent narrative of developments in the eight wards, comparing and contrasting their experiences over time, particularly in relation to the embedding of new practices following the introduction of ('Berwick and Keogh compliant') dashboards, and identifies common themes that can be generalised to other sites. We will identify effective use of dashboards, i.e.where dashboards are embedded in routine practice, and actively used.

- The analysis will achieve Objective 2 of the study, i.e. answer questions about who implements and uses dashboards.
- The analysis will shed light on Objective 3, concerning the governance arrangements within Trusts, e.g.by allowing us to assess the extent to which frontline teams are working within supportive – experimentalist governance – environments, or are subject to top-down performance management.
- The analysis will also contribute to achieving Objective 4, by identifying barriers and facilitators in implementation and use.

Objective 3: Governance

Ethnographic field notes, interview transcripts, site documents: The ethnographic observational data, transcripts of the semi-structured interviews and site documentation will be analysed in the same way as the material for Objective 1, i.e. iterative analysis, coding of transcripts, identification of emerging themes, and mapping onto the Normalisation Process Theory model. Quantitative data relating to the Trusts or their wider health economies will be presented alongside the narrative. It will not be possible to combine the narrative and routine quantitative data empirically – it is not technically feasible - but it is anticipated that the routine data will help to confirm or challenge our ethnographic observations, and the accounts of local staff, about changes that occur during the course of the study.

Outputs:
- A coherent narrative of developments in governance in the four Trusts, wherein common themes can be identified, and used as the basis for generalisation to other sites.
- The analysis will achieve Objective 3 of the study, i.e. answer questions about the extent to which dashboards are used as the basis for reporting to boards and other stakeholders, and the extent to which this is undertaken openly and candidly.
- The analysis will shed light on Objective 2, concerning the governance arrangements within Trusts, e.g.by allowing us to assess the nature of the environments within which wards are working (broadly, performance managed or clinically driven and patient-focused).
- The analysis will also contribute to achieving Objective 4, by identifying barriers and facilitators in implementation and use.

Objective 4: Barriers and Facilitators
As the text above indicates, evidence about barriers and facilitators will be produced in the course of the work undertaken to achieve the first three objectives. We expect that each of the three narratives that will be produced, concerning design processes, implementation and use, and wider governance arrangements, will provide insights into barriers and facilitators.

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