

CRESSWELL, K., MORRISON, Z., CROWE, S., ROBERTSON, A. and SHEIKH, A. 2011. Anything but engaged: user involvement in the context of a national electronic health record implementation. *Informatics in primary care* [online], 19(4), pages 191-206. Available from: <https://doi.org/10.14236/jhi.v19i4.814>.

# Anything but engaged: user involvement in the context of a national electronic health record implementation.

CRESSWELL, K., MORRISON, Z., CROWE, S., ROBERTSON, A. and SHEIKH, A.

2011



## Refereed paper

# Anything but engaged: user involvement in the context of a national electronic health record implementation

Kathrin Cresswell BSc MSc PhD  
Research Associate

Zoe Morrison BSc MSc  
Research Fellow

eHealth Research Group, Centre for Population Health Sciences, University of Edinburgh, UK

Sarah Crowe MPharm PhD MPSI MRPharmS  
Division of Primary Care, University of Nottingham, UK

Ann Robertson BSc MSc PhD  
Research Fellow

Aziz Sheikh MB BS DRCOG DCH MSc MD FRCGP FRCP  
Professor of Primary Care Research and Development

eHealth Research Group, Centre for Population Health Sciences, University of Edinburgh, UK

## ABSTRACT

**Background** The absence of meaningful end user engagement has repeatedly been highlighted as a key factor contributing to ‘failed’ implementations of electronic health records (EHRs), but achieving this is particularly challenging in the context of national scale initiatives. In 2002, the National Health Service (NHS) embarked on a so-called ‘top-down’ national implementation strategy aimed at introducing commercial, centrally procured, EHRs into hospitals throughout England.

**Objective** We aimed to examine approaches to, and experiences of, user engagement in the context of a large-scale EHR implementation across purposefully selected hospital care providers implementing early versions of nationally procured software.

**Methods** We conducted a qualitative, case-study based, socio-technically informed, longitudinal investigation, purposefully sampling and collecting data from four hospitals. Our data comprised a total of 123 semi-structured interviews with users and managers, 15 interviews with additional stakeholders, 43 hours of non-participant observations of meetings and system use, and relevant organisation-specific documents from each case study site. Analysis was thematic, building on an existing model of user engagement that was originally developed in the context of studying the implementation of relatively simple technologies in commercial settings. NVivo8 software was used to facilitate coding.

**Results** Despite an enduring commitment to the vision of shared EHRs and an appreciation of their potential benefits, meaningful end user engagement was never achieved. Hospital staff were not consulted in systems choice, leading to frustration; they were then further alienated by the implementation of systems that they perceived as inadequately customised. Various efforts to achieve local engagement were attempted, but these were in effect risk mitigation strategies. We found the role of clinical champions to be important in these engagement efforts, but progress was hampered by the hierarchical structures within healthcare teams. As a result, engagement efforts focused mainly on clinical staff with inadequate consideration of management and administrative staff.

**Conclusions** This work has allowed us to further develop an existing model of user engagement from the commercial sector and adapt it to inform user engagement in the context of large-scale eHealth implementations. By identifying key points of possible engagement, disengagement and re-engagement, this model will we hope both help those planning similar large-scale EHR implementation efforts and act as a much needed catalyst to further research in this neglected field of enquiry.

**Keywords:** electronic health record, engagement, implementation

## Introduction

Information technology (IT) is increasingly being utilised to facilitate the sharing of information across teams and groups of healthcare staff.<sup>1</sup> In the hope of realising more effective and safer care, many countries are actively pursuing the implementation of electronic health record (EHR) systems through making major investments in these initiatives.<sup>2</sup> However, the existing literature suggests that many IT implementations, particularly those that involve complex organisational transformations, fail to realise their full potential, this often reflecting, amongst other things, the lack of effective approaches to user engagement.<sup>3,4</sup>

To date, agreeing on a shared definition of user engagement in the context of technological innovation in healthcare settings has been difficult, as approaches and contexts vary significantly. Its conceptualisation often depends on the technology in question and the need to accommodate alternate perspectives of different stakeholders, including both implementers (often focusing on the process of engagement) and user groups (often focusing on subjective experiences of this process).<sup>5</sup> More specifically, in relation to eHealth innovations, user engagement tends to be conceptualised as a process involvement in as many aspects of the design, implementation and adoption processes as possible in order to increase a sense of ownership and reduce resistance to the introduction of the new system.<sup>6–25</sup> The underlying assumption here is that users are best placed to understand the intended context of system use; by contrast, developers and implementers may lack important clinical insights, resulting in a lack of understanding of the potential consequences of technologies for end users.<sup>26,27</sup>

England was one of the first countries to make substantial efforts to implement procured EHR systems into hospitals on a national scale. The National Health Service Care Record Service (NHS CRS) was part of a wider program to modernise the NHS through

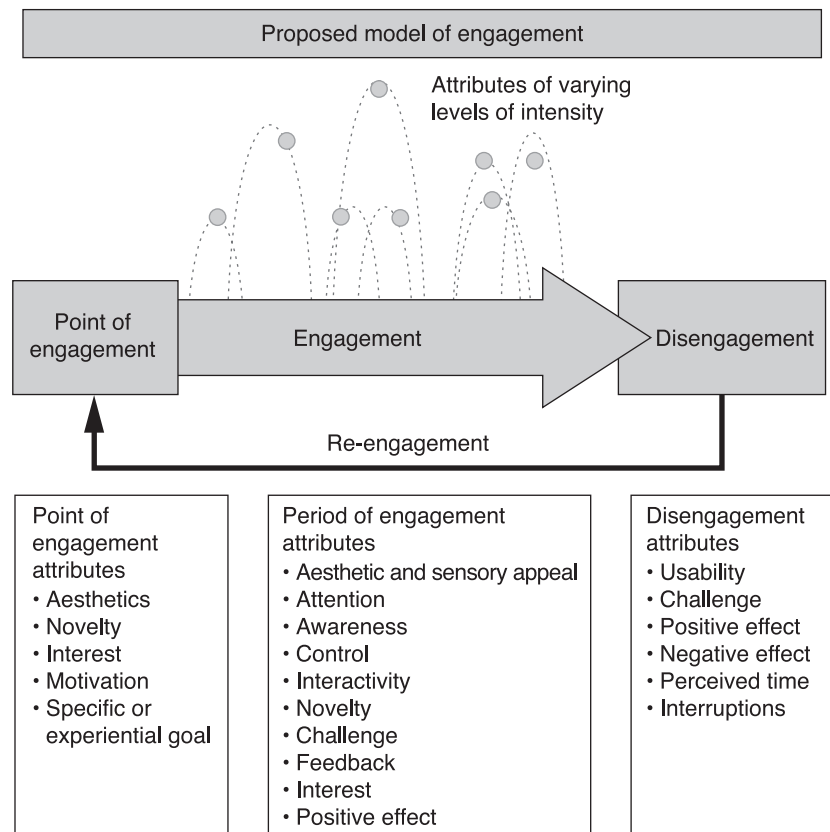
the National Programme for IT (NPFIT). The NHS CRS has been conceptualised as a ‘top-down’ implementation, this reflecting its central management, substantial scale and ambitious implementation timelines.<sup>28,29</sup> NHS Connecting for Health (NHS CFH), an ‘arms-length’ government agency, was charged in 2005 with implementing these nationally procured EHR systems. These included iSOFT’s Lorenzo Regional Care (henceforth referred to as Lorenzo), Cerner’s Millennium and CSE Healthcare’s RiO.

In this paper, we focus on the approaches to, and experiences of, end user engagement in relation to the implementation and adoption of Lorenzo software (which is described in Box 1). We conceptualise user engagement as a form of involvement which will lead to informed implementation of an effective system that is assimilated into working practices due to close alignment with user needs and expectations. We chose to concentrate on this particular software because it was – uniquely – planned to be co-created with NHS organisations and users, which should have facilitated and greatly enhanced user engagement.<sup>6–25</sup> Although such co-creation models have been studied previously, the implementation as part of NPFIT was of particular interest as this differed from the smaller-scale implementations studied hitherto and offered potential insights into user engagement within a multi-organisation and a multi location context.

We thus seek in this paper to build on the existing user engagement literature in relation to IT in health care by reflecting on the approaches to and experiences of user engagement in a national implementation of complex EHRs. Most work to date has focused on small-scale individual organisation-centred implementation approaches allowing extensive customisation of commercial software according to local need.<sup>6–25</sup> We draw in particular on an existing theoretical model of user engagement from less complex, commercial IT applications (Figure 1),<sup>5</sup> and our own work to explore approaches to user engagement in the context of the NPFIT. Based on our findings, we map out where the differences between national implementation and

### Box 1 Characteristics of Lorenzo Regional Care implemented as part of the NPFIT

- Lorenzo is a specific type of web-based EHR software that is built whilst being implemented in the North, Midlands and Eastern Region (NME) of England covering ~ 60% of the country.
- It was originally planned to be implemented as a single solution across both primary and secondary care settings, but the scope was subsequently reduced to exclude primary care settings as contracts were repeatedly renegotiated in order to reduce costs in a climate of increasing economic uncertainty.
- Lorenzo does not exist as yet in its full form, as the original intention was to develop a system in collaboration with the NHS so that it would address the needs of users. Different releases are available as soon as they are developed in India, where most of the developers are based.
- Although releases have to be implemented consecutively, organisations are to some extent free to choose which parts of releases they wish to implement according to their needs.



**Figure 1** A model of user engagement based on a literature review of technology implementation in the commercial sector (adapted from O'Brien and Toms<sup>5</sup> with permission of John Wiley and Sons)

single organisation-centred implementation approaches and associated user engagement lie, how engagement efforts in relation to the NPfIT have been perceived by users and organisations, and how approaches to facilitate engagement can be applied more effectively to large-scale IT implementations. We conclude by offering some preliminary recommendations arising from this work that national and international policy makers and implementation teams may wish to consider.

Our methods have been reported in detail elsewhere.<sup>28,31</sup> Briefly, data were collected between February 2009 and November 2010 from four 'early adopter' hospitals implementing Lorenzo. Participating hospitals were conceptualised as case study sites and were purposefully sampled as some of the first to implement these new systems.<sup>32–35</sup> In addition, we collected data from policy makers, system developers and other relevant stakeholders. Our work drew on socio-technical principles to explore the complex mutually shaping interrelationship between social and technical factors as well as the user experiences of the technology over time.<sup>5,24,36–42</sup>

## Methods

### Design

For the purposes of this paper, we drew on a subset of qualitative data collected as part of our national evaluation of the NHS CRS in English hospitals.<sup>28,30,31</sup> In doing so, we focused on the implementation of Lorenzo as a complex type of EHR software that was intended to be co-created in collaboration with NHS staff, and which therefore did not exist in its final form when implementation began.

### Data collection

Our dataset comprised a combination of 43 hours of observational fieldwork and semi-structured interviews with 123 stakeholders including users and managers from case study sites. These were complemented by interviews with an additional 15 stakeholders outside hospitals including governmental stakeholders, developers and representatives from the independent sector. We also collected and analysed a range of associated hospital-specific (an average of three in each

case study site) and national documents, which we treated as secondary data sources.

Documents, interviews and observations at case study sites allowed us to investigate how the national implementation was approached by local management and received by local users. Examination of national documents and interviews with a wider range of stakeholders gave insights into the broader, national landscape in which these developments were taking place.

Where possible, data from four hospitals were collected at two different time points, approximately six months apart, to allow a certain amount of maturation of software development. During this time, organisations had also expanded their user base and/or software functionality. This longitudinal data collection allowed us to capture developments over time as organisations and users worked out the consequences of the nationally implemented system with incrementally increasing functionality.

## Data analysis

Data were collected and analysed by a designated lead researcher who had overall responsibility for data collection at all four case study sites (KC), drawing on the approach outlined by Miles and Huberman,<sup>43</sup> and Mason.<sup>44</sup> Interviews were transcribed and together with documents and field notes uploaded into NVivo8 software. Initially, data were organised along dimensions identified in the literature as important for 'successful' EHR implementation, whilst still allowing new categories to emerge. Initial coding dimensions included technical, human/social, organisational and macro-environmental factors.<sup>45</sup> Across these dimensions, we examined issues relating to user engagement in more detail by retrieving data from all sources coded against user engagement. We then examined the data in this category and developed subthemes, initially within and then across case study sites and at different time points.<sup>43</sup> These were refined based on seeking complementary contextual data (providing wider contextual insights into the situation), confirmatory data (supporting prior theoretical assumptions developed from other sources) and disconfirming data (those that did not fit with developed theoretical explanations). Disconfirming data and inconsistencies between data sources were examined in most detail. The use of matrices facilitated this analytical process. Throughout, the approach was to investigate user experiences and management efforts through an interpretative lens,<sup>44</sup> seeking to understand how the new system and associated engagement efforts were perceived on the ground.

## Results

A full summary of our dataset and a brief description of each case study site are given in Table 1. Our results broadly confirmed the importance of a number of factors influencing user engagement in large-scale healthcare IT implementations, but they also shed light on important new dimensions (Table 2).<sup>3,20,45–48</sup> We have summarised these graphically, building on an existing model of user engagement from less complex commercial technologies in Figure 2.<sup>5</sup>

We identified the following subthemes, which will be considered in turn:

- layers of complexities to engagement approaches resulting from the national procurement
- usability and customisability issues
- the role of champions and other key individuals
- the complexity surrounding the hierarchical structures and associated engagement efforts of clinical staff.

We begin by describing the strategies for user engagement employed within the context of the national implementation as a whole and in our case study (Lorenzo) sites in particular. We then describe experiences of user engagement efforts on the ground, before discussing potential ways forward.

### Understanding approaches to user engagement in the context of a national implementation

Users generally bought into the overarching vision of nationally shared EHRs, thereby providing a receptive basis for the initial 'point of engagement' (see Figure 2).

'Electronic I think it needs to be done now, I think. I don't know, I just think the day of paper notes is probably gone when there's so much technology around...If you think about it's a very ancient way of doing things to write everything down when there's so much technology out there ... Good vision, but whether this system could do it I don't know.' (Interview, healthcare professional)

Naturally, this overall vision encompassed a number of expectations based on existing needs and the hope for the new system to address these:

'The expectation of the service that I had, I mean I went to a launch a couple of years ago and when they launched it. It was like "wow how cool would that be if you could put in a number and the whole history of someone came up", especially because from the [name of area] we have a lot of people from away as well and you can actually see what, all that data and all that information so you get to know the patient quicker because sometimes the paper notes take

**Table 1** A summary of our data set

Case study				
(1) A large-scale Lorenzo implementation in an acute setting	(2) A small-scale Lorenzo implementation in a community setting	(3) A medium-scale Lorenzo implementation in a mental health setting	(4) A small-scale Lorenzo implementation in an acute setting	Overarching
54 interviews with hospital staff, with a total of 29 different interviewees: 8 operational staff and 21 users 10 hours of observations 13 pages of researcher field notes Documents: deployment history timeline, project initiation document, electronic patient record next stage business case	30 interviews with hospital staff, with a total of 23 different interviewees: 9 operational staff and 14 users 24 hours of observations Six pages of researcher field notes Documents: project initiation document, two project status reports, several sets of minutes from a software steering group meetings, interim evaluation report	22 interviews with hospital staff, with a total of 20 different interviewees: 6 operational staff and 14 users 4.5 hours of observations 15 pages of researcher field notes Documents: project initiation document, two deployment verification reports, lessons learned report	17 interviews with hospital staff, with a total of 15 different interviewees: 9 operational staff and 6 users 5 hours of observations 34 pages of researcher field notes 17 documents including Trust internal communications, supplier documentation and press coverage	15 interviews with governmental stakeholders, independent and commercial sector representatives Examination of national policy documents

time to come through and things can be done accordingly.’ (Interview, healthcare professional)

However, the vision of shared EHRs became compromised by national arrangements. Although the government was a significant stakeholder in driving the overall implementation, it did not directly facilitate the engagement of users as this responsibility was largely devolved to individual organisations implementing Lorenzo. As hospital staff were potential users, hospitals were considered to be in a good position to coordinate local engagement efforts. As one confidential national document reads:

‘[Engaging clinicians] is seen as a key issue, and any difficulty experienced in engaging with clinicians will result in a reduction in the speed of the implementation and in benefits realisation ... [the] devolved approach to implementation is rooted in the belief that one can only implement changes to working practices at a local level. The focus for clinical engagement is therefore at that local level....’

Local engagement efforts were, however, complicated by the ‘top-down’ implementation and the nationally

procured nature of Lorenzo software. Here, a close working relationship between users and management introducing the change was not possible as implementation was led by national structures. Local organisations (including users) were not involved in systems choice, which should have been an important consideration at the initial ‘point of engagement’ (i.e. the beginning of the process of engagement), building on the common vision of a national EHR (Figure 2). This is illustrated by the following extract from a Department of Health publication:

‘The Department [of Health] ... decided to conclude the bulk of procurement activities before focusing on communicating with and engaging NHS staff. Wider engagement and mobilisation of the NHS was not started until [it was] judged that procurement had reached a sufficient stage of maturity to be able to communicate its outcome in a meaningful and efficient way. It was concerned that to have done so earlier might have raised expectations which were either speculative or may not have been met and there were also resourcing constraints.’ (Source: Department of Health, 2006)<sup>49</sup>

**Table 2** Main themes identified, overlap with the existing literature and novel themes arising from the research

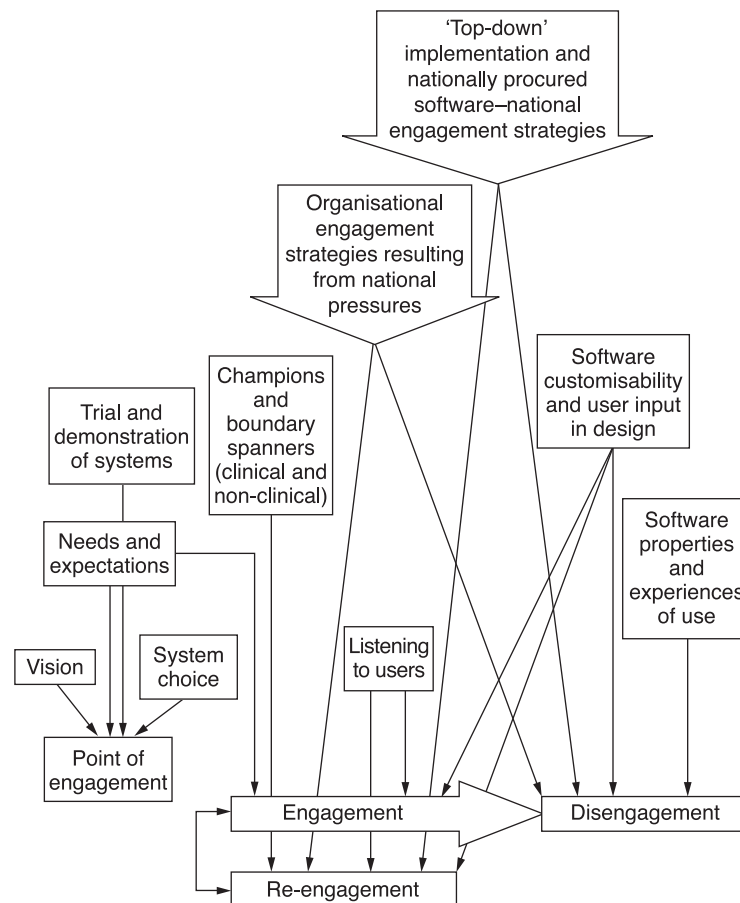
Themes and subthemes emerging from our research	Overlap with the existing literature (Refs)
<i>Technical dimension</i>	
Usability	14,17,24,53,61–63
Customisability	8,64–66
Software that is built whilst being implemented	
<i>Social/human dimension</i>	
A shared vision	
A participatory approach to implementation and development	6–18,21–25
Effective integration into existing workflows	7,14–16,23,61,62,67–74
Champions and boundary spanners as translators between management and user worlds	8,10,18,22,24,42,53,55,61,67,69,75–81
Users' willingness to participate in engagement efforts	
<i>Organisational dimension</i>	
Assessment and addressing of user requirements/attitudes/concerns	15,18,25,41,42,61,65–67,69,79,81–86
Effective communication between developers, management and end users	8,11,22,42,66,67,76,78,87–89
Effective leadership and incentives for use	6,8,9,11,16,21,22,40,42,53,61,69,83,89–91
Identification and agreed measurement of individual and organisational benefits throughout implementation	11,16,17,42,53,61,65,68,80,89,92–95
Effective training and support structures for users	8,10,14,17,21,25,42,62,64,68,69,80,82,87–89,91,94–99
Evaluation and monitoring of progress	6,10,14,17,18,21,22,40,50,53,74,76,83,88,89,100–104
Real versus tokenistic engagement	
Clinical versus user engagement	
Targeted versus organic engagement – time needed for this to occur	
Balance between encouraging and mandating use	
Incentives for users versus focusing engagement efforts on non-users	
<i>Wider macro-environmental dimension</i>	
Engaging on a national scale	
Passing user engagement on to local organisations	
Nationally procured software – configurational constraints	

Local stakeholders in hospitals were unlikely ever to meet the implementers working at a national level, yet at the same time were under intense political pressure to implement the selected products:

'The Public Accounts Committee was quite critical weren't they? They were very clear that, I think it was about six months ago now, they were very clear that if there hadn't been substantial progress over the next six/seven months they were going to look at the whole strategy (...) you know, shoe horn in something that isn't ready ...' (Interview, manager)

As a result, hospital management found itself trying to 'sell' software that it had not chosen to their clinical and administrative staff. This was a difficult undertaking as early release software had limited functionality and offered little in the way of benefits to clinicians or patients, and was replacing well-functioning local systems. In addition, they could not demonstrate the product to its potential users as it did not exist in its final form at that time. These difficulties are exemplified in this interview extract:

'I'll never forget this, when we had a Programme Board ... and they said we have been told by the Secretary of State



**Figure 2** A model of user engagement emerging from our results

essentially, obviously not personally but through his agents that we will be deploying this product in this many Trusts over this period of time and everybody on the [place] goes “what? Nobody told us.” So then the CIOs [Chief Information Officers] had to go to their Trusts, you know, there’s about seven acute Trusts and Mental Health Trusts and said you’ve got to deploy this product over this time period, then they would say to me what’s the product and I’d say I don’t know, there isn’t one but there will be, trust me, you know, you can imagine what they would say to that. It’s completely stupid, completely bonkers ...’ (Interview, governmental stakeholder)

Over time, hospital management therefore tended to lose credibility amongst users. Engagement was in effect inhibited right from the start as the new system could not be demonstrated to users, with the consequence that changes in business, clinical and administrative processes could not be planned for. The first quote below illustrates this lack of credibility, whilst the second quote illustrates how problems in business planning were perceived to impact on efforts to engage system users:

‘... well I think if you’re trying to promote change which is what the National Programme is all about, what informatics was set up to do, then I guess that if you’re trying to convince someone to change you need credi-

bility don’t you? You need two types of credibility, one that what you’re trying to do is compatible with their vision of the future and it’s a good thing to do. And also you need them to feel that it’s safe to change, you know, if I commit a change to my process to take advantage of all these systems are you going to support me? And that’s what we’re trying to work up.’ (Interview, manager)

‘... one of the difficulties for us as a Trust was that we had to design our business processes without having access to the system and I’m sure that’s something that’s been said throughout all the other Trusts is, you know, when you’re engaging with clinicians because it’s, you know, it’s being sold as a clinical product and you can’t show them how it’s going to work it’s very hard for them to say well, yea, we’ll use this bit here and we’ll use that bit here and so for me it was a challenge.’ (Interview, manager)

Problems with the lack of credibility of the software were further exacerbated by early negative experiences with Lorenzo, with clinicians expressing concerns around increased workload, and hospitals reporting that it negatively impacted on organisational functioning. Consequently, users began to disengage with the system implementation (see Figure 2).

‘It does take a little longer to request an investigation than it does using a pen and paper and clearly if we’re going to



use an electronic system it needs to be at least as efficient in terms of time utilisation as the pen and paper otherwise it isn't going to get used universally. So that needs to be improved a little bit but I think it is at an early stage and there's a lot of potential to the system.' (Interview, manager)

Relevant national bodies (in particular NHS CFH) and local management (hospitals) attempted to address this lack of user engagement with 'engagement strategies' focusing on 'stakeholder management' predominantly aimed at clinical users. These approaches were designed to mitigate a recognised risk of users refusing to use the new system. They included targeted communication of anticipated benefits of usage, training, the appointment of clinical leads and attempts to increase users' input into system design.<sup>9,14,50,51</sup> Hospital management's targeted communication strategies were illustrated during the following interview:

'I think it's about what are we communicating, how are we communicate that, what are we saying our expectations are to staff about what are the benefits of this system to patients and to staff. How can we sell that and we need to start developing our, we've got a communication plan but we need to start developing that now, we need to start rolling it out. So we've got, clinicians, doctors who want to use something that's going to add to their working day not something that's going to add more time and more output.' (Interview, manager)

Such local engagement strategies within hospitals were intended to provide a 'push in the right direction' through attempts to win over sceptical staff by emphasising the likely benefits of use. This sometimes also involved a certain amount of spin, as the following extract indicates:

'... it's all about making them [referring to users] feel valued because ... we've got this. It might not always be entirely the truth, you know, but it makes people feel oh well yeah and it just makes people that little bit more compliant to try it, it's a bit of bribery, it's people management.' (Interview, manager)

These 'soft' strategies appeared to work in some instances, but if they were not successful, the next management step was to mandate use of the system. The approaches employed to enforce systems usage varied but included withdrawing existing paper systems.

'I mean there's the carrot, the stick and then a cattle prod and, you know, I mean sometimes you have to use a combination of all three, you know, you wheel and cajole, you make the technical solutions as easy as possible but, you know, people generally don't want to change and until you force them to change by taking away their paper they won't change.' (Interview, manager)

However, in keeping with Figure 2, these strategies targeted stages past the 'point of engagement', i.e. once

the implementation was already well underway and users were obliged to use a system that had been chosen for them by 'the top'. Most efforts were therefore focused on targeting disengagement and re-engagement stages (Figure 2).

## User experiences and perspectives of engagement initiatives

Our results illustrated that user experiences of this technology implementation and associated engagement initiatives had significant consequences for user engagement. Despite widespread agreement on the vision, many users became progressively more disengaged over time (Figure 2). This was most likely shaped by a lack of system usability and customisability; a lack of effective clinical champions and other key individuals that could span boundaries between users and management; and the complexity of the work environment, its hierarchical structures and associated engagement efforts aimed particularly at clinical staff.

In relation to Figure 2, strategies to address issues with disengagement can be placed at the engagement and re-engagement stages representing mitigating actions by management. We will discuss each of the issues and associated user experiences in turn.

## Usability and customisability

Lorenzo was designed as it was being implemented, which potentially allowed significant user involvement. However, system choice and local customisability were limited for reasons of large-scale interoperability, constraining changes that individual users and organisations could make to the system.

'I think all the correct elements are there but, you know, I don't know really how flexible the system is but I know there has been some medical input into making it user friendly for clinical teams, but I think, my feeling is it would benefit from more input from clinicians so that we can get an output that is useful to us. And at the moment we're not quite there really and particularly with things like the generated discharge summary, it's quite a lengthy document, it comes out at four sides of A4.' (Interview, healthcare professional)

Here, national arrangements and associated layers of bureaucracy, including a range of governmental and commercial committees, meant that technical issues reported by users often remained unresolved for extended periods. This led to users feeling that they had not been listened to and contributed to disengagement.

'... you never get, you never get consulted on anything it's just you're doing it and I think that's what gets people's

backs up really, it's just that you're just expected to do it and there's no negotiation or, you know, this is why we're doing it or anything, it's just it's here, get on with it.' (Interview, healthcare professional)

This was compounded by the difficulties experienced with integrating Lorenzo with existing care practices. During the period of our data collection, most users reported that it caused them additional work without bringing the promised benefits.

'I think it would be a great system and I just don't think it works very well. I don't know if it's an appropriate system. It seems to have a lot of downfalls. But I can actually see the bigger picture that yes, it would be really good. I just think we are struggling a little bit with it.' (Interview, healthcare professional)

As a result, users often did not actively participate in communication, engagement and re-engagement efforts (which we refer to here as strategies that are designed to address recognised issues with disengagement) initiated by management, a situation which may have been exacerbated by concurrent changes in the health service and associated 'change fatigue'.<sup>52</sup>

'With all the other changes that are taking place in the health service I think it was just another thing that just people think if you ignore it, it will go away and of course that's not going to happen but that's quite often a perception in the health service with it being so big and there's much red tape that you can avoid things.' (Interview, manager)

Missed opportunities at the 'point of engagement' (Figure 2), together with a lack of systems functionality and performance, undermined subsequent engagement and re-engagement efforts. A failure to demonstrate to users that their concerns were being listened to and acted upon impacted on users' willingness to invest time and effort in making the new system work and on the credibility of engagement efforts, which were described by some users as a 'façade' and 'tokenistic', designed to persuade them to use a system that was viewed as lacking fitness for purpose. This contributed to disengagement, resistance and a feeling that there was no real involvement in decision making.

'... but we're only little cogs in a little wheel so they won't listen to us so ... yea, we don't get listened to ... I'm still waiting three weeks down the line to get my fax machine, to get a gateway on my fax machine so I can start faxing again properly cause our fax machine they gave us in the first place wasn't fit for purpose cause it only does thin paper and the cards we have to fax are thick, I mean just something as simple as that....' (Interview, healthcare professional)

## Champions and other key individuals

There is evidence that the appointment of clinical leads and 'boundary spanners' can be effective as these individuals often have an insight into 'both worlds': management and clinical.<sup>10,42,53</sup> Indeed, we found the use of such local champions to be valued by system users and hospital management. As a result, their expertise and influence were harnessed where possible.

'And so you don't go in and say right we're going to do business process management, you know, you have to facilitate it in such a way that you're using their language, that you can convert, you can translate. So I was almost like an interpreter for them in terms of, you know, no you don't go in and say that, don't you dare do that to them, leave them alone I'll do this bit. And there's also something about the clinicians, either they rate you or they don't, you've either got the credibility or you haven't and I think that was quite important.' (Interview, healthcare professional)

However, centrally appointed, national champions were viewed by some users as lacking credibility because effective two-way communication between those individuals and users did not occur. Similarly, a number of users stated that some clinical leads, despite their clinical background, did not seem to be connected closely enough to those that they were appointed to represent (i.e. clinicians).

'I mean they talk about having clinicians as part of the developers but they're clinicians that haven't been clinicians for such a long time. I mean there's [Name] what's his name who's ... Who's an anaesthetist or was an anaesthetist but when was the last time he ever had to input anything on a computer to do anything with a patient, probably never.' (Interview, healthcare professional)

## Clinical engagement versus user engagement

We further found that, despite a strategy of engaging clinical staff, guided by local management assumptions that if consultants could be 'won over' then other staff groups would follow, senior consultants did often not engage in local implementation discussions – possibly because they had already reached the disengagement stage (Figure 2).

'Well yeah consultants are kind of, they don't come to events you go to them and it's making sure you go to the right events and get the right sort of message or you get one or two consultants, they don't need to be enthused about the benefit ... they just need to understand the agenda and have a view, it might be a negative view but at least they're talking about Lorenzo. So we're actually starting to engage with what we would class as the senior stakeholders across the two sites, deliberately engaging consultants...' (Interview, manager)

This may be partly due to the nature of consultants' work environment, where the timely delivery of patient care often took priority.

'Clinicians are also, if they change their working practice to use these new systems then their tolerance of failure would I think be a lot less than maybe an accountant or a traditional user just because of the nature of what they're doing. (...) I don't mean tolerance as in getting cross, they need access because the sort of environment they're in, then if something isn't working and their process depends on it, you can't say to the patient, "Just sit there for 20 minutes while I hang on at the service desk, everything's going to be fine".' (Interview, manager)

The important role of senior consultants in the hierarchical structures within health care to some extent justifies the focus on clinical engagement, as does the fact that they can be both users and managers. This approach to engagement was therefore based on the idea of opinion leadership, with consultants mandating local use. However, consultants delegated many responsibilities, including data input into Lorenzo, to their juniors. These arrangements created a situation in which consultants were often the clinicians with the least exposure to using Lorenzo.

'I think it's more to do with the hierarchy of the clinical team in that the more junior you are in that clinical team the more of the admin stuff that you get to do. Or you're asked to do, you're expected to do. And a lot of that admin stuff is documenting in the clinical notes. So acting as scribe on the ward round or being asked to place a request for a patient or whatever and they're the duties that Lorenzo supports. So the junior doctors have got more exposure to the system earlier than the senior members of the staff which then creates its own problem in that the seniors are then more reluctant to expose themselves with a new product...' (Interview, manager)

In addition, our results indicated that the engagement of non-clinical stakeholders, who were often the most frequent users of the early Lorenzo functionality, received far less attention. As a result, these users were often disengaged, disillusioned and frustrated.

## Discussion

### Summary of main findings

This work has enabled us to describe and understand the consequences of the various engagement approaches employed in the context of the national implementation of Lorenzo. The longitudinal nature of this work has furthermore allowed us to appreciate how this evolved over time, which has been important in facilitating the appropriate adaptation of the existing, commercially orientated model of user engagement

for use in the context of studying large-scale EHR implementation (Figures 1 and 2).<sup>5</sup> Despite the presence of an overall vision at the 'point of engagement', local engagement efforts have been negatively influenced by a lack of user involvement in procurement decisions as well as implementation timelines, and the nature of the Lorenzo system itself, which was perceived to lack usability and customisability. These factors resulted in notable disengagement of users. The re-engagement efforts we observed were often approached as risk mitigation strategies to prevent further alienation of users, but such strategies had already missed an important opportunity to initiate engagement (i.e. the 'point of engagement'). Drawing on local clinical champions and boundary spanners was found to have the potential to facilitate re-engagement to some extent, but non-clinical staff (often the most frequent users of the functionality) were particularly neglected in relation to engagement and re-engagement efforts.

### Strengths and limitations of this work

Our results have built on the existing literature, which to date has not considered the complex issue of user engagement in the context of national EHR implementations (see Figure 2). By researching sites longitudinally, we have been able to describe local and national engagement strategies employed and understand the effects of these on users, and the potential mechanisms involved.

However, our work is not without its limitations. We have, despite being able to trace developments over time, investigated the early stages of Lorenzo implementation only, resulting in limited insights into the more embedded use of the system. In addition, our clear rationale for focusing on one type of national EHR system due to its unique features (i.e. Lorenzo) means that the transferability of our findings to other EHR systems and contexts would benefit from further consideration.

### Considering our findings in relation to the wider literature

Our results have shown how a national 'top-down' EHR implementation conflicted with the notion of user engagement itself, illustrated by political pressure to implement centrally procured systems, whereby users lacked system choice and customisability. In line with this, other authors have argued that participation in government initiatives may not be as participatory as it may first appear; eventually certain governmental objectives need to be achieved, with the

result that these objectives may at some point become 'too important' to be participatory.<sup>54</sup>

Ideally, users would be involved in all aspects of systems choice, interface design, evaluation, implementation and sustained development of the software to ensure that their needs are reflected in software design.<sup>6-25</sup> Such efforts should focus on the 'point of engagement' building a solid basis for the future, as opposed to targeting the disengagement and re-engagement stages. That said, we accept that any approach to engagement needs to be tailored to the local situation, balancing the requests of users with organisational and strategic requirements. For example, it is likely that some user requests will contradict others, or requests may adversely affect organisational functioning. This therefore necessitates a careful balancing act of diverse priorities by the implementers.

The literature suggests that user engagement is most effective if the system is 'home-grown' and customisable.<sup>45,55</sup> More typically in such scenarios, a local need is identified and users themselves slowly, often over a period of decades and supported by local management, change the system to address this need.<sup>56</sup> Here, engagement is inherent in the development process as implementation is driven by users. However, a small-scale, evolutionary approach does not address large-scale interoperability. It is also becoming less affordable and in many cases felt to be less attractive because of the slow pace of development.<sup>56</sup>

Overall, effective user engagement in large-scale EHR implementations is complex and in some respects even contradictory. The question of how users can be involved whilst at the same time achieving some degree of system interoperability remains, but our work has highlighted the importance of the initial 'point of engagement' and the effect of 're-engagement' strategies. In an ideal scenario, the word 'engagement' would hardly be mentioned as it would simply 'be there' without the need for any mitigation strategies to re-engage disengaged users. Our study supports previous research which found that the issue of engage-

ment only seemed to become important when it was identified as a risk to implementation 'success', or offered a retrospective explanation for an implementation being perceived to be a 'failure'.<sup>57,58</sup> Users may be primed to this and labels such as 'stakeholder engagement strategies' may therefore arouse such questions as: 'is there any reason why I should not be engaged?'. This could further undermine the concept of engagement and contribute to user alienation and resistance to implementation.

## Implications for policy, practice and research

It is not within the remit of this paper to debate whether a national EHR implementation approach is an optimal strategy, so we concentrate our thoughts on how to facilitate engagement from this point forward (see Box 2 for a summary). Our suggestions may also be transferable to other large-scale IT implementations in the healthcare sector.

In line with the new strategic IT direction of the UK government, with a growing emphasis on local systems choice,<sup>59</sup> we expect some of the problematic complexities of a centralised, national approach to diminish in future. For example, devolving of engagement responsibilities to individual hospitals is likely to continue and to be facilitated by more local input in systems choice and tailoring of local systems. However, it is important to recognise that future implementation efforts will be likely to require continuous re-engagement strategies as the 'point of engagement', initially promising as it built on a common vision, has received far too little attention. The English implementation context will probably therefore continue to be characterised by retrospective risk mitigation strategies in relation to engagement and re-engagement, as opposed to the preferable focus on the initial 'point of engagement'.

### **Box 2** Recommendations emerging from our work to facilitate user engagement in large-scale IT initiatives in health care

- There is a need to establish a common vision and have user input in systems choice. The focus here should be on the 'point of engagement' as opposed to targeting already disengaged users.
- The system needs to be adequate and customisable.
- Management's engagement efforts need to be real as opposed to tokenistic.
- Focus on not only clinical but user engagement.
- Allocate sufficient time for as much organic engagement to occur as possible.
- Draw on effective (not tokenistic) translators between user and management worlds.
- Explore more effective use of incentives for those who use as opposed to focusing on engaging non-users.
- Get the balance right between encouraging and mandating use.
- Users need to actively participate in management's engagement efforts.

The implications for similar ventures internationally may also be considered. First, a focus on the initial 'point of engagement' is vital. This can be achieved by building on a common vision and user input in systems choice, which may have to be local by definition. Second, there is a need to realise that if the system being implemented is perceived as inadequate and has limited capability for customisation to local needs, engagement strategies are likely to fail. Management focus should therefore be not on engagement *per se*, but on finding a solution that works for as many members of the organisation as possible to improve business processes as well as ways of working. Conversely, trying to impose a new computer system that is perceived as inadequate by users without the opportunity for it to be changed in appropriate time-scales is likely to act as an insurmountable barrier to achieving any degree of user buy-in.

In addition, we argue for the need for user representation to go beyond a reliance on medical consultants to understand and promote the views of diverse staff groups involved in the delivery of health care. The participation of representatives of clinicians, administrative staff and patients, in numbers that reflect the scale of the planned eHealth implementation, should enhance meaningful user engagement and reduce the challenges to implementing. Furthermore, this could enrich system functionality through closer alignment with the needs of the service for which it is intended. This form of engagement undoubtedly takes time: users' time, the time to communicate with and listen to users, time to revise implementation strategies if necessary and time to customise the product. In addition, sufficient resources will be required to facilitate the availability of users to participate in engagement initiatives whilst fulfilling the requirements of their employment.

We also accept that engagement strategies may lose momentum for reasons that may not be anticipated. In these instances, there are strategies that can help re-engage users. For example, having a dedicated individual to whom users can feed back problems on behalf of a group or community of users may facilitate two-way communication between users and implementers. Our findings indicate that face-to-face contact is often preferred. It is also important that any such designated individual has the capacity to understand users' perspectives and their working environment. This does not necessarily require a person with a clinical background, but it needs someone capable of taking the boundary spanner role, who is able to 'translate' between management and users and build bridges between them.

We offer our model of user engagement in the context of national EHR implementations (Figure 2) as a starting point for conceptualising a complex phenomenon and emphasise the need to test and

develop it further. It is important that future developments draw on relevant, existing models from other sectors as user engagement does not only present a problem in the context of healthcare IT.

## Conclusions

Effective user engagement is critical for the successful implementation of EHR systems but extremely challenging to achieve, particularly in the context of attempting to implement a large-scale, complex and nationally procured system such as Lorenzo. In order to maximise the chances of success for similar initiatives internationally, it is important to allow local organisations to engage end users effectively, facilitate organic approaches to engagement and genuinely encourage and respond to user input at all stages of the implementation process. This includes focusing efforts on the initial 'point of engagement' by building on a common vision and by allowing user input into system choice. Mitigation strategies can be helpful but there is a need to recognise that these are often focused on re-engagement.

Approaches need to shift from mechanistic models of clinical engagement–disengagement–re-engagement towards models that recognise the importance of the 'point of engagement', drivers for different groups of users, the need for continuous communication and key local individuals who are capable of being boundary spanners.

In relation to the implementation of EHRs in England, the new governmental direction including greater local systems choice and the resulting devolvement of engagement activities to individual hospitals is likely to facilitate user re-engagement.<sup>60</sup> However, local efforts will need to focus on implementing software that is fit for purpose, which can be realised by user-informed design, and the coherent communication of the implementation strategy if users are to trust that their efforts to make the system work will eventually result in benefits.

## ACKNOWLEDGEMENTS

We are grateful to the participating hospitals for supporting this work and to all interviewees who kindly gave their time. Throughout the process of undertaking this work we have had helpful support from colleagues at the NHS Connecting for Health Evaluation Programme led by Richard Lilford and supported by Lee Priest, Nathalie Maillard and Jo Foster. Lee Priest also represented the funders on our independent project steering committee, which

was chaired by David Bates. Other members of this committee included Martin Buxton, Antony Chuter, Ian Cowles and Kathy Mason. We also acknowledge the support of the National Institute for Health Research through the Comprehensive Clinical Research Network.

## CONTRIBUTORS

AS conceived this study and KC led on writing the paper, with ZM, SC and AR collecting data, developing ideas and commenting on various drafts. AS and KC are guarantors.

## REFERENCES

- Mort M and Smith A. Beyond information: intimate relations in sociotechnical practice. *Sociology* 2009; 43(2):215–31.
- Burton L, Anderson G and Kues I. Using electronic health records to help coordinate care. *Milbank Quarterly* 2004;82(3):457–81.
- Black A, Car J, Pagliari C, Anandan C and Cresswell K. The impact of ehealth on the quality and safety of health care: a systematic overview. *PLoS Medicine* 2011;8(1).
- Ferlie EB and Shortell SM. Improving the quality of health care in the United Kingdom and the United States: a framework for change. *Milbank Quarterly* 2001;79(2):281–5.
- O'Brien HL and Toms EG. What is user engagement? A conceptual framework for defining user engagement with technology. *Journal of the American Society for Information Science* 2008;59(6):938–55.
- Austin CJ, Hornberger KD and Shmerling JE. Managing information resources: a study of ten healthcare organizations. *Journal of Healthcare Management* 2000; 45(4):229–38.
- Beuscart-Zephir MC, Anceaux F, Crinquette V and Renard JM. Integrating users' activity modeling in the design and assessment of hospital electronic patient records: the example of anesthesia. *International Journal of Medical Informatics* 2001;64(2–3):157–71.
- Bossen C. Test the artefact – develop the organization. The implementation of an electronic medication plan. *International Journal of Medical Informatics* 2007;76(1): 13–21.
- Dagros D, Williams PD, Chesney JD, Lee MM, Theoharis E and Enberg RN. Implementation of an obstetrics EMR module: overcoming user dissatisfaction. *Journal of Healthcare Information Management* 2007;21(1):87–94.
- De Mul M, Berg M and Hazelzet JA. Clinical information systems: CareSuite from Picis. *Journal of Critical Care* 2004;19(4):208–14.
- Doebbeling BN, Chou AF and Tierney WM. Priorities and strategies for the implementation of integrated informatics and communications technology to improve evidence-based practice. *Journal of General Internal Medicine* 2006;21(Suppl 2):S50–7.
- Hendy J, Reeves BC, Fulop N, Hutchings A and Masseria C. Challenges to implementing the National Programme for Information Technology (NPfIT): a qualitative study. *BMJ* 2005;331(7512):331–6.
- Nikula RE. Why implementing EPRs does not bring about organizational changes – a qualitative approach. *Studies in Health Technology and Informatics* 2001; 84:666–9.
- Puffer MJ, Ferguson JA, Wright BC *et al.* Partnering with clinical providers to enhance the efficiency of an EMR. *Journal of Healthcare Information Management* 2007;21(1):24–32.
- Scott JT, Rundall TG, Vogt TM and Hsu J. Kaiser Permanente's experience of implementing an electronic medical record: a qualitative study. *BMJ* 2005; 331(7528):1313–16.
- Sicotte C, Pare G, Moreault M-P and Paccioni A. A risk assessment of two interorganizational clinical information systems. *Journal of the American Medical Informatics Association* 2006;13(5):557–66.
- Snyder R, Weston MJ, Fields W, Rizos A and Tedeschi C. Computerized provider order entry system field research: the impact of contextual factors on study implementation. *International Journal of Medical Informatics* 2006;75(10):730–40.
- Van Ginneken AM. The computerized patient record: balancing effort and benefit. *International Journal of Medical Informatics* 2002;65(2):97–119.
- Car J, Anandan C, Black A *et al.* *The Impact of eHealth on the Quality & Safety of Healthcare – a systematic overview and synthesis of the literature*. Report for the NHS Connecting for Health Evaluation Programme, 2008. Available at: [www1.imperial.ac.uk/resources/32956FFC-BD76-47B7-94D2-FFAC56979B74/](http://www1.imperial.ac.uk/resources/32956FFC-BD76-47B7-94D2-FFAC56979B74/)
- Catwell L and Sheikh A. Information technology (IT) system users must be allowed to decide on the future direction of major national IT initiatives. But the task of redistributing power equally amongst stakeholders will not be an easy one. *Informatics in Primary Care* 2009; 17(1):1–4.
- Duggan C. Implementation evaluation. HIM professionals share their experiences bringing health IT online. *Journal of AHIMA* 2006;77(6):52–5.
- Fenton SH, Giannangelo K and Stanfill M. Essential people skills for EHR implementation success. *Journal of AHIMA* 2006;77(6):60.
- Giuse DA and Kuhn KA. Health information systems challenges: the Heidelberg conference and the future. *International Journal of Medical Informatics* 2003;69(2–3):105–14.
- Keshavjee K, Bosomworth J, Copen J *et al.* Best practices in EMR implementation: a systematic review. *AMIA Annual Symposium Proceedings* 2006;982.
- Ovretveit J, Scott T, Rundall TG, Shortell SM and Brommels M. Improving quality through effective implementation of information technology in healthcare. *International Journal for Quality in Health Care* 2007;5(5):259–66.
- Bendoly E and Speier C. Silver bullet junkies and the codifiers that love them: behavioral roots behind a legacy of bad modeling and use. *Decision Sciences* 2008;39(2).

- 27 Jakobs K, Procter R and Williams R. Standardisation and implementation of information technology. *Proceedings of the International Resource Management Association* 2001;192–5.
- 28 Robertson A, Cresswell K, Takian A, Petrakaki D, Crowe S and Cornford T. Implementation and adoption of nationwide electronic health records in secondary care in England: qualitative analysis of interim results from a prospective national evaluation. *BMJ* 2010;341:c4564.
- 29 Coiera E. Building a national health IT system from the middle out. *Journal of the American Medical Informatics Association* 2009;16(3):271–3.
- 30 Cresswell K, Ali M, Avery A et al. *The Long and Winding Road ... An Independent Evaluation of the Implementation and Adoption of the National Health Service Care Records Service (NHS CRS) in Secondary Care in England*. <http://www.haps.bham.ac.uk/publichealth/cfhep/005.shtml> (accessed 9 May 2011).
- 31 Sheikh A, Cornford T, Barber N et al. Implementation and adoption of nationwide electronic health records in secondary care in England: final qualitative results from a prospective national evaluation in 'early adopter' hospitals. *BMJ* 2011;343:6054.
- 32 George A and Bennett A. *Case Studies and Theory Development in the Social Sciences*. MIT Press: Cambridge, MA, 2005.
- 33 Stake RE. *The Art of Case Study Research*. SAGE: London, 1995.
- 34 Yin R. *Case Study Research, Design and Methods*. SAGE: London, 2009.
- 35 Crowe S, Cresswell K, Robertson A, Huby G, Avery A and Sheikh A. The case study approach. *BMC Medical Research Methodology* 2011;11(1):100.
- 36 Coiera E. Four rules for the reinvention of health care. *BMJ* 2004;328(7449):1197–9.
- 37 Chiasson M, Reddy M, Kaplan B and Davidson E. Expanding multi-disciplinary approaches to healthcare information technologies: what does information systems offer medical informatics? *International Journal of Medical Informatics* 2007;76:S89–97.
- 38 Doolin B and Lowe A. To reveal is to critique: actor-network theory and critical information systems research. *Journal of Information Technology* 2002;17:69–78.
- 39 Prout A. Actor-network theory, technology and medical sociology: an illustrative analysis of the metered dose inhaler. *Sociology and Health & Illness* 1996; 18(2):198–219.
- 40 Aarts J, Doorewaard H and Berg M. Understanding implementation: the case of a computerized physician order entry system in a large Dutch university medical center. *Journal of the American Medical Informatics Association* 2004;11(3):207–16.
- 41 Pare G. Implementing clinical information systems: a multiple-case study within a US hospital. *Health Services Management Research* 2002;15(2):71–92.
- 42 Yusof MM, Kuljis J, Papazafeiropoulou A and Tergioulas LK. An evaluation framework for health information systems: human, organization and technology-fit factors (HOT-fit). *International Journal of Medical Informatics* 2008;77(6):386–98.
- 43 Miles MB and Huberman AM. *Qualitative Data Analysis*. SAGE: Thousand Oaks, CA, 1994.
- 44 Mason J. *Qualitative Researching*. SAGE: London, 2002.
- 45 Cresswell K and Sheikh A. The NHS Care Record Service (NHS CRS): recommendations from the literature on successful implementation and adoption. *Informatics in Primary Care* 2009;17(3):153–60.
- 46 Mair FS, May C, Finch T et al. Understanding the implementation and integration of e-health services. *Journal of Telemedicine and Telecare* 2007;13(Suppl 1):36–7.
- 47 Rogers E. *Diffusion of Innovations*. Free Press: New York, 1983.
- 48 Greenhalgh T, Robert G, Macfarlane F, Bate P and Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Quarterly* 2004;82(4):581.
- 49 Department of Health. *The National Programme for IT in the NHS*. [www.nao.org.uk/publications/0506/department\\_of\\_health\\_the\\_nati.aspx](http://www.nao.org.uk/publications/0506/department_of_health_the_nati.aspx) (accessed 2 May 2011).
- 50 Smaltz DH, Callander R, Turner M et al. Making sausage – effective management of enterprise-wide clinical IT projects. *Journal of Healthcare Information Management* 2005; (2):48–55.
- 51 Eason K. A case study of socio-technical systems design within the NPfIT programme. Bayswater Institute Report, 2009.
- 52 Garside P. Are we suffering from change fatigue? *Quality and Safety in Health Care* 2004;13(2):89–90.
- 53 Greenhalgh T, Stramer K, Bratan T, Byrne E, Mohammad Y and Russell J. Introduction of shared electronic records: multi-site case study using diffusion of innovation theory. *BMJ* 2008;337:a1786.
- 54 Mosse D. The making and marketing of participatory development. In: van Ufford PQ and Giri AK (eds) *Moral Engagement and Interventions in Development: contingencies and beyond*. Routledge: London, 2004.
- 55 Boonstra A and Broekhuis M. Barriers to the acceptance of electronic medical records by physicians From systematic review to taxonomy and interventions. *BMC Health Services Research* 2010;10:231.
- 56 Murphy MF, Staves J, Davies A et al. How do we approach a major change program using the example of the development, evaluation, and implementation of an electronic transfusion management system. *Transfusion* 2009;49(5):829–37.
- 57 Erdley WS, Sackett K and Pope R. Tech versus touch: narrowing the great divide. *Journal of Nursing Informatics* 2003;7(2):26–33.
- 58 Brennan S. The biggest computer programme in the world ever! How's it going? *Journal of Information Technology* 2007;22(3):202–11.
- 59 Cabinet Office. *Government ICT Strategy*. [www.cabinetoffice.gov.uk/content/government-ict-strategy](http://www.cabinetoffice.gov.uk/content/government-ict-strategy) (accessed 28 April 2011).
- 60 Public Accounts Committee. *The National Programme for IT in the NHS: An update on the delivery of detailed care records systems*. [www.publications.parliament.uk/pa/cm201012/cmselect/cmpublicacc/1070/1070.pdf](http://www.publications.parliament.uk/pa/cm201012/cmselect/cmpublicacc/1070/1070.pdf) (accessed 5 August 2011).

- 61 Pare G, Sicotte C, Jaana M and Girouard D. Prioritizing the risk factors influencing the success of clinical information system projects. A Delphi study in Canada. *Methods of Information in Medicine* 2008;47(3):251–9.
- 62 Sprague L. Electronic health records: how close? How far to go? *NHPF Issue Brief* 2004;800:1–17.
- 63 Stevenson JE, Nilsson GC, Petersson GI and Johansson PE. Nurses experience of using electronic patient records in everyday practice in acute/inpatient ward settings: a literature review. *Health Informatics Journal* 2010;16(1):63–72.
- 64 Karsten H and Laine A. User interpretations of future information system use: a snapshot with technological frames. *International Journal of Medical Informatics* 2007;76:S136–40.
- 65 Vishwanath A and Scamurra DS. Barriers to the adoption of electronic health records: using concept mapping to develop a comprehensive empirical model. *Health Informatics Journal* 2007;13(2):119–34.
- 66 Yarbrough AK and Smith TB. Technology acceptance among physicians: a new take on TAM. *Medical Care Research and Review* 2007;64(6):650–72.
- 67 Halamka J, Aranow M, Ascenzo C *et al.* E-Prescribing collaboration in Massachusetts: early experiences from regional prescribing projects. *Journal of the American Medical Informatics Association* 2006;13(3):239–44.
- 68 Lium JT, Tjora A and Faxvaag A. No paper, but the same routines: a qualitative exploration of experiences in two Norwegian hospitals deprived of the paper based medical record. *BMC Medical Informatics and Decision Making* 2008;8(2):1–12.
- 69 Ludwick DA and Doucette J. Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. *International Journal of Medical Informatics* 2009;78(1):22–31.
- 70 Moen A. A nursing perspective to design and implementation of electronic patient record systems. *Journal of Biomedical Informatics* 2003;36(4–5):375–8.
- 71 Rose AF, Schnipper JL, Park ER, Poon EG, Li Q and Middleton B. Using qualitative studies to improve the usability of an EMR. *Journal of Biomedical Informatics* 2005;38(1):51–60.
- 72 Schiff GD and Bates DW. Can electronic clinical documentation help prevent diagnostic errors? *New England Journal of Medicine* 2010;362(12):1066–9.
- 73 Ham C, Kipping R and McLeod H. Redesigning work processes in health care: lessons from the National Health Service. *Milbank Quarterly* 2003;81(3):415–39.
- 74 Yasnoff WA, Humphreys BL, Overhage JM *et al.* A consensus action agenda for achieving the national health information infrastructure. *Journal of the American Medical Informatics Association* 2004;11(4):332–8.
- 75 Davidson E and Chiasson M. Contextual influences on technology use mediation: a comparative analysis of electronic medical records systems. *European Journal of Information Systems* 2005;14(1):6–18.
- 76 Goroll AH, Simon SR, Tripathi M, Ascenzo C and Bates DW. Community-wide implementation of health information technology: the Massachusetts eHealth collaborative experience. *Journal of the American Medical Informatics Association* 2009;16(1):132–9.
- 77 Greenhalgh T, Stramer K, Bratan T, Byrne E, Russell J and Potts HWW. Adoption and non-adoption of a shared electronic summary record in England: a mixed-method case study. *BMJ* 2010;340(jun16\_4):c3111.
- 78 James D, Hess S, Kretzing JE and Stabile ME. Showing ‘what right looks like’ – how to improve performance through a paradigm shift around implementation thinking. *Journal of Healthcare Information Management* 2007;21(1):54–61.
- 79 Kelly CS. Perinatal computerized patient record and archiving systems: pitfalls and enhancements for implementing a successful computerized medical record. *Journal of Perinatal and Neonatal Nursing* 1999;12(4):1–14.
- 80 Townes PG Jr, Benson DS, Johnston P and Vaughn C. Making EMRs really work: the Southeast Health Center experience. *Journal of Ambulatory Care Management* 2000;23(2):43–52.
- 81 Van der Meijden MJ, Tange H, Troost J and Hasman A. Development and implementation of an EPR: how to encourage the user. *International Journal of Medical Informatics* 2001;64(2):173–85.
- 82 Clemmer TP. Computers in the ICU: where we started and where we are now. *Journal of Critical Care* 2004;4(4):201–7.
- 83 Lorenzi NM, Smith JB, Conner SR and Campion TR. The Success Factor Profile for clinical computer innovation. *Studies in Health Technology and Informatics* 2004;107:1077–80.
- 84 Pendergast DK and Buchda VL. Charting the course. a quality journey. *Nursing Administrator Quarterly* 2003;27(4):330–5.
- 85 Quinzio L, Junger A, Gottwald B *et al.* User acceptance of an anaesthesia information management system. *European Journal of Anaesthesiology* 2003;20(12):967–72.
- 86 Rose J, Jones M and Truex D. Socio-theoretic accounts of IS: the problem of agency. *Scandinavian Journal of Information Systems* 2005;17(1):133–52.
- 87 Crosson JC, Stroebel C, Scott JG, Stello B and Crabtree BF. Implementing an electronic medical record in a family medicine practice: communication, decision making, and conflict. *Annals of Family Medicine* 2005;3(4):307–11.
- 88 Granlien MF, Hertzum M and Gudmundsen J. The gap between actual and mandated use of an electronic medication record three years after deployment. *Studies in Health Technology and Informatics* 2008;136:419–24.
- 89 Ash J and Berg M. Report of conference Track 4: socio-technical issues of HIS. *International Journal of Medical Informatics* 2003;69(2–3):305–6.
- 90 Mechanic D. Rethinking medical professionalism: the role of information technology and practice innovations. *Milbank Quarterly* 2008;86(2):327–58.
- 91 Adler KG. How to successfully navigate your EHR implementation. *Family Practice Management* 2007;14(2):33–9.
- 92 Klein KJ and Sorra JS. The challenge of innovation implementation. *Academy of Management Review* 1996;21(4):1055–80.
- 93 Lu Y-C, Xiao Y, Sears A and Jacko JA. A review and a framework of handheld computer adoption in health-



- care. *International Journal of Medical Informatics* 2005; 74(5):409–22.
- 94 Tonnesen AS, LeMaistre A and Tucker D. Electronic medical record implementation barriers encountered during implementation. *Proceedings of the AMIA Annual Symposium* 1999;624–6.
- 95 Saigh O, Triola MM and Link RN. Brief report: Failure of an electronic medical record tool to improve pain assessment documentation. *Journal of General Internal Medicine* 2006;21(2):185–8.
- 96 Bali RK and Wickramasinghe N. Achieving successful EPR implementation with the penta-stage model. *International Journal of Healthcare Technology and Management* 2008;9(1):97–105.
- 97 Bates DW and Gawande AA. Improving safety with information technology. *New England Journal of Medicine* 2003;348(25):2526–34.
- 98 Keddle Z and Jones R. Information communications technology in general practice: cross-sectional survey in London. *Informatics in Primary Care* 2005;13(2):113–23.
- 99 Mannan R, Murphy J and Jones M. Is primary care ready to embrace e-health? A qualitative study of staff in London primary care trust. *Informatics in Primary Care* 2006;14(2):121–31.
- 100 Davidson SM and Heineke J. Toward an effective strategy for the diffusion and use of clinical information systems. *Journal of the American Medical Informatics Association*. 2007;14(3):361–7.
- 101 McGowan JJ, Cusack CM and Poon EG. Formative evaluation: a critical component in EHR implementation. *Journal of the American Medical Informatics Association* 2008;15(3):297–301.
- 102 Pagliari C. Implementing the National Programme For IT: what can we learn from the Scottish experience? *Informatics in Primary Care* 2005;13(2):105–11.
- 103 Shekelle PG, Morton SC and Keeler EB. Costs and benefits of health information technology. *Evidence Report/Technology Assessment* 2006;(132):1–71.
- 104 Walker JM, Bieber EJ and Richards F. *Implementing an Electronic Health Record System*. Springer: New York, 2006.

#### FUNDING

This work is independent research commissioned by the NHS Connecting for Health Evaluation Programme. The views expressed in this publication are those of the authors and not necessarily those of the NHS, the NHS Connecting for Health Evaluation Programme or the Department of Health.

#### CONFLICTS OF INTEREST

None.

#### ADDRESS FOR CORRESPONDENCE

Kathrin Cresswell  
Centre for Population Health Sciences  
The University of Edinburgh  
Room 115, Medical School,  
Teviot Place  
Edinburgh EH8 9AG  
UK  
Tel: +44 (0)131 650 9241  
Email: kathrin.beyer@ed.ac.uk

Accepted January 2012