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Electronic Patient Records and Benefits to Clinicians: an Actor-Network Study of a Technological Innovation in the NHS

Mhorag Goff

University of Salford, Salford, UK

`m.goff@edu.salford.ac.uk`

Abstract. This paper draws on findings from research in progress to discuss the ways in which EPRs are implicated in changing work practices for clinicians within the NHS in England. The study set out to question the apparent inevitability of this technology by investigating whether EPRs benefit their users. Recognising that they have been explicitly conceived to serve multiple purposes, the benefits to front line clinical users are dependent on the purposes for which EPRs are being used and the additional responsibilities and risks implied by the non-clinical interests inscribed.

The study uses Actor-Network Theory as a means to investigate the relationships that constitute the EPR, and in doing so to identify the entangled sets of interests brought to bear on the realisation of this technology. The findings suggest that sharing of patient data beyond the local largely privileges secondary uses while benefits to clinicians are concentrated on locally shared EPRs.

Keywords: electronic patient records • Actor-Network Theory • NHS

1 Introduction

The National Programme for IT (NPfIT) was launched in 2002, as part of which a centrally defined programme of EPR development was set out for both primary and secondary care organisations across the NHS in England. Following the devolution of healthcare within the UK in 1999, England, Scotland, Wales and Northern Ireland have each taken a distinct approach to EPR development [1].

Electronic patient records (EPRs) are fundamental to visions of future health care delivery in the UK [2, 3]. They are expected to provide safer, quicker and better quality patient care as a key element of modernised information systems within the NHS [4, 5]. Discourses from government and IT suppliers about the promise of this technology hinge on notions of modernisation and ‘seamless’ care driven by pursuit of clinical and management information to evidence performance, reduce errors and achieve efficiencies [6]. This is to be realised through an ‘information revolution’, which involves improving the flow of information within the NHS [7].

The rationales for EPR development imply that in addition to its properties as a digital object its value derives from its networked-ness in terms of allowing wider sharing of patient information within and between organisations locally, regionally and nationally. The notion of improved information flows is based on the idea of abstracting clinical information captured at the point of care from the local context of production [8]. EPRs are therefore predicated on the ‘networkedness’ or scope of sharing of records and the patient information within them, apparent in the UK government’s ambition to develop a nationally networked longitudinal electronic record. ‘Networkedness’ in this respect refers to the extent to which the EPR technology is being used to exchange information about patients and their care between NHS Trusts, which represent semi-autonomous organisational units under the direction of the government Department of Health.

In this respect the National Programme for IT embodies infrastructural ambitions for EPR systems, which can be seen as enablers of a range of benefits and transformative improvements to the ways in which healthcare is delivered including, for example, virtual consultations [9].

A key driver for the large scale development of electronic patient records is the opportunity for secondary uses of patient data to support care commissioning, administration and research [5], [2], [10] at Trust and national levels, including for example, analyses of patient ‘casemix’, which categorises patients on the basis of consumption of resources, and comparisons of patient outcomes between Trusts [11]. This relies on the development of standardised data formats and recording practices and the ability to (easily) extract and aggregate data from local EPRs for central use. However, the literature highlights the risks of prioritising a secondary uses agenda which places a burden of information provision on clinicians to capture patient data in the EPR when it adds little value to clinical work practices [8, 12].

The National Programme for IT has run over-budget, costing to date an estimated £9.8 billion [13]. It has been criticised for being some years behind schedule having been due to be completed in 2010 [14], against a backdrop of mixed success of EPR programmes globally [15], and a perception among some clinicians that EPRs are an administrative rather than a clinical tool [16].

The objectives of the National Programme for IT in relation to EPRs were only partially achieved before the NPfIT was dismantled in late 2011 [7], [14], notably in terms of the implementation of local EPR systems in hospitals, and the rollout of a nationally accessible Summary Care Record. The failure of the NPfIT to meet its original objectives, the significant costs and the scale of the ambitions with respect to EPR development justify questioning this technology. In particular it is recognised that a national EPR presents ethical issues, especially in relation to the uses of patient data [17], manifested in the ongoing controversy about the privacy of patient records. Therefore the potentially profound implications for healthcare professionals as users, for patients and for the nature of healthcare make it important to critically discuss this technology.

This paper focuses on exploring clinical users’ experiences of EPRs, and the benefits and disadvantages to their work practices. In relation to their position at the forefront of healthcare provision, I start from the assumption that technologies such as the EPR are intended to support the work practices of healthcare professionals and that this in turn will have ramifications for healthcare provision. I therefore aim to under-

stand users' actor-networks for the EPR, as a means to discuss how the technology benefits them. Cresswell et al. [18] note that using Actor-Network Theory means being selective about what to include within scope and what to exclude, because of the impossibility of mapping the entire network. For this reason I explicitly include those involved with healthcare provision under the auspices of the NHS (whether within a Trust or in related bodies), while stakeholders such as patients, software providers and pharmaceutical companies, although they have an interest in EPRs, are out of scope.

In the context of a government vision of a nationally networked record the study sets out to find out what this means for the work practices of clinicians by investigating the reality of the technology as experienced in use. For this reason I have taken a meso level approach to investigating this technology using Actor-Network Theory, not within an individual organisational context, but in relation to multiple NHS organisations which will, if government strategy is realised, entail significantly interconnected EPR systems and extensive information flows.

2 Methodological and Theoretical Background

Data were collected through interviews with EPR users across 10 NHS Trusts in England in a number of roles in primary, secondary and ambulatory care as indicated in Figure 1 below. Participants include a number of non-clinical users, whose perspectives were originally sought as a means to better understand the secondary uses of EPRs, in addition to the use of documentary sources such as government reports. Through an iterative methodology of identifying actors and refining understanding of the actor-network, it was found that substantial investigation of non-clinical uses would be out of scope due to the explosion of complexity in the actor-networks, a challenge acknowledged in the literature [19].

Participant Trusts were selected for diversity of healthcare settings and on the basis of an existing EPR implementation. In addition to participant Trusts having a local EPR system Fig. 1 also shows the instances of inter-organisationally shared EPRs encountered in this study, including the Diabetes Record, the Summary Care Record and the Specialist Hospital EPR for which the scope of information sharing is indicated.

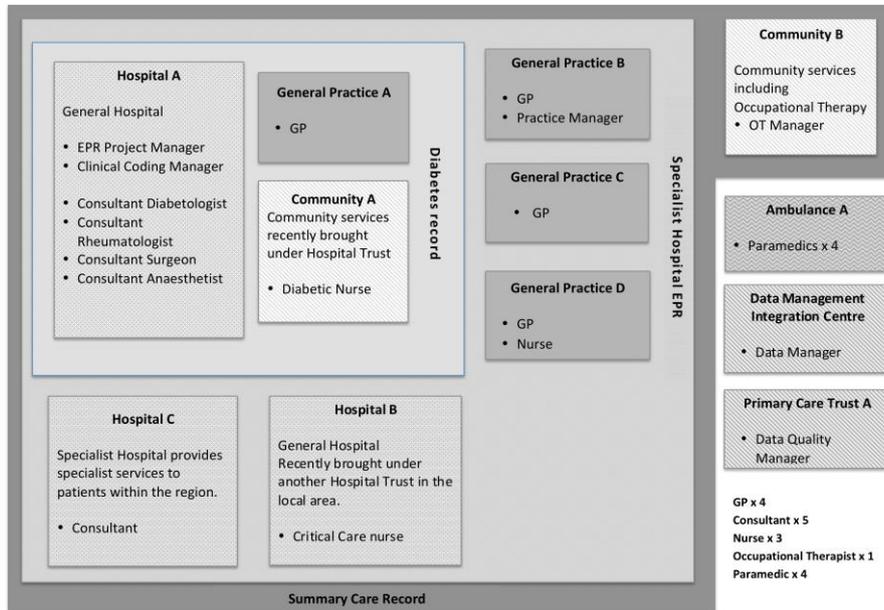


Fig 1. Participant Trusts and EPR users

Among broadly socio-technical systems perspectives on information systems it has long been recognised that technological artefacts inscribe certain interests, values and ideals in relation to their domains of use, which tend to reflect and reproduce a particular view of organisational reality belonging to the dominant group or groups [20, 21]. This implies that a system does not necessarily support the work practices of all users [22, 23], and that power may be exercised through the use of a technology. This means that technologies cannot be considered neutral tools, rather they are political in nature, entangled with and emerging from a particular set of socio-material arrangements in a given implementation context [24].

Actor-Network Theory (ANT) holds that an entity exists as a product of a particular configuration of associations with a constellation of human (or social) and non-human (material) entities [25]. The hybrid nature of entities arises because the social is defined in relation to, and presupposes the material, and vice versa, such that they are inseparable [21]. Understanding the actor-network for a given phenomenon, such as the EPR, entails identifying the entities and relationships that constitute that actor-network, and in doing so appreciating the influences of various actors on the outcome. Any entity may have membership of multiple actor-networks [26] and that this also means a research object may be constituted by multiple actor-networks [27]. My focus will be on actor-networks for the EPR as defined by its users in their particular healthcare roles and settings.

The concept of inscription, central to Actor-Network Theory, is the translation of interests into material form [28] through the design, configuration and use of material artefacts. This concept is used to discuss the manifestation of interests within EPR systems in specific local settings, in doing so revealing the ways in which power and

politics emerge from the actor-network. This paper therefore presents an Actor-Network Theory analysis of the implications of EPRs for clinicians' work practices through discussing their actor-networks for the technology. Through its agnosticism about scale [29] and its ability to trace connections between entities at micro, meso and macro level [30], ANT is able to support analysis of how this technology is manifested across multiple organisations, and therefore be sensitive to its networked aspects.

3 Experiences of EPRs

These findings derive from interviews with EPR users and draw out aspects of discussions that relate to benefits and disadvantages of EPR use, or non-use.

EPR users interviewed indicate a consensus that electronic patient records are beneficial through being more accessible than paper records in a number of ways. All clinical users agreed that EPRs are a significant improvement on paper records in terms of legibility and because they are not lost or misplaced. They can also be accessed concurrently by multiple individuals rather than being tied up by a single user at a time. The improved accessibility of patient records entails advantages in terms of time and human resources which would previously have been spent tracking down paper case notes, and reduced delays in getting access to record information which could otherwise affect the responsiveness and timeliness of patient care. Furthermore the flexibility and convenience of 'anytime, anywhere' access to electronic records was noted by a number of clinicians, enabling them to access EPRs from different locations on site and potentially off-site.

A second area in which users see EPRs as beneficial is in terms of more and better quality clinical information about patients, with access to the integrated clinical contributions of different professional groups, including doctors, nurses and Allied Healthcare Professionals, where their records would previously have been relatively inaccessible. Easier access to patient information also supports information sharing with healthcare professionals in other organisations as clinicians can respond more quickly and accurately to enquiries.

In this respect, a specialist hospital, which by definition treats patients usually treated by other healthcare providers, allows access to their EPR for local GPs and hospitals via web portal. Nevertheless access was found to be little used in practice, challenging the idea that EPRs might fulfil a knowledge management function.

Challenges are experienced in terms of the continued need for paper documents to bridge between Trusts. This reflects the distributed-ness of care pathways for patients, especially those with chronic conditions or multiple co-morbidities, so that Trusts need the means to communicate effectively with each other about their patients. The persistence of paper makes it necessary to scan forms and letters into electronic format, creating demand for additional human resource. Moreover users complain that scanned documents are inconvenient to use because of the time taken to open individual files and the difficulty of finding detail within them, although it was noted that thumbnails and bookmarking functionality help to mitigate this.

The continued reliance on paper also indicates that EPR systems remain largely local and are not integrated between Trusts, as originally envisioned by NPfIT. Certain types of information are shareable via EPR applications between Trusts, with local

EPR systems of participant Trusts incorporating functionality allowing requests for tests and treatments, such as blood tests, X Rays and MRI scans, and communication of results to be done electronically through the EPR. The NHS healthcare model requires clinicians to request services from service provider facilities, often in other Trusts; therefore this functionality within EPR systems supports the model and is reported as being heavily used by clinicians.

Clinical specialisms are a significant shaper of EPRs and have a bearing on how well EPR systems fit with and support (or fail to support) work practices. In Critical Care and surgery EPRs are perceived as being of less value than in other specialisms. For chronic conditions such as asthma and diabetes that entail ongoing demand for healthcare services treatment cuts across multiple healthcare organisations, entailing a need for greater collaboration and information sharing. EPRs are seen as essential for effective management of chronic disease because of the need to track and monitor a range of physiological data from tests and readings over time, for example when monitoring of a patient's weight or blood sugar levels. This is impossible without structured records that facilitate filtering and organising of that information, and moreover EPRs provide the ability to manipulate and visualise that data.

“There's certain things that are very difficult to do without a computer, chronic disease management is one of them” (Business Change Manager, PCT A).

Diabetes is a specialism where the EPR is perceived as particularly beneficial, and for this reason a participant hospital Trust has developed a diabetes-specific area within their EPR which is shared with and contributed to by the community diabetes team and GPs in the local area. This presents a relatively rare instance of an inter-organisational EPR being used to provide 'seamless' care, and while still partial in content, is the closest to the vision of whole record sharing.

The patient empowerment and self-care agendas in the NHS aim to enable patients with chronic and lifestyle-related conditions to take greater responsibility for their own care [31], not least because such conditions are expensive to treat and potentially detrimental to long-term quality of life. A number of users reported that the ability to graph clinical data, such as blood pressure readings, for individual patients is particularly valuable in supporting effective consultations in relation to behaviour change, and the development of patients' own expertise.

Reduced duplication of recording is cited as an anticipated benefit of EPR systems [32] in relation to the integration of previously disparate records systems within Trusts. For example, clinical entries made in the EPR can be reused for hospital discharge letters to GPs by cutting and pasting content, thereby reducing rework. However, the efficiency and value of EPRs in terms of capture and sharing of (close to) real time patient data is predicated on the assumption of contemporaneous recording [33, 34], and where consultations are not office-based or clinicians are unable to enter data into the EPR at the bedside they rely on recording notes on paper or using a dictaphone for input later.

3.1 Materiality

The extent to which EPRs benefit users relates not only to content and scope of information sharing but also to material aspects of EPR use including interweaving of access and use with work practices. These considerations are closely tied to users'

roles and healthcare settings, and represent one way in which non-human actors are significant within the actor-network.

Computing hardware presents physical considerations for EPR use in terms of whether there are enough devices and whether they are available in the locations they are needed, and the suitability of hardware, whether desktop or mobile devices, for particular settings and clinical functions. A nurse participant from a Critical Care ward complained of the lack of physical space for the Computers on Wheels, comprising a workstation attached to a trolley, provided for consultants to access EPRs at the bedside, and intended to be moved around the ward during ward rounds. There is also insufficient hardware for staff in other work spaces, such as the nurses' stations, as well as challenges with fitting EPR use around unpredictable work practices characteristic of urgent care settings.

Users are reliant on adequate broadband connection for network access, highlighted as an issue for community services where clinicians go out on home visits. In one Trust mobile broadband had been trialled with community Occupational Therapists, who reported problems with accessing and using EPRs in some geographic areas due to poor network coverage. A specialist consultant who regularly works outside his own Trust noted that network access permissions can be a barrier to EPR use when working away from his 'home' Trust site, highlighting that assumptions on which access is based do not fit all modes of working.

Material access issues highlight the localness of EPRs, in tension with the ambition for inter-organisational sharing which demands inter-connected access and recording-related processes. That material aspects of use may be a constraint reflects the largely autonomous nature of NHS Trusts and the need for robust information governance to manage the sharing of patient records in ways which protect patient privacy.

3.2 Distribution of Benefits

Benefits and disadvantages are not equally distributed, with hospital consultants acknowledging that junior doctors experience greater difficulties in gaining access to computers to view records, and that they do not have secretarial support to input clinical entries into EPRs on their behalf. In this respect secretaries shield consultants from having to alter their work practices too much and in this way consultants experience the benefits of the EPR without as many of the disadvantages.

Access to hardware also operates hierarchically so that if there is a shortage of computers there is an informal expectation that nurses, administrators, Allied Healthcare Professionals and junior doctors should give up a computer they are using for a consultant. Although not necessarily experienced as a burden or disadvantage by secretaries, the use of EPRs in hospital settings is reliant on their work, and it is acknowledged that anticipated efficiency gains from EPRs in terms of clinical activity must be offset against increased demands for secretarial time.

Users also reported that EPR use is associated with new information requirements and work responsibilities, reflected, for example, in an increase in recording compared with paper records. Furthermore in order to have an input into the ongoing development of EPRs users must invest time in keeping up to date with technical developments, and in training and familiarising themselves with the functionalities of the system.

3.3 Secondary Uses

An information-driven NHS entails increased demand for greater quantities of and more granular data. This is brought about in part by demand for internal and external accountability for use of resources and quality of care, and EPRs are envisaged as essential in supporting this strategy [35]. In this respect EPRs inscribe non-clinical purposes and agendas in addition to supporting clinical practice, and these include provision of data quantifying clinical activities and numbers and types of patients treated.

“Now you have to be able to not only *do* things to patients, you have to *prove* that you’ve done it. That’s the only way you get paid.” (GP, General Practice D).

This generates a requirement for diagnostic and treatment information to be captured in coded and structured form, for example, using Read codes, an alphanumeric coding scheme for representing diagnoses and treatments within electronic patient records, or drop down menus which provide a fixed set of options for documenting aspects of care. This places a demand on clinicians to record information in structured form, which they may not otherwise capture in this way for their own clinical purposes. One consultant expressed frustration that he could not order an ultrasound scan for a patient because the given body part was not available in the options for that field within the EPR. Restricting options for recording not only facilitates standardised clinical recording, it also constrains representation of reality and can therefore be used to present organisational activity in a better light [36].

The evidence-based medicine agenda is reflected in the use of EPRs as a mechanism to support the standardisation of clinical practice. In one participant hospital Trust, the EPR enables pre-configured sets of medications for anaesthetics and pain management use with certain categories of patient, which are provided in a drop down menu. This encourages the use of the standard prescribing protocols by making it easier to prescribe in this way and also therefore discourages clinicians from selecting more freely from available medications when prescribing. The protocols derive from National Institute of Health and Care Excellence¹ guidelines, thereby also making the EPR a tool to promote and legitimise the evidence-based medicine agenda.

This use of EPRs to encourage standardisation is linked with clinical audit and associated targets for care quality improvement, which acts as a form of performance management in relation to clinical practice. Recording in the EPR therefore reflects the accountability agenda, including that of medico-legal accountability.

“What is does is back up what you’re doing so anything to do you can be held accountable for so if anything went to coroner’s you’ve got proof that you’ve been doing your job.” (Nurse, Hospital B).

For certain conditions explicitly targeted by the Department of Health the EPR is used as a checklist of activities to ensure not only that a minimum standard of care, but that there is recorded evidence to demonstrate that targets have been met. Care quality targets are also tied to payments for Trusts’ services and additional financial incentives, for example, through the Quality Outcomes Framework for GPs and Payment by Results for hospitals. EPRs play a critical role in providing the evidence of

¹ <http://www.nice.org.uk/>

such activity and of the meeting of targets and other measures of performance against centrally defined criteria.

4 Discussion

Clinicians' experiences of EPR use are strongly mediated both by their material aspects and by the inscriptions that derive from non-clinical agendas, as outlined above. These inscriptions serve as mechanisms to enforce standards in clinical activity, not only through focussing attention on the achievement of targets and measurable indicators of good practice but also by selectively enabling and constraining particular recording practices which then feed into clinical behaviours.

Unsurprisingly users who have an interest in clinical research and management-related uses of data are more concerned about the availability of structured data than with narrative-style recording, with structured data more easily aggregated, while for clinical purposes narrative recording, for example in clinical notes, remains important. This highlights the tension between what is clinically useful and support for broader organisational objectives.

In general users are ambivalent but accepting of EPRs as a technology, creating a sense that use is inevitable and that there is no going back to paper records. This lack of criticality is recognised in other studies that investigate the implications of health information systems e.g. [37, 38], and arises, I suggest, because EPR use is entangled with the use of those inscriptions such that non-use is all but impossible and would disadvantage users. Moreover clinicians acknowledge the need to carry out some information activities for the wider benefit of the organisation.

In so far as non-clinical managerial and other agendas are inscribed within EPRs they are impossible to resist and as such power effects are played out through a variety of controls over clinical and non-clinical behaviours, mediated by the EPR. This pervasiveness therefore has implications for the ability of users to challenge or avoid non-clinical agendas. It is argued that the insinuation of an information system into the organisational context restructures users' entire social world, such that opposition becomes lost [39]. Their embeddedness within clinical activity means that EPR use tacitly acts to stabilise these inscriptions and legitimise the agendas of which they are a part. For example, their use to support performance measures such as those used in national league tables provides reciprocal legitimacy for both performance management mechanisms and for the EPR.

It is argued that an actor-network reshapes reality such that its existence becomes taken for granted [40]. In terms of users' limited criticality about EPRs it can also be argued from an Actor-Network perspective that the stabilisation of the EPR in any organisational context necessarily entails a reconfiguration of reality to accommodate the EPR such that it is hard to imagine the world without it. In this respect EPR use has become part and parcel of what clinicians do on a daily basis not only on a clinical level but also in terms of non-clinical activities around performance reporting and accountability. Once established such an entity may be taken for granted, hidden from view and closed to debate and scrutiny. This is particularly the case for infrastructures, which are by definition, intended to become 'part of the furniture' [26].

Nevertheless, it has been recognised within the Information Systems literature on power and information systems that users are not necessarily passive subjects in this

respect, and may use EPRs to ‘play the system’ to their advantage e.g. [41], for example to produce more positive self-representations. Within this study users reported using data from EPRs as evidence to support their own performance appraisals and also to exploit the ways in which EPRs focus attention on particular measures to present their organisation in the best light in various ‘figures’. One GP noted that performance targets imposed by the UK Department of Health had skewed clinical recording such that it had become a running joke among GPs that the Quality Outcomes Framework has “cured depression overnight”, alluding to the observation that GPs are more reluctant to record diagnoses which entail setting in motion a set of clinical activities that are perceived as laborious.

Where benefits are experienced from inter-organisational sharing of patient information, this has been partial and related to particular sub-sets of patient information, such as the diabetes element of the EPR, and communication of tests and results.

5 Conclusion

Using Actor-Network Theory as a methodological approach reveals a range of interests and relationships implicated in the achievement of the EPR as a technological phenomenon, incorporating both clinical and non-clinical agendas. Reporting findings about clinicians’ experiences of day to day EPR use grounds the envisioned aim of a nationally networked EPR within local realities. The ideal of a networked EPR as an infrastructure and enabler of wider uses of patient information has only been partially realised. Clinicians make use of certain aspects of inter-organisational sharing via EPRs, however low uptake and use of the national Summary Care Record, and low usage of the specialist hospital’s EPR indicates that these instances have as yet failed to translate clinical interests in such a way that they can stabilise.

While the nationally networked EPR has not yet been realised, additional risks and responsibilities associated with EPR use are nevertheless related to the overall information strategy of which this is a part. While there are undoubtedly benefits to users, disadvantages also have to be absorbed in terms of additional responsibilities, such as increased recording, capturing information in coded form, and greater scrutiny of clinical practice which relate both to material aspects of use that mediate access within given use settings and inscriptions of non-clinical agendas.

EPRs bring benefits to clinicians in a number of fundamental ways, centred on more reliable access to patient information as compared with paper records, both for the records themselves and in terms of the availability of greater quantities and more sources of information about patients.

However, benefits and disadvantages are not experienced equally by all groups of users, such that EPRs may in some respects reinforce existing hierarchies and professional boundaries. This supports Vikkelso’s [42] conceptualisation of technologically enabled organisational change in terms of shifts and redistributions rather than simply in terms of improvements. In this way the study reinforces findings from the literature that suggest that EPRs may be less transformative than expected because users try to minimise the impact on their work practices [29]. This also challenges the assumption that EPRs and health information systems will straightforwardly empower healthcare professionals by liberating them from certain activities and through increased and

more democratic access to patient information, as acknowledged in the literature e.g. [42].

This study, by taking a meso level approach, offers an analysis of the EPR across a number of local instances, recognising it as a multiple research object. The research contributes to the literature on this topic by analysing benefits to clinical practice in relation to EPRs as local applications and as national infrastructure. It suggests that to date benefits have largely been experienced in relation to local organisational EPRs, restricted in networkedness to individual Trusts, challenging expectations behind the original objective of infrastructure-like nationally networked records. The benefits of the various types of EPR and the roles they play in supporting clinician's work practices will have implications for the successful achievement of EPRs as technological innovations, and will influence the feasibility of achieving the government's long-term vision for the information revolution in healthcare.

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