e-Health – For Continuity of Care
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e-Literacy in health care

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Abstract. This paper explores notions of e-Literacy (otherwise IT literacy or digital literacy) in health care. It proposes a multi-dimensional definition of e-Literacy in health care and provides suggestions for policy makers and managers as to how e-Literacy might be accounted for in their decisions.

Keywords. Health care, e-Literacy, IT literacy, information systems, electronic prescription, electronic patient record, information systems implementations

Introduction

The digitalisation of health care today involves core clinical functions, requiring health care professionals (HCPs) to use a multiplicity of information systems (IS) and digital devices. To make effective use of them HCPs need a variety of skills, which we refer to as e-Literacy. This term, partly replacing the earlier term of IT literacy, signifies a useful shift from a narrow focus on technology and its direct use (e.g. being able to use a keyboard or a word processor), to a focus on purposeful use (e.g. using IS to make an appointment for a patient, to code a diagnosis or treatment, or to send an electronic note to another HCP). The literature on e-Literacy (or digital literacy as it is also called) is substantial [1] but most studies related to health care are concerned with patients or citizens using web-based health sites [2, 3]. Similarly many studies on implementation of IS in health care emphasise the importance of IT skills for HCPs but seldom elaborate on the nature of those skills.

This paper draws on studies of implementations of electronic patient records in secondary care and of the routing of electronic prescriptions in primary care in England's National Health Service (NHS) to explore notions of e-Literacy in health care. It proposes a multi-dimensional definition of e-Literacy in health care and provides suggestions for policy makers and managers as to how e-Literacy might be accounted for in their decisions.

1. Methods

We draw on our research experience in the field of IS in health care spanning more than a decade. In particular, reference is made to findings from two research projects for the evaluation of two English NHS National Programme for IT initiatives – the NHS Care Records Service (CRS) in hospital settings (project 1), and the Electronic Prescription

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Service (EPS) in primary care (project 2)[2]. These evaluations began in 2008, and were completed respectively in February 2011 and January 2012.

These were large longitudinal studies of a national scale. A team of researchers were involved from four Universities in England and Scotland. A mix of research methods were applied, including observations of work practices and doctors' clinics, interviews with stakeholders, survey and documentary analysis. Across the two studies, empirical research was conducted in a variety of settings, including 17 NHS Hospital Trusts, 7 general practice surgeries and associated high street pharmacies. Among our research participants were hospital doctors and general practitioners, nurses, hospital and community pharmacists, allied health professionals, receptionists and clerks, administrators and managers, IT implementers and trainers, all involved in different ways in the implementation and adoption into use of new health IT. The studies were reviewed by NHS Ethics Committees and classified as service evaluations; informed consent was obtained from participants; all data – transcripts of interview recordings and field notes - were anonymised so that either individuals and/or their organisations would not be identifiable.

Further details on the methods for each of the two studies can be found in the project publications (e.g. [4, 5]).

2. Results

This section highlights key findings from the two studies described above in relation to the systems use and e-Literacy.

2.1. Project 1 - the NHS Care Records Service: implementation of Electronic Patient Records in secondary care

Attitudes towards IT / Self efficacy

HCPs revealed a variety of attitudes towards IT. Some HCPs in principle welcomed IT but had reservations about the particular systems in use. Others feared how IT would impact their working lives. Confidence in being able to use the systems (to follow the screens, to input data) varied between professionals.

Nurses, in particular, were perceived (by other professional groups and at times by themselves) as having poor knowledge of IT. But this view was not supported by all: "*Everybody is at a different level with computers aren't they, but it's not a particular issue, because it's easy to use. ... We've all been trained in it and nobody has ever said that they can't use it any more. It's a practical thing, the more you use it then the more familiar you get with it."* (Nurse 1, Site C)

Experience of training

Opinions regarding the experience of training varied from very negative to decisively positive. In all the sites users felt that support from trained individuals within their own team was most valuable. A common complaint was that the training

[2] "An Evaluation of the Implementation and Adoption of the NHS Care Records Service (NHS CRS) in Secondary Care in England" (CfHEP005) - http://www.birmingham.ac.uk/research/activity/mds/projects/HaPS/PHEB/CFHEP/reports/projects/005.aspx, and the "Evaluation of the Electronic Prescription Service in primary care" (CfHEP004) - . http://www.birmingham.ac.uk/research/activity/mds/projects/HaPS/PHEB/CFHEP/reports/projects/004.aspx. Two of the authors (TC and VL) have been involved in both projects, one author (EK) was involved in CfHEP005.

was too early and the material was forgotten by the time it was needed to be put to use. Other criticisms included concerns that training was *'"not sufficient"* and *"rushed"*. In some Trusts, users felt that the training *"was way too broad based and too generic and it missed a point"* (HCP, Site D) and that it *"didn't focus precisely on the bits of the system that we had to use and was not about the actual workflow that we would be doing"* (HCP, Site D). Thus HCPs perceived that the training was on the direct use of the system (buttons and interfaces) rather than on its purposeful use (e.g. to get jobs done and problems solved).

Dimensions of e-literacy

e-Literacy as a set of basic computer skills

Some HCPs (those with little exposure to IT) were predominantly concerned with their ability to 'use computers' and in particular to type fast. IT staff also defined skills needed by HCPs to use the system in very narrow, often technical terms: "*It's not hard—it's not something that's really technical hard; it's just about inputting information. [...] I think a lot of them don't feel confident and they are frightened."* (Configuration Architect, Site C).

e-Literacy as a purposeful use

Yet, HCPs' attitudes to the new systems were not simply shaped by their level of IT skills but also by concerns about the fit of the system with work practices. Their comments about the training indicate that they saw 'being able to use the system' as ability to perform their work, not as a set of abstract or isolated skills.

e-Literacy as sense making

Others sought even deeper understanding of the system they were asked to use*: "I think that the understanding of [the IS] by us, clinicians is not good. I think we need to understand. [..] I think perhaps what we should have had is education about what it meant. What the outcome might be and how we might understand how the system actually works, that would have been useful.* (HCP, Site C)

At the time of the research it was too early for the new practices to be fully institutionalised and new innovative ways of working to emerge, taking full advantage of functionalities offered by the new IS being implemented (the NHS CRS systems). Our research does however indicate that as time passed the HCPs learned new IT skills, become more familiar with computers in general and specifically with the new IS. They developed their understanding of what such system might mean for their work at present and perhaps in the future.

2.2. Project 2 - the Electronic Prescription Service in primary care

Dimensions of e-literacy

e-Literacy as practical knowledge of IS

In this study most of the users had already gained some familiarity with the new IS introduced in their primary care clinic. They often had developed an understanding of the idiosyncrasies of the system and the work context of its use, as the following observation notes indicate: "*The receptionist receives the request for a prescription and processes it; she explains that 'if she presses Request, then it goes in a box [inbox/workflow] and the doctor never sees it, it gets lost'. So instead she tells me if she re-authorises it (and produces a new one) then the doctor sees it*."

"*with [the new IS] you have to be careful because the last patient record you have accessed gets automatically reselected. Any action you are doing can get recorded under that record*"

e-Literacy as practical knowledge of IS in work context

Knowing how to use the system effectively also means being familiar with the context (understanding IS through understanding the work context), rather than having an abstract knowledge of the technology. This may call for pre-empting problems, knowing the next step before it happens and knowing that something should happen. For example, one of the authors observed that when a member of staff could not find prescription requests which should have arrived by email she checked the previous system (the webmail). She returned with a few requests printed out and commented: "*I thought it was funny, even if it was only one, we would have had something"*.

e-Literacy as whole system understanding

This requires users to understand why in certain cases the system's output might not be as expected and be able to predict the system's behaviour, e.g. to see why items prescribed might not make an electronic prescription. Some of the existing software provided limited feedback on why this was the case, but not all system messages (e.g. error messages) were informative. More complex cases may involve understanding the effect data entered in one field might have on other fields, as relationships between fields/areas of the system may not be immediately perceivable.

"*[The software] generates automatic warnings for patients under/over use of medications. But the system only generates automatic warnings if the GP enters correct data in the field 'Duration' and GPs do not understand the meaning of this field and do not use it correctly. Also, warnings are set too low, generating too many false alarms and therefore GPs prefer to switch them off*." (GP and ex-member of software supplier User Group).

3. Discussion

3.1. Conceptualising e-Literacy

Table 1 depicts different dimensions of e-Literacy that underpin effective use of IS in health care, as illustrated by our research.

Table 1. Dimension of e-Literacy in health care

Dimensions e-Literacy as:	Description
Self-efficacy, Motivations and Attitudes to IT	Attitudes to using IT. Beliefs regarding having (or not) the appropriate skills / abilities.
Computer skills	Set of (abstract) skills that an individual needs to acquire to use the system, such as typing, navigating sites, etc.; ability to 'input data'.
Purposeful use /Practical knowledge of IS in work context	Ability to use the system to perform health care related work. Higher level: understanding system's idiosyncrasies, anticipating problems, knowing what to look for and where.
Whole-system understanding	Understanding interdependencies of the socio-technical system. This may include understanding how the data will be used by other parts of the system, and by other HCPs, managers, researchers, etc.
Sense making	Sense making or working out meanings and implications of ITs for individuals, groups, or organizations (e.g. for professional identity).
Innovating and transformation processes	Understandings and beliefs regarding IT potential to transform health care. Ability to innovate with IT.

Medical work is usually done in groups or teams and in co-operation with others and IT has to be integrated in this context [6]. A higher level e-Literacy implies an

ability to understand how *others* work might be mediated through use of IT, how different parts of a system connect and how different systems are interconnected. This includes seeing relationships between fields and the consequences of data manipulation beyond its first intended purpose. In the case of health information exchanges such as the routing of prescriptions between organisations, connecting prescribing software with a range of dispensing software, central repositories, and different data dictionaries, require a relatively higher level of e-Literacy.

e-Literacy is certainly not acquired once for a lifetime but is dynamic and changing. Innovative ways of delivering health care utilising new technologies, from texting to health related Web 2.0 applications, demand new set of skills from health care professionals, and may also requires some old skills to be set aside.

We thus propose the following definition of e-Literacy in health care:

> *a dynamic and context-specific ensemble of the skills, attitudes and understandings necessary and appropriate for working with digital tools and systems (including computers, smart phones and other devices) in order to perform health care related tasks both individually and as part of a team, and to participate in processes of (technology-led) change within institutional settings*.

3.2. Implications for practice

Our conceptualization of e-Literacy in health care has implications for the way IS implementation and post-implementation activities are organized. For example, managers need to support 'sense making' activities, i.e. to assist individual and groups in 'working out' what the new system means for them and their work. There is a need for more focus on 'what you are communicating and to whom' instead of 'what data needs to be entered and where'. Although some formal training before a system is implemented (i.e. before it goes 'live') is needed, on-going support and 'learning-by-doing', including collaborative learning should be emphasised. Perhaps it also means that organizations are never fully 'ready' for the implementation of a new system. They need to prepare themselves but also to allocate significant resources towards on-going support and learning. Indeed it is as people develop their e-literacies that they might find ways for innovative uses of IS.

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