The Hayes principles: learning from the national pilot of information technology and core generalisable theory in informatics

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ABSTRACT

Background There has been much criticism of the NHS national programme for information technology (IT); it has been an expensive programme and some elements appear to have achieved little. The Hayes report was written as an independent review of health and social care IT in England.

Objective To identify key principles for health IT implementation which may have relevance beyond the critique of NHS IT.

Outcome We elicit ten principles from the Hayes report, which if followed may result in more effective IT implementation in health care. They divide into patient-centred, subsidiarity and strategic principles. The patient-centred principles are: 1) the patient must be at the centre of all information systems; 2) the provision of patient-level operational data should form the foundation – avoid the dataset mentality; 3) store health data as close to the patient as possible; 4) enable the patient to take a more active role with their health data within a trusted doctor–patient relationship.

The subsidiarity principles set out to balance the local and health-system-wide needs: 5) standardise centrally – patients must be able to benefit from interoperability; 6) provide a standard procurement package and an approved process that ensures safety standards and provision of interoperable systems; 7) authorise a range of local suppliers so that health providers can select the system best meeting local needs; 8) allow local migration from legacy systems, as and when improved functionality for patients is available.

And finally the strategic principles: 9) evaluate health IT systems in terms of measureable benefits to patients; 10) strategic planning of systems should reflect strategic goals for the health of patients/the population.

Conclusions Had the Hayes principles been embedded within our approach to health IT, and in particular to medical record implementation, we might have avoided many of the costly mistakes with the UK national programme. However, these principles need application within the modern IT environment. Closeness to the patient must not be interpreted as physical but instead as a virtual patient-centred space; data will be secure within the cloud and we should dump the vault and infrastructure mentality. Health IT should be developed as an adaptive ecosystem.

Keywords: computers, health policy, health planning, medical informatics, medical record systems: computerised

The Hayes principles

The Hayes report is written as a critique of the current NHS IT programme in England; however, in our view these principles are much more broadly applicable and plans for new IT systems or existing systems could be evaluated against them.
The Hayes report sets out some clear principles for the purpose, design and effective implementation of IT systems in health care: the Hayes principles. In other domains sets of principles have proved useful, and in our domain the Caldicott principles have stood the test of time. The principles within the Hayes report can be gathered into three groups: patient-centred; subsidiarity; and strategic (Box 1).

The National Pilot of Implementing Technology (NPoIT)

This editorial critiques the NHS IT programme using the Hayes principles. We have misnamed NPfIT – the National Programme for IT (NPOIT) – the National Pilot of Implementing Technology. Our view is that the NPfIT is a massive pilot of a largely untested approach to providing IT on a health service scale. And, like all large programmes there will inevitably be successes and failures. The vital thing is that we learn from these successes and failures, as if we neglect to do this much resource may continue to be wasted.

Successes

NHS number

Providing a unique identifier for patients has been a real step forward. It has enabled records in primary and secondary care to be linked and has improved the reliability and accuracy of the denominator allowing more accurate estimates of the prevalence of disease. There are downsides – the principle ones in primary care have been: 1) babies did not initially have NHS numbers; and 2) the NHS number is not the unique key identifying the patient in the general practice electronic patient record (EPR) system. This means it is possible to end up with duplicate NHS numbers on general practice computer systems and there can be multiple uses of a temporary NHS number.

Electronic X-ray images

Electronic X-ray images, which can be more easily forwarded using the Picture Archiving and Communication System (PACS), have been extremely successful.

Box 1 Extraction of the key principles within the Hayes report

Patient-centred principles
1. The patient must be at the centre of all information systems
2. The provision of patient-level operational data should form the foundation – avoid the dataset mentality
3. Store health data as close to the patient as possible
4. Enable the patient to take a more active role with their health data within a trusted doctor–patient relationship

Subsidiarity principles
5. Standardise centrally – patients must be able to benefit from interoperability
6. Provide a standard procurement package and an approved process that ensures safety standards and provision of interoperable systems
7. Authorise a range of local suppliers so that health providers can select the system best meeting local needs
8. Allow local migration from legacy systems, as and when improved functionality for patients is available

Strategic principles
9. Evaluate health IT systems in terms of measureable benefits to patients
10. Strategic planning of systems should reflect strategic goals for the health of patients/the population

Pay for performance (P4P) monitored using routine data

The Quality and Outcomes Framework (QOF) – using routine computer data to monitor quality – has been more successful than might have been anticipated. However, it exposes a potential weakness in the use of a comprehensive coding system. The P4P only uses a limited number of codes to count towards the quality target. A general practitioner (GP) may have treated the patient properly and coded that they have done so in the computer system, however, if the code used is not on the limited list then it will not attract P4P. There are pros and cons to this, and this form of P4P requires the practice to have a ‘dataset mentality’ (Principle 2). We may also be over-alerting about possible drug interactions to an extent which may not be helpful to patients.
Pathology links

Linking laboratories to general practice computer systems, although started before the NPoIT had begun, has become nearly universal. These links enable pathology results to be posted electronically into the patients’ records.

Mixed

Health services’ own drug dictionary

The NHS Dictionary of Medicine and Devices (DM and D) was created to produce a standard reference source for medications. However, one system (EMIS LV) has functioned in the long term using British National Formulary chapter headings; and every day in clinical practice we prescribe something which triggers the response ‘No DM and D code’. We also have clinical codes for medications – currently the Read system – not to mention the fact that all drug interaction alerts are linked to yet another classification system. The question needs to be asked as to whether all these parallel drug dictionaries need to be funded?

Can we find information we need in a large coding system?

The rationale for a large, complex terminology is that all the concepts a clinician might need to use are contained within it. There are, however, several problems with this:

1. There are so many different ways that the same concept might be represented that it can be found in many different parts of the coding system: the same problem might be represented as ‘Cough’, ‘Night cough’, ‘Cough and wheezing’, ‘Bronchitis’, ‘Asthma’ and so on. This makes it very difficult to find information. It is no surprise to me that even with the relatively simple Read system P4P insists on a limited list of codes.

2. In polyhierarchical systems the problem is magnified. In a simple, hierarchical family tree-like system such as Read version 2 it is possible to identify cases by searching further up the coding hierarchy – e.g. C10 for all types of diabetes; however, in a polyhierarchical system, like Read Clinical Terms version 3 (CTv3) or the Systematised Nomenclature of Medicine Clinical Terms (SNOMED CT), terms have so many ‘child’ codes this is rarely helpful.

3. Finally, although there is scope to represent multiple concepts there are no definitions of any of the terms. Whilst people seek ‘semantic interoperability’ between systems there are absolutely no guarantees that one clinician’s or clinical coder’s ‘asthma’ or ‘liver cancer’ is the same as any other’s.

There is an argument that a smaller coding system might provide more benefits – but no research is being carried out to test this argument.

Failures

Summary care record

The summary care record is driven by hypothecated clinical need. It was anticipated that a summary record must inevitably have benefit for patients. The research to demonstrate this is lacking.

My Health Space

Again, providing web-space for patients was presumed to be a good thing, but went unnoticed by many patients. A combination of niche provision (such as patients being able to browse their dialysis data) and local provision (such as the ability to browse one’s own general practice record) meets the Hayes principles of sharing data in a trusted environment and keeping data local to patients.

Pursuit of interoperability and the expense of usability

The attention of many EPR suppliers has been on interoperability and engaging in an assessment schedule which has distracted them from improving consulting room functionality.

Manager purchasers who put management data ahead of clinical care and child safety

The greatest problem of all has been the manager purchaser who places management data ahead of patient care. In SdeL’s locality child health data will now be split between a community silo and the general practice EPR system, rather than sharing the general practice electronic record. The same managers have barred their nurses from entering any data into the general practice EPR, offending the first Hayes principal – such actions should not be acceptable in any health system, nor to professional bodies.

Core generalisable theory in primary care informatics

We still lack what should be the broad, generalisable principles in informatics and the Hayes principles may fill part of this gap. The Hayes report should not only
be remembered for its critique of the great national pilot of IT, but also as a statement of more generalisable principles.

Our current theory is relatively limited – we have a definition, two laws and a limited number of theoretical models, and a limited literature on evaluation.

Definition of our discipline

The only published definition of our discipline, primary care informatics, is patient and health centric and very much aligned with the Hayes principles.13

First and second laws of informatics

The first law of informatics is that data may only be used for the purpose for which it is recorded.14 When combined with the first Hayes principle, the focus of data collection in EPR systems de facto becomes patient care. It is not possible to combine the first law and the first Hayes principle in any other way. The second law says you can break the first law if you fully understand the context within which the data are recorded.15 Secondary use of data is acceptable – but it is secondary use, modulated by the recording context.

Theoretical models for IT implementations

Few models have been created to describe the scope and context of IT implementations. Lusignan and Chan have described informatics at the intersection of the: 1) organisation, 2) individual, 3) clinical task and 4) technology,16 while Greenhalgh and Stones suggest that big IT projects are looked at in terms of the co-evolving social structures and human and technological interaction17 and Ellis suggests that we should use the model of complex adaptive systems.18

Evaluation

There are also few schemas for the evaluation of IT implementations. Socio-technical models provide a useful framework for the scope and dynamic nature of implementations.19 However, more structured frameworks are found in Friedman and Wyatt’s classic work, where they seek to join quantitative and qualitative traditions under objectivist and subjectivist headings.20 More recently Greenhalgh has aligned the many research traditions involving the electronic record into concepts of the EPR: 1) EPR as a container or itinerary; 2) the EPR user; 3) organisational context; 4) the clinical work; 5) process of change; 6) implementation success; and 7) complexity and scale.21 However, these may lack the focus on patient benefit set out within the Hayes principles.

Conclusions

It is vital that a young discipline like informatics not only learns the lessons from this report but also extracts the principles from it and applies them to future health IT projects. Had we had the Hayes principles ten years ago – and if they had been widely accepted as part of the core generalisable theory within our discipline – would we be where we are today? Our view is that we would not even have planned, let alone tried to implement, some of the parts of the ‘national pilot’ and might have had a wider choice of systems competing to demonstrate their ability to deliver greater health gain.

What next in health IT?

So, where do we go from here? We believe that it is vitally important to see the Hayes report as the beginning of a much bigger adventure for health IT. There are two directions that we would like to see pursued.

First, whilst the report focuses on functionality, when it comes to the hosting of data and provision of services significant additional benefit can be gained through leveraging the latest developments in cloud computing. Whilst we support the principle ‘store health data as close to the patient as possible’, we see that ‘closeness’ as being within a virtual space in which the patient is central and has a strong feeling of ownership and control over their own data. The data is close to them in so far as they can see it, update it and have full control over choosing with whom to share it. Physicians and informaticians must dump the ‘vault and infrastructure’ mentality,22 and instead properly exploit the data centre efficiencies, economic advantages and the agility that can be achieved through modern ‘cloud’ architectures and the use of ‘software as a service’ deployment styles for an ‘e-health application store’.

The second is to embrace the complex adaptive systems/digital ecosystems approach to developing health software services. The behaviour of any system emerges from the interaction between that system and related systems and the context within which these systems are placed.

We must next build an agile health IT ecosystem that can evolve and adapt as both patients’ and practitioners’ experience grows.
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