The implications of e-health system delivery strategies for integrated healthcare: Lessons from England

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ABSTRACT

Purpose: This paper explores the implications that different technical strategies for sharing patient information have for healthcare workers and, as a consequence, for the extent to which these systems provide support for integrated care.

Methods: Four technical strategies were identified and the forms of coupling they made with healthcare agencies were classified. A study was conducted in England to examine the human and organizational implications of systems implemented by these four strategies. Results were used from evaluation reports of two systems delivered as part of the NPfIT (National Programme for Information Technology) and from user responses to systems delivered in two local health communities in England. In the latter study 40 clinical respondents reported the use of systems to support integrated care in six healthcare pathways.

Results: The implementation of a detailed care record system (DCRS) in the NPfIT was problematic because it could not meet the diverse needs of all healthcare agencies and it required considerable local customization. The programme evolved to allow different systems to be delivered for each local health community. A national Summary Care Record (SCR) was implemented but many concerns were raised about wide access to confidential patient information. The two technical strategies that required looser forms of coupling and were under local control led to wide user adoption. The systems that enabled data to be transferred between local systems were successfully used to support integrated care in specific healthcare pathways. The portal approach gave many users an opportunity to view patient data held on a number of databases and this system evolved over a number of years as a result of requests from the user community.

Conclusions: The UK national strategy to deliver single shared database systems requires tight coupling between many users and has led to poor adoption because of the diverse needs of healthcare agencies. Sharing patient information has been more successful when local systems have been developed to serve particular healthcare pathways or when separate databases are viewable through a portal. On the basis of this evidence technical strategies that permit the local design of tight coupling are necessary if information systems are to support integrated care in healthcare pathways.

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1. Introduction: e-health systems and integrated care

Coordinating healthcare in complex cases can involve many different healthcare agencies and a major goal in many

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countries is to use e-health systems for health information exchange in order to share information about patients across agencies in order to promote 'seamless' care. One of the debates about achieving this goal is the organizational level at which it has to be undertaken: it cannot, for example, be achieved completely 'bottom up' with every healthcare agency developing its own system because this would make it very difficult to share information between agencies. Is it necessary therefore to have a 'top-down strategy' where systems are defined at a national level? Or could there be, as Coiera et al. [1,2] have suggested, a 'middle out approach' where systems are defined at the level needed for coordinated care? An issue that is linked to, but conceptually separate from, the question of the organizational focus of the development is the technical strategy used to deliver the shared information service. It is notably that at the top down, middle-out and bottom-up levels a number of different technical strategies are in use around the world. The questions this paper addresses are (i) what implications do the different technical strategies have for the users of shared patient information and (ii) how does the choice of technical strategy relate to the organizational focus of design?

This paper reports findings about the use made of national e-health systems deployed in England and findings from a study in two local health communities in England that looked at the extent to which e-health systems support health information exchange across the organizational boundaries between healthcare agencies. This was the EPICOg project (Electronic Patient Information Crossing Organizational Boundaries) [3]. The systems that were investigated in this study were the products of both national and middle out strategies and used a number of different technical strategies. This enabled us to examine the implications of the different strategies for the sharing of patient information by healthcare staff engaged in the delivery of care. We have used the broad term 'e-health' to refer to all of these systems because, although they all hold electronic patient information, they may take many different forms.

The first section of this paper outlines the technical strategies that were in use. The implications of these strategies for the users of the systems are then reported together with their responses to system deployment. The paper concludes with an exploration of why users responded in different ways to these technical strategies and discusses the implications for the delivery of e-health systems to support integrated health care.

2. Alternative technical strategies for the delivery of e-health systems

In Fig. 1 different technical strategies for healthcare information management are identified that were found in practice in the EPICOg project and that are in use in different parts of the world. We have used the concept of coupling [4,5] to differentiate between these strategies. Coupling is a systems concept that defines the relationship between sub-components of a system. A tightly coupled system is one in which a change in one sub-system has a direct and significant impact on another component. In a loosely coupled system sub-components may be part of the same system but a change in one does not

directly affect the other or, if there is an impact, there are contingencies that mean the impact can be moderated. In this study we are concerned with the database of patient records delivered by each of these technical strategies and the degree to which it is coupled to user systems, i.e. the processes by which healthcare workers contribute to and make use of electronic patient records. In examining coupling in relation to the sharing of electronic patient information we have explored three elements that relate specifically to the data held in these systems: tightness, range and scale. We have placed these strategies on a scale from tight to loose coupling in Fig. 1. In this context a tightly coupled e-health system is one in which all users are working with an identical database of patient records. Working with a tightly coupled system gives a user the benefit of shared functions and data but at the cost of losing local discretion and control. Users have to provide data in prescribed ways and make use of the data in the form that it is provided. A loosely coupled system is one in which, whilst there are ways of sharing patient data, users may be using different databases and may therefore retain some local control over what they input to the system and how they use it. The second component of coupling is the range of data being shared and therefore involved in the coupling. A system may, for example, provide comprehensive patient data or only a sub-set of the information available about a patient. The final component is the scale of the population using the coupled system. At the extremes the system may be available to all healthcare workers in a nation or may be restricted to two specific healthcare agencies that are cooperating in a particular healthcare pathway.

Fig. 1 identifies four strategies for health care information management that were found in use. The tightest form of coupling was a comprehensive patient database system that was to be used across a whole health service. This was the Detailed Care Record System (DCRS) implemented as part of the NPfIT (National Programme for Information Technology) in England [6]. This was a national system intended to contain a wide range of data accessible by a large and diverse population of healthcare professionals. Another strategy is to achieve tight coupling at a national level but only in respect of a sub-set of patient data as in the National Patient Summary (NPO) in Sweden [7] and the Summary Care Record (SCR) in England [8]. In both cases the intention is that this limited set of data be made available to a large-scale population. A strategy that has existed for many years is to support specific healthcare information exchange, i.e. to provide a system for sharing a limited set of patient data in support of a particular process and between a limited set of healthcare agencies, for example, in providing pathology laboratory reports (e.g. Path Links in the UK) or e-prescription systems. We have defined this as a looser form of coupling because the tight link is restricted to a particular healthcare function and only a limited set of users share data using the system. Another looser form of coupling is the portal approach in which, via a web browser, a user can view the information held about a specific patient held on a range of different databases. This approach is a looser form of coupling because each agency is able to maintain its own database whilst enabling sharing by permitting 'read only' access to others. This approach can enable a large number of users to share a wide range of information. This is the approach adopted in