

A New Approach to Connecting Information Systems in Healthcare

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1 Introduction

A novel approach to managing the information needed by healthcare practitioners working collaboratively to care for a patient is described. Traditionally, healthcare information systems have been disease focused, containing patient data related only to a specific function or concern, such as laboratory results or a particular disease. As healthcare is moving toward a collaborative, patient-centric approach which involves care teams comprising a range of health professionals with different needs, skills and working practices, they require up to date, reliable access to more comprehensive patient data; Data which is currently spread through databases at several treatment centres including hospitals, GP's surgeries and palliative care centres. Additionally, this information must be accessible without disrupting the current systems and services provided by each institution from these systems. A new approach to data sharing based on Virtual Organisations (VO) with a Service Oriented Architecture (SOA) which will allow patient-relevant data to be accessed from the diverse sources available is presented. Preliminary requirements and challenges that such an approach will need to meet are presented, and the approach is compared with existing approaches to illustrate its applicability to this domain. Finally, results and future work are covered.

2 Background

Traditionally, healthcare information systems have been organised around departments and services (such as oncology or laboratory test requests and reporting)[1]. While this served the needs of a healthcare professional working in isolation, the move towards a collaborative approach has led to the creation of multidisciplinary care teams (MDTs) working at different organisations [2, 3]. Each MDT will be different, and the composition of the MDT (people and roles) may change over time as treatment progresses. Similarly, the information requirements of the team will vary with stages of treatment and be specific to the patient. The information required by a member will be unique and will vary with time. An MDT approach results in increased communication needs between team members [4], which current systems cannot readily support [5]. Thus, information provision must change to meet these new requirements without affecting current working practices too radically.

3 Challenges

The move towards a MDT approach introduces several information challenges [6]:

- The secure handling of highly sensitive personal data;
- The location of a particular piece of data cannot be pre-determined.
- Handling any number of information systems, practitioners and patients, where each patient has a distinctive care pathway (no one data model can be expected to serve all practitioners' needs);
- Provision of data from heterogeneous databases in a secure environment;
- Provision of required information in the right time without disrupting existing services provision (current systems should remain autonomous).
- The need for a flexible approach accommodating the dynamic nature of health services;
- The need to access historical as well as recent patient data; and
- The need to access external data sources e.g. information about adverse drug reactions.

4 Virtual Organisation Approach

A Service Oriented VO (SOVO) approach is proposed to meet these challenges. This approach supports local autonomy through a modified federation of databases. Identified data is supplied to the VO through a wrapper. Each legacy system has an individualised wrapper, allowing data structures to be adjusted within the wrapper. This means that the VO does not require an enrolled system to conform to a particular data model.

This consists of an access management database, a software component, and constituent databases. The management database records care teams, practitioners, patients, and their relationships. The software component accesses both the management and constituent databases and presents an appropriate view of that data to each user. Constituent databases consist of existing healthcare databases currently in use at care facilities, which have been enrolled in the system.

An individual VO is created for each MDT, which allows limited access to the databases associated with the team's members. Specifically, the system only allows team members to access data about their patients, and can further limit access depending on the individual's information needs, so providing additional security to a patient's data.

Information required by each team member depends on his/her role, hence, developing a 'universal' internal data model to meet everyone's needs is not appropriate. Also, forcing all data into a common data model ignores the diversity of current systems. Hence, our architecture uses several distinct internal data models, which reflect the information system being accessed and the role of the team member. That is, each view will have its own data model, and each system contributes to the views differently. In order to achieve this goal, information requirements need to be determined for each team role, and interfaces designed accordingly. Also, since the