

## Chapter 2.6

# A Framework for the Design of Web Service Based Clinical Management Systems to Support Inter and Intra Organizational Patient Journeys

**Carolyn McGregor**

*University of Western Sydney, Australia*

### **ABSTRACT**

The clinical management of premature and ill term babies is challenged by the necessity of several inter and intra organizational patient journeys. Premature and ill-term babies born in regional Australia and Canada must be moved to another hospital with Neonatal Intensive Care Unit (NICU) facilities. NICU babies requiring surgery must be moved to a Level IV NICU for surgery. Current clinical management supports the transfer of limited patient data via paper or telephone exchange. In this article a framework for the design of Web-service-based clinical management systems to support inter and intra organizational patient journeys is presented. A series of Web services are described and integrated and coordinated through BPEL processes enabling greater support for inter- and intra-organizational

transfer of patient data. This framework is demonstrated through a NICU case study. A key benefit of this framework is that it enables the establishment of “on demand” patient journeys eliminating the need to establish permanent point-to-point connections.

### **INTRODUCTION AND MOTIVATION**

Healthcare and specifically the allocation of funds towards improved provision of healthcare via improved patient journeys represents a significant portion of the Australian, USA, United Kingdom, and Canadian National Budgets (Curry, McGregor, & Tracy, 2006).

Patient Journeys document a pathway of Clinical Management guidelines that represent the patient’s journey through treatment and care.

Clinical Management systems are designed to assist care providers in diagnosis and treatment using existing already established methods of diagnosis and accepted treatments (Gross-Portney & Watkins, 2000).

Health care redesign and in particular patient journey redesign (also sometimes referred to as patient pathway or flow) involves analyzing the overall processes involved with the intra- and inter-organizational movement of a patient and then identifying how this journey can be improved via the removal of wasted and excessive activities, process duplication and improved communications between the patient, their carers and the clinicians involved with the journey itself. Process redesign techniques have been used extensively in the business, manufacturing, and computing domains for many years but it is only recently that process improvements in healthcare have been achieved through similar reengineering approaches (Curry, McGregor, & Tracy, 2006).

In general, the research, development and adoption of new information technologies (IT) and information systems (IS) within the healthcare domain is currently lagging behind other industries (McGregor, 2006; Wu, Wang, & Lin, 2005).

Web services enable standardized information exchange through XML messaging. Business Process Execution Language for Web services (BPEL) (Andrews et al., 2003) provides a mechanism to integrate and coordinate the invocation of several Web services within the structure of a business process. Web-service-enabled Patient Journeys have the potential to significantly impact the effective expenditure of these funds by enabling paradigm shifts in Clinical Management.

This article presents case study based research supporting the development of a framework for the design of Web-service-based Clinical Management systems to support intra- and inter-organizational patient journey workflows. The framework enables the modeling of existing patient journeys and supports the reengineering

of these patient journeys to improve communication between clinicians and remove duplication, wasted, and excessive activities. Web services are designed that enable greater support for inter- and intra-organizational transfer of patient data. This research builds on existing model-driven Web services integration and development research (Bordbar & Staikopoulos, 2004) by further applying these concepts researched within the business context to the domain of clinical management activities within a patient journey. To facilitate the coordination of the complete inter and intra organizational patient journeys, Business Process Execution Language for Web services (BPEL) is used as BPEL enables the generation of executable workflows built using Web services. A key benefit of this framework is that it enables the establishment of “on demand” patient journeys eliminating the need to establish permanent point to point connections.

The case study used for this research is the patient journey of neonatal and ill-term babies between (1) special care nurseries in urban, rural, or remote hospitals to tertiary or children’s hospital Neonatal Intensive Care Units (NICUs) and (2) tertiary NICUs and children’s hospital NICUs, when a baby is transferred for surgery.

The article is organized as follows. First a discussion is presented on related recent research in the areas of health informatics to support ICUs together with recent Web services and BPEL research. The next section presents an overview of the framework for the design of Web service based clinical management patient journeys. The following section introduces the Neonatal Intensive Care Unit (NICU) case study environment. Afterwards, the application of the framework to generate BPEL process to support neonatal patient journeys is presented. The article is concluded where future work is presented.

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