Chapter 4
Web Services for Healthcare Management

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ABSTRACT

Nowadays, Health Care Organizations (HCOs) are interested in defining methodologies of Information Technology (IT) for providing high quality services at minimum cost. Through modern software and hardware, they can process data and manage the three important phases: diagnosis, prognosis, and therapy. In this scenario, Web Technologies (WTs) can: provide advanced Information Systems that combine software applications; offer a heterogeneous connectivity to users; allow costs reduction; improve the delivery of the services; guarantee an interactive support of the doctors, interconnectivity between the HCOs, and effective information sharing. In this chapter, first it is described how to provide the services of a HCO through the WTs, and then it is shown how Operations Research makes it more effective, to deal with, for example, clinical data classification problem, clinical predictions, clinical what-if analysis, and Web services composition process.

INTRODUCTION

Health Care is "*The prevention, treatment, and management of illness and the preservation of mental and physical well-being through the services offered by the medical and allied health professions*" (*American Heritage Medical Dictionary*).

The main actors are: *Healthcare Administrators* (overseeing various healthcare departments and personnel and sometimes administrating some healthcare facilities or managing a small group of nurses); *Medical Specialties* (including respiratory care, medical imaging, health information technology, clinical research administration and more); *Medical Assistants* (performing clerical tasks in hospitals and physician's offices, including bill-

ing, filing, scheduling and helping patients fill out necessary forms. They sometimes also assist with basic medical work); *Physical Therapists* (treating patients with injuries, diseases or age-related problems that impair their physical well–being).

The *patients* represent the users and thus the final consumers of the health services. That being so, a HCO could be modeled like a *Supply Chain*, with suppliers and customers, offering its services at specific costs.

Each actor (supplier or customer) performs specific activities. For example: a supplier, on the base of the specific role, could take care either of the therapies (Physical Therapists) or of the administrative aspects (HC Administrators). On the other hand, a customer could require some suggestions, therapies and analyses. It is worth noting that there is no rigid and fix classification because, sometimes, a supplier could also become a customer.

In the literature, different models of supply chain for HC are proposed even though a lot of them are more focused on the classical supply chain perspective of a major manufacturer. This approach could not be valid for a general HC network because it has to offer specific services. In Hübner (2008), it is proposed a supply chain model for HC considering the customer's point of view. This proposal integrates a *process model*, a *document model*, and a *functional model* because they combine the view of clinical and economic issues related to the procurement, provision, and use of medical supplies. The first model is divided in two main components: the strategic part and the operational one. The second model, instead, is more focused on the data and information related to all the clinical and economic aspects occurring in HCO. Finally, the third model is a natural integration of the first two ones. Its functions are divided into layers (*Content*, *Contract*, *Order-to-payment*, *Service*, *Clinical Outcome*, and *Knowledge*) organized and managed like a stack. The main goal of this stack is to follow the product's path from the supplier to the customer

(patient) in which its information and knowledge is accumulated in order to use it without problems.

Figure 1 shows a schematic example of a health supply chain where: the first node represents the set of HC components (doctors and administrative personal); the second is the set of the customers (patients) and the two arrows represent the flow through the network. These flows could be information, data, therapies, suggestions and results of clinical analyses, but also medical products, medicines and payments for health services. Moreover, the two loops represent the internal actions performed by both HC personnel (to transfer, for example, the test tubes from a medical department to the specific laboratory) and patients, respectively.

The advantage of representing a HCO as a supply chain is to track products and information. This also assures the safety of patients; a saving of production, procurement and logistics costs; a facility of itemized billing and maintenance of regulatory compliance. In the efficient management of a HCO as a supply chain it is introduced the role of the *manager* who generally has to: supervise the human resources departments in the hospitals; oversee the medical assistants and the billers in physician's offices; manage the support staff in rehabilitation facilities and fill many other roles.

Moreover, because HC is considered one of the largest industries in the world (Marsh et al.

Figure 1. A schematic example of a health supply chain
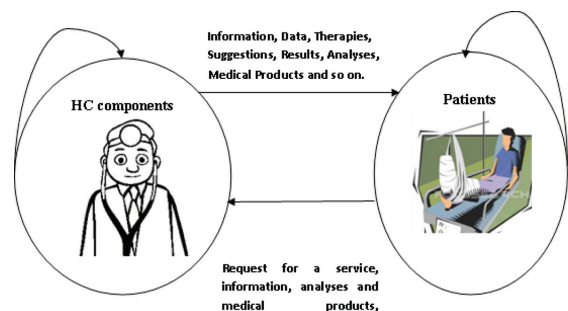
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