Chapter 5
Electronic Health Records in a Tele-Ophthalmologic Application with Oracle 10g

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ABSTRACT

Electronic health record (EHR) refers to the complete set of information that resides in electronic form and is related to the past, present and future health status. EHR standardization is a key characteristic to exchange healthcare information. Health Level Seven (HL7) and Digital Imaging and Communications in Medicine (DICOM) are intensively influencing this process. This chapter describes the development and experience of a web-based application, TeleOftalWeb 3.2, to store and exchange EHRs in ophthalmology. We apply HL7 Clinical Document Architecture (CDA) and DICOM standards. The application has been built on Java Servlet and Java Server Pages (JSP) technologies. EHRs are stored in the database Oracle 10g. Its architecture is triple-layered. Physicians can view, modify and store all type of medical images. For security, all data transmissions were carried over encrypted Internet connections such as Secure Sockets Layer (SSL) and HyperText Transfer Protocol over SSL (HTTPS). The application verifies the standards related to privacy and confidentiality. TeleOftalWeb 3.2 has been tested by

from the University Institute of Applied Ophthalmobiology (IOBA), Spain. Nowadays, more than thousand health records have been introduced.

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INTRODUCTION

Telemedicine is a general concept including diagnoses, examinations, medical meetings, collaborative operations and nurseries (Xiang et. al, 2003). Telemedical information systems are necessary for the implementation of telemedicine applications (Horsch & Balbach, 1999). Amongst these systems are the Electronic Patient Records (EPRs) and the Electronic Health Records (EHRs) (Holle & Zahlmann, 1999). EPR can be defined as a set of relevant patient information stored in digital format that allows adequate medical assistance delivered to the patient even in distinct places and scenarios (Furuie et al., 2007). EHR is a secure, real-time, point-of-care and patient-centric information resource for physicians (HIMSS, 2003). EHRs include information such as observations, laboratory tests, diagnostic imaging reports, treatments, therapies, drugs administered, patient identifying information, legal permissions and allergies. Currently, this information is stored in all kinds of proprietary formats through a multitude of medical information systems available on the market (Eichelberg et. al, 2005). EHR must enable the communication of healthcare information to support shared patient care, improved quality of care and effective resource utilisation (IEEE, 1993). The primary purpose of EHR is the support of continuing, efficient and quality integrated health care. Amongst EHRs benefits are their universal access, coding efficiency and efficacy, easier and quicker navigation through the patient record (Smith & Newell, 2002). The potential advantages of an EHR over a traditional paper-based patient record involve: distributed and simultaneous access, high availability, fast information retrieval, better quality, higher confidence and possibility of reanalysis (Furuie et al., 2007). There are several barriers to their adoption such as training, costs, complexity and lack of a national standard for interoperability (Gans et. al, 2006).

Telemedicine applications and services often involve many institutions using different systems and technologies. This complicates the technical standardization. International and European institutions are concerned with EHR standardization such as the International Standards Organization Health Informatics Standards Technical Committee (ISO/TC) 215, European Committee for Standardization Technical Committee (CEN/TC) 251, openEHR, Health Level Seven (HL7), Extensible Markup Language (XML), Digital Imaging and Communication in Medicine (DICOM), American National Standards Institute (ANSI) and others (Bott, 2004). The development of HL7 and DICOM standards has also been of great benefit in the telemedicine services and applications.

HL7 standard is used for many different medical environments. It is a not-for-profit organization involved in development of international healthcare standards. It is used for many different medical environments. For example, there are mobile clinical information systems by using HL7 to integrate the patient data (Choi, 2006). HL7 Document is intended to be the basic unit of a document-oriented EPR. The patient medical record is represented as a collection of documents. HL7 Clinical Document Architecture (CDA) is a XML-based document markup standard that specifies the structure and semantics of EHR for the purpose of exchange. Clinical Document Architecture – Release One (CDA–R1), became an American National Standards Institute (ANSI)–approved HL7 Standard in November 2000, representing the first specification derived from the HL7 Reference Information Model (RIM). CDA – Release Two (CDA–R2), became an ANSI-approved HL7 Standard in May 2005 (Dolin et al., 2006). HL7/CDA is a XML-based document markup standard that specifies the structure and semantics of EHR for the purpose of exchange. CDA standard provides an exchange model for clinical documents. Many CDA documents comprise an individual EHR. A CDA document is a contextually complete information object that can include text, images, sounds and other multimedia content. CDA Level one sets a requirement