The OpenMRS System:
Collaborating Toward an Open Source EMR for Developing Countries

Benjamin A. Wolfe[1], Burke W. Mamlin M.D.[1,2], Paul G. Biondich M.D., M.S.[1,2], Hamish SF Fraser MB.ChB., M.Sc.[3], Darius Jazayeri M.Eng.[3], Christian Allen[3], Justin Miranda[3], William M. Tierney M.D.[1,2]

Regenstrief Institute, Inc.[1], Indiana University School of Medicine[2], and Partners In Health[3]

Abstract

OpenMRS is an open source infrastructure for the creation of medical record systems in developing countries. Produced and maintained collaboratively across multiple institutions, this framework consists of an open source data model, a set of core application functions, and a default implementation. The goal of this implementation is to provide the beginnings of an EMR that is suitable for all groups involved with healthcare in developing countries.

The Problem

A successful healthcare system in a developing country will satisfy the needs of several stakeholders. Most importantly, systems must serve the patients, then possibly the clinicians, researchers, funding agents, and the associated Ministry of Health. There are many efforts in developing countries to create an EMR to cover the needs of each group – and many of these efforts are entirely redundant. However, these endeavors often fail to meet the needs of one concerned party or another.

The Solution

We have created a collaborative network between the Regenstrief Institute and Partners in Health (PIH) and developed an initial code base. This free and open source code base provides simplified access to a complicated backend database. We named the system "OpenMRS." We produced the OpenMRS system with extreme scalability and the need for multiple languages in mind. At the core lies an encoded-value dictionary that is able to provide both the questions and answers on an encounter form. The Regenstrief Institute's data model has demonstrated this dictionary method for 30+ years—we simply borrowed and expanded on these ideas for OpenMRS.

The entire system was designed for a limited-resource installation. We chose tools, wherever possible, that were freely available and open source, ensuring that the overall project remains both low-cost and easily updatable. We chose Java as the programming language for its widespread use and inter-operating system design. We developed our database backend in, but not tied to, the proven MySQL database. We use Hibernate (a Java-based persistence engine) to bridge the Java world and relational database world.

The dictionary at the core of the data model satisfies all stakeholders. The encoded values allow for quick manipulation of forms and facilitate getting data back to the clinician, fulfilling the needs of patients, clinicians (and developers). Researchers and Ministries of Health can enjoy clean, definable data coming back out of the database. The open source collaboration serves the funding agents and Ministries of Health with a low-cost installation that can be quickly adapted for use in multiple locales.

Our goal is to develop a complete EMR with the help of future collaborators. The application's functionality can be expanded through modules without the need to modify the existing system.

We have implemented and tested the OpenMRS system in western Kenya. Future installations include Rwanda, South Africa, Tanzania, and Uganda.
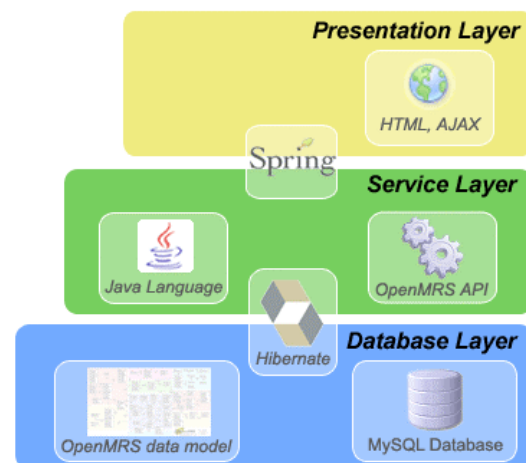

Figure 1. The layers of an OpenMRS implementation