

# Integrating Personalized Health Information from MedlinePlus in a Patient Portal

Damian BORBOLLA<sup>a,1</sup>, Guilherme DEL FIOLE<sup>b</sup>, Vanina TALIERCIO<sup>a</sup>, Carlos OTERO<sup>a</sup>, Fernando CAMPOS<sup>a,c</sup>, Marcela MARTINEZ<sup>a</sup>, Daniel LUNA<sup>a</sup>, Fernando QUIROS<sup>a</sup>

<sup>a</sup>Health Informatics Department, Hospital Italiano de Buenos Aires, Argentina

<sup>b</sup>University of Utah, Utah, USA

<sup>c</sup>HL7, Argentina

**Abstract.** The objective of this paper is to describe the implementation and use of context aware information in Spanish from MedlinePlus embedded in a Patient Portal. Personalized information can help patients solve problems, make treatment decisions, gain confidence in their ability to care for themselves and communicate with providers. To integrate MedlinePlus information in our institutional PHR we used the HL7 Context-Aware Knowledge Retrieval Standard, also known as the Infobutton Standard. After analysing one year of use, patients accessed MedlinePlus information in Spanish in a similar rate to other personalized information generated locally. Infobuttons associated to laboratory test results were used in approximately 10% of patients portal sessions when reviewing lab results.

**Keywords.** Health Information, Patient Portal, Personal Health Record (PHR), Infobuttons, MedlinePlus

## Introduction

Personal health records (PHRs) are ‘healthcare-related online applications that allow consumers to interact with their health care information in one place.’ [1] There are two main PHR architecture implementations. The first one is linked directly to the physician’s practice-based electronic health record (EHR), and these are known as tethered PHRs or “Patient Portals”. The other is a stand-alone implementation, without linkages to any EHR. The first architecture offers advantages because it can include specific information imported directly from the patient’s medical record. Functions available in these tethered PHRs include: reminders for preventive practices, the ability for patients to securely e-mail their clinicians, make an appointment, or ask for a new prescription. [2] From tethered PHRs, patients can have access to their problem list, medication list, laboratory test results, and links to personalized health information. Evidence that patient portals improve health outcomes, cost, or utilization is insufficient, [3] however the use of these kinds of systems is also spurred by financial

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<sup>1</sup> damian.borbolla@hospitalitaliano.org.ar

incentives and outlined in the USA Meaningful Use incentive program, which aims at disseminating EHR adoption. [4]

Infobuttons can be defined as context-specific links embedded in EHR or PHR systems and that provide seamless access to relevant online health information resources. [5] While investigators have studied the use and impact of Infobuttons on clinicians' information needs and information-seeking behaviour, little has been done to investigate the use of infobuttons by health care consumers.

MedlinePlus, from the US National Library of Medicine (NLM), is a freely available consumer health information resource that offers information about diseases, conditions, and wellness issues in laymen terms. MedlinePlus information is offered in English and Spanish. MedlinePlus Connect is a free service that allows health organizations and health IT providers to link patient portals and electronic health record (EHR) systems to MedlinePlus via Infobuttons. [6] MedlinePlus Connect accepts requests for information on diagnoses (problem codes), medications, and laboratory tests, and returns related MedlinePlus information.

This paper describes the implementation process of infobuttons within a PHR system as well as the use of MedlinePlus information in Spanish through these infobutton links.

## **1. Methods**

The study took place at Hospital Italiano de Buenos Aires (HIBA) in Argentina. HIBA is a non-profit academic medical center with over 2,000 physicians and 6,000 employees. In 1998, HIBA began to implement a Healthcare Information System (HIS) that was completely developed in-house. Within the HIS, there is a Terminology Server that supports standard medical vocabularies including SNOMED-CT. [7] The HIBA information infrastructure includes a patient portal, which was launched in 2007. In October 2013 approximately 80,000 patients were enrolled representing more than 50% of enrolment rate.

The core functions of HIBA's portal are similar to those of other patient portals and include: Secure messaging, access to limited electronic health record (EHR) data, delivery of personalized health information, appointment scheduling and bill management

In 2008, access to personalized consumer health information was added as a new functionality in the portal, but all the information offered was developed in-house. As developing healthcare information it is not an easy task, in 2012 we decided to integrate HIBA's PHR with MedlinePlus information in Spanish via infobutton using the two implementation strategies offered by the NLM.

In order to understand if patients read the information offered, we used audit log information of the interaction of the patients with the portal on MedlinePlus general information and lab test results. In this paper we describe the use of this new information source.

## **2. Results**

We started the implementation process in July 2012, following the indications available at the MedlinePlus Connect website, we decided to show the information from

MedlinePlus in two different modules of the PHR, the home screen and the laboratory test results module. The first one was implemented as “push” mechanism, where information related to a patient’s diseases is automatically displayed when the patient is logged into the system. The other format, offered in the laboratory test results module, is a “pull” approach, in which patients actively click on a specific button (infobutton) located next to each test result to access explanatory information from MedlinePlus. Two software developers from our department worked half time in this project, and took them approximately 20 days to have the first version of the solution available for patients.

The two alternatives were implemented using the Health Level Seven (HL7) Context-Aware Knowledge Retrieval (Infobutton) Standard. The Infobutton Standard supports two implementation approaches that were used in the HIBA PHR. Specifically, the pull approach described above uses the HL7 URL-based implementation guide and the push approach uses the HL7 services-oriented architecture (SOA) implementation guide. The sections below describe how these strategies were implemented and how patients used them.

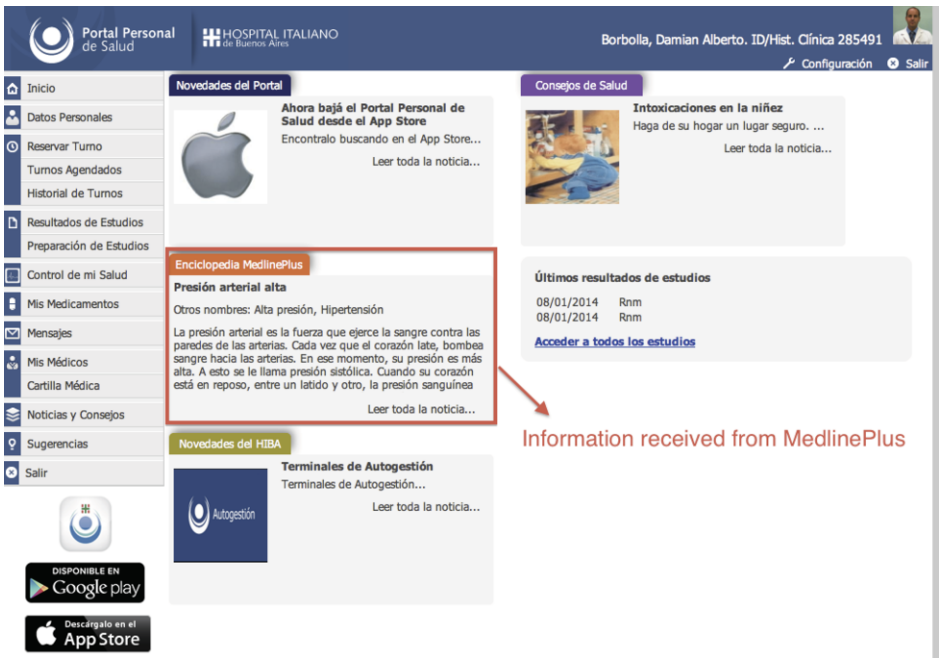


Figure 1. Personalized information at HIBA’s PHR

2.1. Disease-specific information for patients

After logging into HIBA’s PHR, all users were presented with information specific to their health conditions and demographic profile in the main screen. This information is derived from the SNOMED-CT diagnostic and problems list section of HIBA’s EHR. All terms in the problem list are auto-codified with the terminology server and a SNOMED-CT code is linked to each of these terms. When users access their home page in the PHR, a knowledge request is sent to MedlinePlus Connect including the

patient's problems (SNOMED-CT codes), age, gender, and language. When the information is received, the Web service provided by the NLM generates a standard XML knowledge response with relevant content, which is received and parsed by the PHR in Argentina. Figure 1 shows how information coming from MedlinePlus is integrated with the information produced locally.

## 2.2. Infobuttons in the lab results

Every time patients access their laboratory results, they can click on infobuttons located next to each of the results displayed. When an infobutton is clicked, the test's LOINC code provided by the terminology server at HIBA is encoded in a URL-based knowledge request. This knowledge request is sent to MedlinePlus Connect, which responds with relevant content in HTML format. This content is then displayed to the user in a browser window independent from the PHR

## 2.3. Infobuttons Use

Both Infobutton approaches were released to users in August 2012. The information provided by MedlinePlus Connect on the portal's home screen was accessed on average 1,000 times per month, compared to 1,500 times for local information and 500 times for food recipes.

Reviewing laboratory results is the functionality patients use the most in the portal. On average, patients access laboratory results in 50% of their portal sessions. Between September 2012 and September 2013, patients accessed explanatory information from MedlinePlus via infobuttons in 10% of the sessions in which patients accessed their lab results. The lab test that triggered most of the infobutton uses was CBC, with a total of 11,682 clicks, followed by urine culture, with 5,236, both in one year period. Trends of the use of the two functionalities implemented are shown in Figure 2

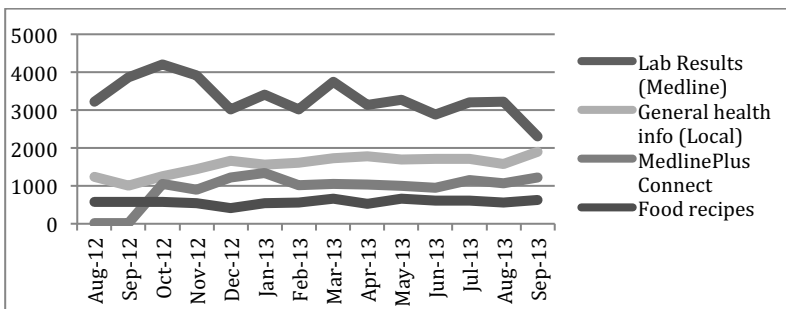


Figure 2. Comparison of access to MedlinePlus and locally produced information

## 3. Discussion

As the demand for patient portals increases, understanding the functionalities available, use and impact of these portals becomes critical. Other studies described functionalities of PHRs. [8-10] In this study, we have described the implementation process and investigated the use of personalized consumer health information in Spanish provided

by MedlinePlus Connect and accessible via infobuttons in a PHR for patients in Argentina. We have observed strong use of both functionalities provided in the patient portal, especially by the personalized information provided in the main screen linked to patients' problem lists. This concept of accessing personalized information is a relatively new. Similar approaches to tailored information for patients have been described by Weiner and Pfeifer [11]. They proposed "Recommender Systems" as a potential approach to suggest items of interest to users. While there has been research with recommender systems aimed at helping clinicians' decision making [12], to our knowledge there are no publications describing such experience with patients, even though, according to the NLM, there are approximately 13 healthcare institutions and more than 30 EHR systems using MedlinePlus Connect. [13]

The main limitation of this study is that we were unable to determine details such as the value and impact of the information accessed by patients; and whether value and impact differ between MedlinePlus and locally produced content.

Given the high use of MedlinePlus information through our PHR, we believe that other health organizations could benefit from a similar standards-based implementation approach. Future research will assess the value and impact of the information accessed on patients.

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