MEDINFO 2007
HISA Ltd Australia
© 2007 The authors. All rights reserved.

Integration of Medical Publications into the Clinical Routine Using HL7 "Clinical Decision Support Context-Sensitive Information Retrieval"

Kristian Struck[a], Sven Tiffe[a], Michael Dahlweid[b]

[a]*Agfa HealthCare, Healthcare Application Platform, Metatools, Austria*
[b]*Agfa HealthCare, Product Management, Germany*

Abstract

To support clinical staff in their daily decisions, a context-sensitive information retrieval mechanism has been embedded into a widely used health information system. This mechanism implements the HL7 "Infobutton" approach that has been extended to formalize the search result. These results consist of articles whose characteristics match the patient's information like diagnoses, gender and age.

Keywords:

Clinical Decision Support Systems, HL7 Infobutton, Context-Sensitive Search

Introduction

An important goal of Clinical Decision Support is to provide the right information to the right users at the right time. One approach to achieve this goal is to provide adequate medical articles to both clinical staff and patients. We integrated a context-sensitive information retrieval based on the HL7 "Infobutton"[1] approach into Orbis, a hospital information system (HIS) with over 1200 installations and more than 450,000 users. With "Infobutton", various medical information sources can be embedded into the clinical routine process.

Methods

The "Infobutton" technology

Based on an early specification of the "Infobutton" [1], we developed a component "Infobutton Manager" (IM) that is embedded in the client-platform of the HIS. The IM is able to query various content providers (e-resources) and is responsible for providing additional information from the enquiring user context, current task context (type of task the user is trying to perform) and patient context (gender and age).

The search request is well defined in the "Infobutton" specification and includes a set of main search criteria that can be either free-text or formalized values. The set of supported search criteria depends on the e-resource and is not restricted by the specification.

As a first e-resource, the ICD-based retrieval of medical documents has been connected. This provider uses an intelligent fingerprint mechanism to map ICD-codes to medical articles [2] from Medline. We were able to use ICD-10 codes as search criteria as in German hospitals diagnoses are already documented during the patient's admission and also during the whole clinical process.

Another e-resource enables semantic full-text retrieval in publication databases of publishers like Springer Medizin Verlag [3].

Both e-resources are web-services that use the Simple Object Access Protocol (SOAP) as the communication layer and as payload the XML "Infobutton" resource request.

In contrast to the outlined request, the "Infobutton" specification does not define a structured result format.

Searching for information

The general information search- and retrieval-workflow can be described as follows: The user starts a search by selecting diagnoses or full-text for which he needs more information. Then, the request is extended with contextual information and forwarded to the e-resource by the IM.

As a result, the e-resource sends a list of documents and related concepts back to the enquiring system. The user may either select documents for ordering or he can refine the search by adding or removing related concepts based on MeSH-terms or ICD-codes as search criteria.

The "Infobutton" specification does not define the result of the e-resource request, thus we have implemented two different approaches to model the search and retrieval workflow:

Structured result format

As a first approach, an XML structure has been introduced as request result. This structure contains meta-information on the documents such as title, authors, journal, related concepts and ordering information. The result-XML can be stored, processed by other applications or shown to the enquiring user in the search dialog. From here, the user is

1 HL7 "Clinical Decision Support Context-Sensitive Information Retrieval" (Infobutton)

able either to start another search-workflow if he modifies the search criteria, or to order a document.

Web-based result handling

As second approach, the e-resource result is a URL that serves as an entry point to the web-based search- and retrieval-workflow of the individual e-resource provider. The e-resource request is initiated only once. Then the resulting URL is forwarded to the web-browser in the enquiring system. Further refinement of search criteria and document orders are realized within the website via hyperlinks.

Results

The HL7 “Infobutton” approach can be used to integrate knowledge sources into the diagnostic and therapeutic process. Its open concept allows connecting to different knowledge providers but lacks a structured result format. Both introduced approaches have advantages and disadvantages.

Structured result format

The approach of using structured result formats has the major advantage that the receiving system can directly react on the result and integrate the information in its application framework.

- All parts of the result can be processed electronically.
- The result can be integrated into the HIS platform and processes with respect to the HIS vendor's design guideline and look & feel.
- It is possible to modify, add or remove both context-data and search criteria during the whole search process.

However, we also have to take the disadvantages of this method into account.

- This proprietary XML strongly reflects the structure of the special e-resource that was used. Without a standardized result, we have new implementation efforts to integrate the result handling for a new e-resource.
- Other types of information (e.g. picture or audio databases) are difficult to integrate with this special literature search.

Web-based result handling

Currently, from our point of view, the web-based approach is the preferred way.

- Processing the URL is easy to implement. The result is simply passed to the system's web-browser.
- The HIS vendor is not responsible for developing the user interface. The e-resource vendor can influence presentation of the result.

The web-based method implies disadvantages, too.

- For optimal user guidance, the e-resource web-result has to be developed with respect to the HIS vendor's design guidelines. This means that the e-resource has to provide different web-services for their customers.
- Once, the search is started, it is not possible to modify, add or remove context-data and search criteria by the HIS system. The context information and search criteria are collected only once, with the initial resource request. The modification of search criteria during the search process is a function, that has to be provided by the respective e-resource.

Conclusion

The integration of HL7 “Infobutton” approach is a good way to serve the clinical staff with up-to-date information.

Like the e-resource request, the result data should also be covered by the HL7 “Infobutton” specification.

In terms of semantic interoperability the use of formal codes instead of free text search criteria may also be an issue when used in an international context where code systems of e-resources and customers differ. In such cases, additional efforts to convert “Infobutton” queries are required.

References

[1] HL7 Infobutton Standard API Proposal, January 4th, 2006
[2] Christian Herzog, et al. SyynX solutions: practical knowledge management in a medical environment. Bremen: ACM Press, CIKM 2005: 556-559
[3] Semgine Technology, http://www.semgine.com/index.php?id=17, Accessed May 30th, 2007

Address for correspondence

Kristian Struck
Agfa HealthCare
Diefenbachgasse 35, A-1150 Vienna, Austria
Email: kristian.struck@agfa.com