GLARE: a Domain-Independent System for Acquiring, Representing and Executing Clinical Guidelines

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Abstract. We briefly describe GLARE, a domain-independent system to acquire, represent and execute clinical guidelines, which as been developed since 1997 in a joint cooperation between Computer Sciences Departments and Az. Ospedaliera S.Giovanni Battista in Turin, one of the largest hospitals in Italy. A demo of the (prototypical) system is also available.

Problem addressed. Clinical guidelines represent the current understanding of the best clinical practice, and are now one of the most central areas of research in Artificial Intelligence (AI) in medicine and in medical decision making. In recent years, many researchers have pointed out the advantages that can be provided by the adoption of computer-based systems. In particular, computer-based approaches may provide user-friendly interfaces to assist physicians in the acquisition and execution of clinical guidelines, providing an automatic mapping of the acquired knowledge into a computer-interpretable format. Such a computer-interpretable format can then be used for navigating/querying the guidelines, but also for executing it on specific patients.

Different systems and projects have been developed in recent years in order to realise computer-assisted management of clinical guidelines. Our contribution is the GLARE system.

Specific purpose of the system. We sketch GLARE (GuideLine Acquisition, Representation and Execution), a domain-independent system for acquiring, representing and executing clinical guidelines [1]. GLARE is characterized by the adoption of Artificial Intelligence (AI) techniques at different levels in the definition and implementation of the system.

First of all, a high-level and user-friendly knowledge representation language has been designed, providing a set of user-friendly and physician-oriented representation primitives.

Second, a user-friendly acquisition tool has been designed and implemented, on the basis of the knowledge representation formalism. The acquisition tool provides various forms of help for the expert physicians, including different levels of syntactic and semantic tests in order to check the “well-formedness” of the guidelines being acquired. In particular, extended AI temporal reasoning techniques are used to check the consistency of temporal constraints [2].

Third, a tool for executing guidelines on a specific patient has been made available. The tool is strictly integrated with the clinical records in the Patient Database, so that data are automatically retrieved from the Database whenever needed. The execution module also provides hypothetical reasoning (“what if”) facilities, to support physicians in the comparison of alternative diagnostic and/or therapeutic strategies. Also decision theory features are exploited in order to enhance GLARE’s decision-making facility.

The GLARE approach has been successfully tested on clinical guidelines in different domains, including bladder cancer, reflux esophagitis, heart failure and ischemic ictus.

Conclusions. The GLARE approach demonstrates the feasibility of a computer-assisted approach to clinical guidelines, and shows the advantages of adopting advanced AI techniques. A prototypical version of the system has been implemented using Java and Cache, and a demo of the acquisition, execution and “what if” facility is also available.

References