Supporting medical decision in telecardiology: A patient-centered ontology-based approach

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Abstract and Objective

The objective of the AKENATON project is to improve alert management and to support patient-centered medical decision in telecardiology. This requires to integrate information transmitted by implantable cardiac devices with clinical data extracted from patient. We present the role played by the ontology in the system for data integration and for decision support.

Keywords :

Ontology, Decision support techniques, Artificial cardiac pacemaker, Defibrillators

Introduction

More and more patients benefit from implanted cardiac devices such as implantable cardioverter-defibrillators (ICDs), including patients with chronic heart failure. Telecardiology, along with home monitoring, has improved patient safety and quality of life, and is expected to decrease mortality and hospitalization rates [1]. In this context, ICDs send many remote alerts about device failures and arrhythmias to physicians, who have to assess their relevance and emergency level. The objective of the AKENATON project is to shift from device-centered safety follow-up to perspectives centered on individualized patient care, in order to improve alert management. To achieve this goal, the system must extract information from cardiac device monitoring systems and from patient records, including text reports, provide a unified representation of data whatever their source (ICD or patient record), and support reasoning features.

Methods

Decisions in ontology design were mainly guided by the application: the starting point was a set of scenarios. We designed a domain ontology and application-specific modules which have restricted scopes and are driven by specific objectives. The latter contain a relatively small number of concepts that have been defined in some detail, with relations and inference rules that enable reasoning for the intended tasks [2].

Results

Ontology plays a central role in the system. It is used for modeling and instanciating structured patient information, for driving information extraction from text reports, and finally for reasoning on real data. The completeness and the reasoning capabilities of the ontology have been assessed by checking against competency questions related to the motivating scenarios. Up to now, we have implemented scenarios related to episodes of atrial fibrillation (AF) (Fig. 1). The system is designed to propose potential severity and evaluate risks for ICD alerts by taking into account the patient clinical context.

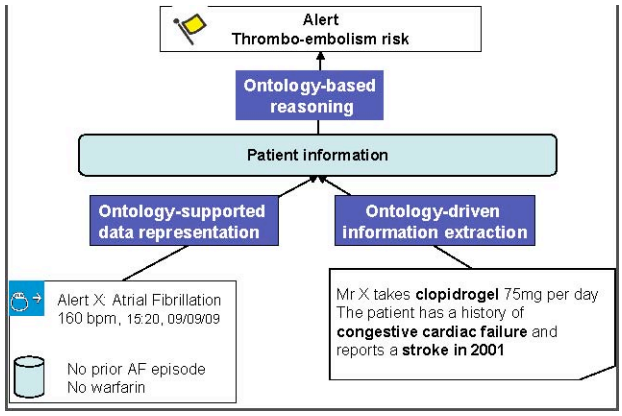

Figure 1 - Patient-centered alerts: role of the application ontology

Acknowledgements

The AKENATON project is funded by the French Agence Nation-ale pour la Recherche (ANR-07-TecSan -001)

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