"A Chronic Ontology Model as TeleCare-Decision Support System for Longitudinal Monitoring of Patients with Bipolar Disorder"

Chryssa H. Thermolia¹, Ekaterini S. Beï¹, and Euripides G. M. Petrakis¹
1 School of Electronic and Computer Engineering, Technical University of Crete, 73100 Chania, Crete, Greece

Introduction: Bipolar Disorder (BD) is a severe psychiatric illness that exhibits a time-dependent recurrence. The dramatic mood swings between mania and depression that accompany BD cause impacts in every aspect of a patient's life. The effectiveness of pharmacotherapy and therapeutic compliance in patients with BD increase the complexity of this chronic illness. Addressing these issues, we exploit Semantic Web Technologies (1) to develop a Telecare-Decision Support System based on evidence-based clinical guidelines and the patient's medical information. We present a chronic ontology model describing the scenario of mania that incorporates acute episode and treatment algorithms as well as patient-centered factors.

Methods: Considering the scenario of mania, we utilize clinical guidelines and recommendations in an attempt to integrate the patient's history, pharmacotherapy and other therapeutic interventions in our chronic ontology model. We exploit Semantic Web Technologies in order to extract knowledge included in this information and implement the decision mechanism. Semantic Web technologies form a family of very specific technology standards from the World Wide Web Consortium (W3C) that are designed to describe and relate data on the Web and inside enterprises (2). We can represent all necessary information about the monitoring and the evolution of Bipolar Disorder using Ontologies, which describe the concepts in a domain of interest and the relationships between them. Ontologies are described and instantiated using OWL language that is used for processing the Web information. Furthermore, clinical guidelines are formulated as rules using OWL-based rule language, the Semantic Web Rule Language.

BD is a rapidly evolving in time mental disorder. The developed ontology evolves in time in order to encode the recorded changes and address the consistent management of these changes (3). In our implementation, these changes in the domain are reflected in the transition of the static concepts into dynamic concepts.

Results: In order to manage the scenario and the evolution of the disorder, we provide a clinical decision support (CDS) system able to support the clinicians’ individualized treatment decisions. Such systems generally provide clinicians, staff, patients, and other individuals with knowledge and person-specific information, intelligently filtered and presented at appropriate times, as to enhance health care (4). Our proposed CDS system enables clinicians to monitor constantly the patient’s condition and provides alert to every change of the patient’s state. We interact with clinicians through a Graphical User Interface we have developed, facilitating them to insert data about the patient’s condition and retrieve recommendations about the best individualized treatment, as well as notifications about serious changes of the patients’ state.

Conclusion: Semantic Web Technologies can support decision-making in telecare of mental disorders by encoding its progression in the course of life of bipolar patients, if basic elements of clinical guidelines and patient-centered factors are considered. The chronic ontology model is proposed to illustrate the entire spectrum of bipolar mania and to demonstrate the effectiveness of the Telecare-CDS system and its potential for clinical use by health care professionals (psychiatrists and primary care physicians).
Role of funding source
This work was supported by project "AI-CARE" of the "COOPERATION 2011" framework under the NSRF 2007-2013 Program of the Greek Ministry of EDUCATION, LIFELONG LEARNING AND RELIGIOUS AFFAIRS.

References: