Proposed Ontology for Seizure and Epilepsy

Robert Yao[1], Jeffrey Buchhalter[2], and Graciela Gonzalez[1]

[1] Department of Biomedical Informatics, Arizona State University, Scottsdale, AZ, USA

[2] Phoenix Children's Hospital, Phoenix, AZ, USA

1 INTRODUCTION

The understanding and classification of seizures and epilepsy syndromes have constantly changed with the advent of new knowledge from new technologies. Ontologies provide a structured knowledge framework that could aid in more precisely defining and standardizing terminologies and diagnoses. This in turn could enhance the abilities of researchers and clinicians to pinpoint the causes of a disorder, discover new treatment measures, and improve patient outcomes.

2 BACKGROUND

Epilepsy is a complex disease in that it is defined by many components and does not always have a clear, single etiology. Biologically, there may be genetic, molecular, cellular, or systemic contributions. Clinically, this includes observation of seizure types, diagnostic tests, demographic data, and diagnostic tests like EEGs and neuroimaging. The understanding and classification of seizure types and the epilepsy syndromes that those types help to identify have constantly changed with the discovery of new knowledge. This has allowed for the possibility of more precise definitions and for the standardization of terminologies leading to more precise diagnoses. Standardization and classification of seizures and/or epilepsy is periodically handled by the International League Against Epilepsy (ILAE).

While proposals by the ILAE have been used by researchers to map discovery and by clinicians to diagnose epilepsy, those proposals are not logically structured or designed to diagnose and define epilepsy. The ability to provide a structured knowledge framework for a disease such as epilepsy will enhance the abilities of researchers and clinicians to pinpoint the causes of a disorder, discover new treatment measures, and improve patient outcomes.

3 HYPOTHESIS

We hypothesize that a more refined ontology for seizures and epilepsy syndromes that adequately reflects the latest measurements, observations and medical findings can be used to assist empirical diagnosis of epilepsy and to potentially differentiate new syndromes in a logical and standardized format.

4 METHODS

A review of previously proposed Seizure and Epilepsy classifications is being done to determine the most general way to classify each seizure, syndrome, and epilepsy. By analyzing and defining the building blocks of Epilepsy, an Epilepsy Ontology is iteratively formalized using Protege. Each seizure and syndrome will be instantiated to the ontology to determine if it provides a reasoning framework on epilepsy knowledge.

5 RESULTS

A poly-axial ontology is being defined to encode the conceptual building blocks of seizures and Epilepsy. The ontology will be open for both qualitative and quantitative evaluation when the data/evidence is available in preference over consensus expert opinion.

6 DISCUSSION

The aim of this ongoing work is to help clinicians better understand the etiology of seizures and definitions of and relationships between seizures and epilepsy syndromes, and to provide a more helpful path towards research, diagnosis, and treatment of the disorder. Eventually, this ontology could be expanded for use with other diseases, providing more structured definitions. Such a standard framework could also help pinpoint knowledge deficits, which in turn should drive laboratory and clinical experiments to discover missing knowledge.