A Clinical Decision Support System for Tinnitus Diagnosis and Therapy

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INTRODUCTION

Commonly referred to as “ringing in the ears,” tinnitus has a devastating impact on the quality of life of those affected chronically. Currently, there are no approved drugs available to treat tinnitus, and methods focus instead on tinnitus management. Among treatments is tinnitus retraining therapy (TRT), which is based on the neurophysiological model of tinnitus and aims to achieve the habituation of symptoms through a combination of counseling and sound therapy [1]. Despite its success in clinical trials, the method is not widely offered. Clinical Decision Support Systems (CDSS) are innovative tools which we expect to benefit the infrastructure surrounding TRT. Within this research, we propose a data-driven computerized decision support tool that will assist physicians in delivering TRT.

OBJECTIVES

- Develop a knowledge base of TRT, which involves pre-processing clinical data and applying machine learning algorithms to extract knowledge in the form of predictive and descriptive models.
- Design and implement the software architecture needed to support the system.

METHODS AND MATERIALS

The proposed CDSS uses a knowledge-based artificial intelligence approach to diagnosing and recommending treatment for patients with tinnitus. The rules for the system have been extracted in the previous work [3]. The system runs inference on the provided data using the knowledge base and action rules which are to be encoded as Java Expert System Shell (JESS) rules. The Rete algorithm is used for pattern matching to provide treatment and diagnosis decision support [3]. In order to provide decision support, the system requires user input of various TRT artifacts such as Dr. Pawel J. Jastreboff’s initial/follow-up interview and Tinnitus Handicap Inventory (THI) forms, as well as various audiological assessments.

RESULTS

A prototype of the CDSS has been designed in accordance to principles laid out for effective CDSS guidelines in previous works [2]. The system supports the following features:

- Patient management
- Visit management and operations:
  - Dialogues for various components of TRT such as audiological exams, counseling, real-ear measurements
  - Interview and Tinnitus Handicap Inventory (THI) forms
- Diagnostic and treatment inference

DISCUSSION

In order to complete the design and development of the CDSS, next steps should include:

- Test the accuracy and usability of the system;
- Revise the system according to results of usability testing;
- Further encode TRT knowledge as actionable JESS rules;
- Implement persistent storage for practical clinical usage.

REFERENCES