DBS-Expert: Automated Deep Brain Stimulation Programming Using Functional Mapping

https://neurodegenerationresearch.eu/survey/dbs-expert-automated-deep-brain-stimulation-programming-using-functional-mapping/

Principal Investigators

HELDMAN, DUSTIN A

Institution

GREAT LAKES NEUROTECHNOLOGIES

Contact information of lead PI
Country

USA

Title of project or programme

DBS-Expert: Automated Deep Brain Stimulation Programming Using Functional Mapping

Source of funding information

NIH (NINDS)

Total sum awarded (Euro)

€ 1,883,622.94

Start date of award

28/09/2012

Total duration of award in years

2

The project/programme is most relevant to:

Parkinson's disease & PD-related disorders

Keywords

Deep Brain Stimulation, Maps, symptomatic improvement, Postoperative Period, Algorithms

Research Abstract

? DESCRIPTION (provided by applicant): The objective is to engineer, build, and clinically validate DBS-Expert, an expert system for optimizing postoperative programming of deep brain stimulation (DBS) in patients with movement disorders such as Parkinson's disease (PD). The clinical utility of DBS for treatment of PD is well established. However, great outcome disparity exists among recipients due to varied postoperative management, particularly concerning DBS programming optimization. Many programmers have only a cursory understanding of electrophysiology and lack expertise and/or time required to determine an optimal set of DBS parameters from thousands of possible combinations. DBS-Expert will improve outcomes and equalize care across the country for patients not in close proximity to DBS specialty centers. The primary innovations include 1) automated functional mapping based on objective motion sensor-based motor assessments that will intelligently navigate the DBS parameter space to guide the programming session and 2) intelligent algorithms that will find a set of parameters that optimize for efficacy while minimizing side effects and battery usage. The clinically deployable DBS-Expert system will include wireless wearable motion sensors, a tablet software app, and secure cloud storage. The app will include a simple interface to guide the programming session, collect all sensor and stimulation data, and adjust DBS settings. For typical use, the system will start by performing automated monopolar survey to determine the patient-specific functional anatomy around the lead site and narrow the search space for determining an optimal set of programming parameters. This therapeutic window will be valuable at the initial postoperative programming session and simplify subsequent adjustment sessions. In Phase I, subjects with PD wore our existing Kinesia motion sensor while prototype software guided an automated monopolar survey. Stimulation was incrementally increased at each contact until symptoms stopped improving or side effects appeared. Search algorithms were successfully developed to automatically identify optimal DBS stimulation parameters. Parameters chosen by the algorithms improved symptoms by nearly 36% or maintained therapeutic benefits while reducing stimulation amplitude to decrease battery usage. Phase II will include 1) developing an app to integrate the successful Phase I prototype functional mapping software with DBS IPG programmer communication protocols to streamline use, 2) a multi-center clinical evaluation to optimize specific functional mapping protocols and parameter space navigation algorithms, and 3) integration of the optimal search algorithm and bidirectional communication protocols into a commercially viable product. We hypothesize DBS-Expert will improve patient outcomes, access to care, clinician and patient experience, battery usage, and frequency and duration of follow-up programming sessions compared to traditional programming practices.

Lay Summary

PUBLIC HEALTH RELEVANCE: The clinical utility of deep brain stimulation (DBS) for the treatment of movement disorders such as Parkinson's disease has been well established; however, there is a great disparity in outcomes among DBS recipients due to varied postoperative management, particularly concerning the choosing of an optimal set of programming parameters from the thousands of possible combinations. The proposed system will use motion sensor based assessments to develop a functional map and intelligent algorithms to determine a set of programming parameters that maximize symptomatic benefits while minimizing side effects and battery consumption.

Further information available at:

Types:

Investments > €500k

Member States:
United States of America

Diseases:
Parkinson's disease & PD-related disorders

Years:
2016

Database Categories:
N/A

Database Tags:
N/A