EPSRC Centre for Predictive Modelling in Healthcare

https://www.neurodegenerationresearch.eu/survey/epsrc-centre-for-predictive-modelling-in-healthcare/

Principal Investigators

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Country

United Kingdom

Title of project or programme

EPSRC Centre for Predictive Modelling in Healthcare

Source of funding information

EPSRC

Total sum awarded (Euro)

€ 2,723,741

Start date of award

01/01/2016

Total duration of award in years

4.0

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Neurodegenerative disease in general

Research Abstract
Our Centre brings together a world leading team of mathematicians, statisticians and clinicians with a range of industrial partners, patients and other stakeholders to focus on the development of new methods for managing and treating chronic health conditions using predictive

mathematical models. This unique approach is underpinned by the expertise and breadth of experience of the Centre's team and innovative approaches to both the research and translational aspects.

At present, many chronic disorders are diagnosed and managed based upon easily identifiable phenomena in clinically collected data. For example, features of the electrical activity of the heart of brain are used to diagnose arrhythmias and epilepsy. Sampling hormone levels in the blood is used for a range of endocrine conditions, and psychological testing is used in dementia and schizophrenia. However, it is becoming increasingly understood that these clinical observables are not static, but rather a reflection of a highly dynamic and evolving system at a single snapshot in time. The qualitative nature of these criteria, combined with observational data which is incomplete and changes over time, results in the potential for non-optimal decision-making.

As our population ages, the number of people living with a chronic disorder is forecast to rise dramatically, increasing an already unsustainable financial burden of healthcare costs on society and potentially a substantial reduction in quality of life for the many affected individuals. Critical to averting this are early and accurate diagnoses, optimal use of available medications, as well as new methods of surgery. Our Centre will facilitate these through developing mathematical and statistical tools necessary to inform clinical decision making on a patient-by-patient basis. The basis of this approach is patient-specific mathematical models, the parameters of which are determined directly from clinical data obtained from the patient. As an example of this, our recent research in the field of epilepsy has revealed that seizures may emerge from the interplay between the activity in specific regions of the brain, and the network structures formed between those regions. This hypothesis has been tested in a cohort of people with epilepsy and we identified differences in their brain networks, compared to healthy volunteers. Mathematical analysis of these networks demonstrated that they had a significantly increased propensity to generate seizures, in silico, which we proposed as a novel biomarker of epilepsy. To validate this, an early phase clinical trial at King's Health Partners in London has recently commenced, the success of which could ultimately lead to a revolution in diagnosis of epilepsy by enabling diagnosis from markers that are present even in the absence of seizures; reducing time spent in clinic and increasing accuracy of diagnosis. Indeed it may even make diagnosis in the GP clinic a reality.

However, epilepsy is just the tip of the iceberg! Patient-specific mathematical models have the potential to revolutionise a wide range of clinical conditions. For example, early diagnosis of dementia could enable much more effective use of existing medication and result in enhanced quality and quantity of life for millions of people. For other conditions, such as cortisolism and diabetes where a range of treatment options exist, identifying the optimal medication, and the pattern of its delivery, based upon the profile of the individual will enable us to maximise efficacy, whilst minimising unwanted side effects.

Lay Summary
Further information available at:

Types:
Investments > €500k

Member States:
United Kingdom

Diseases:
Alzheimer's disease & other dementias

Years:
2016

Database Categories:
N/A

Database Tags:
N/A