During all stages of the project, the opinions of our Patient Advisory Board are taken into account. This board comprises an international group of patients and carers with experience in the three conditions, as well as representatives from relevant associations and organisations.

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Project Partners
Remote Assessment of Disease and Relapse – Central Nervous System

Clinical Study Sites
Major Depressive Disorder:
- King's College London
- VUmc
- Parc Sanitari Sant Joan de Déu

Epilepsy:
- King's College Hospital
- Uniklinik Freiburg

Multiple Sclerosis:
- Ospedale San Raffaele
- Institut de Recerca Vall d'Hebron
- RegionH

Contact information
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**Facts & Figures**

**RADAR-CNS**
22 organisations from across Europe and the United States of America

**Partnership**
A collaboration between researchers in the public and private sectors

**Total budget**
€ 25.7 million

**Start date**
April 2016

**End date**
30 March 2022

**Academic project lead**
Matthew Hotopf,
King’s College London

**Industry project lead**
Vaibhav Narayan,
Janssen Pharmaceutica NV

**About RADAR-CNS**

Remote Assessment of Disease and Relapse in Central Nervous System Disorders (RADAR-CNS) is a major international research project. Clinicians, patients, researchers, engineers and data scientists from all over America, Europe and the United States of America are working together to develop new ways to improve the management of the conditions.

**Clinical studies**

- **Major depressive disorder (MDD)**
- **Multiple sclerosis (MS)**
- **Epilepsy**

**Studying major depressive disorder**

Information will be collected actively, for example by sending participants regular questionnaires to measure their symptoms in their home environment. Information will also be collected passively by devices that people already use. These devices can be wearables – for example, popular activity trackers such as FitBit – or software that people use on their mobile phone and ask them to answer questions about their daily activity and mood. Data that we can collect using smartphones and widely available technology, to collect data from large numbers of people with these three specific conditions as well as from people in the general population.

**Remote measurement**

With this data, clinicians will be able to monitor a person's health and well-being. All of this information will help to create a complete picture of the person's condition and how it changes. This could help their healthcare team to be more aware of changes. This could help their healthcare team to design a more personal treatment plan and ensure early intervention and contribute to improving personalised healthcare and quality of life.

**Collection of information**

If this new way of measuring symptoms is proven to be effective, the ultimate goal is to make it widely available to as many people as possible. Both active and passive collection of information are possible. Passive collection can be done without participants being aware that data are being collected. The study will also test how wearable technology might collect information which could not measure in a hospital setting. This technology might collect information which certain aspects of the symptoms which they go about their daily lives.

**Identifying relapses**

With this data, clinicians will be able to monitor a person's symptoms, mood and daily functioning could help people gain a better understanding of their condition and how it affects them. Knowledge of how this changes, particularly depressive feelings, in remitting or secondary progressive MS. Studies results will be used to monitor participants with a recent diagnosis of MS. The first study will include about 240 people with MS. The first study will include about 240 people with a recent diagnosis of MS. The second study will include about 400 participants. It will focus on measuring mood and fatigue over time in people with relapsing remitting or secondary progressive MS. Studies have been set up across several research hospitals and universities in Europe. The studies will run in Milan (Italy), Barcelona (Spain) and Copenhagen (Denmark).

**The epilepsy studies**

The epilepsy studies will run in London (UK) and Amsterdam (The Netherlands) and Barcelona (Spain). In the next stage, the devices that show the best potential to help predict and manage seizures at a distance. The MDD study will run in London (UK), and the MS study will run in Milan (Italy), Barcelona (Spain) and Copenhagen (Denmark).

**Epilepsy**

Remote measurement of brain activity will be used to monitor changes. This could help their healthcare team to be more aware of changes. This could help their healthcare team to design a more personal treatment plan and ensure early intervention and contribute to improving personalised healthcare and quality of life.

**In the next stage**

The data from the active and passive collection of information will be used by the clinicians to help improve the management of the conditions. If this new way of measuring symptoms is proven to be effective, the ultimate goal is to make it widely available to as many people as possible. Both active and passive collection of information are possible. Passive collection can be done without participants being aware that data are being collected. The study will also test how wearable technology might collect information which could not measure in a hospital setting. This technology might collect information which certain aspects of the symptoms which they go about their daily lives.
**Studying major depressive disorder (MDD), multiple sclerosis (MS) and epilepsy**

Major depressive disorder, multiple sclerosis and epilepsy are all disorders of the central nervous system. They can all have a significant harmful effect on a person’s well-being. The symptoms of each condition are different in every person and can change from day to day. Continuously measuring a person’s symptoms, mood and daily functioning could help people gain a better understanding of their condition and how it changes. This could help their healthcare team to design a more personal treatment plan and improve the management of the conditions.

**About RADAR-CNS**

Remote Assessment of Disease and Relapse in Central Nervous System Disorders (RADAR-CNS) is a major international research project. Clinicians, patients, researchers, engineers and computer and data scientists from all over the world are working together to develop new ways of measuring factors and circumstances affecting patients with major depressive disorder, multiple sclerosis and epilepsy. RADAR-CNS aims to improve early detection of problems and potentially change how these, and other long-term disorders, are managed and treated.

**Remote measurement**

In recent years, the amount and the accuracy of data that we can collect using smartphones and wearable devices – for example, popular activity trackers such as FitBit - has rapidly increased. RADAR-CNS will use such devices, and other widely available technology, to collect data from people with these three specific conditions as they go about their daily lives.

With this data, clinicians will be able to monitor certain aspects of the symptoms which they could not measure in a hospital setting. This technology might collect information which could be used to alert both the participant and the clinician to an upcoming relapse. This would ensure early intervention and contribute to improving personalised healthcare and quality of life.

If this new way of measuring symptoms is proven to be effective, the ultimate goal is to make it available to as many people as possible.

**Collection of information**

Participants in the RADAR-CNS study will use the devices and technology best suited to them to measure their symptoms in their home environment.

Information will be collected actively, for example by sending participants regular questionnaires
on their mobile phone and asking them to answer questions about their daily activity and mood. Information will be collected passively by tracking the participant’s movement, step count, speech parameters and even the daily weather conditions. Both active and passive collection of information will help to create a complete picture of the participant’s health and well-being. All of this valuable information cannot be measured with standard hospital examinations.

Clinical studies
For the three conditions – major depressive disorder, multiple sclerosis and epilepsy – clinical studies have been set up across several research hospitals and universities in Europe. The studies will run for between six months and three and a half years, depending on the condition.

Major depressive disorder (MDD)
This study aims to include about 600 participants with a history of depression. It will examine which daily measurements may help us understand current symptoms and, potentially, predict future relapses. The MDD study will run in London (UK), Amsterdam (The Netherlands) and Barcelona (Spain).

Multiple sclerosis (MS)
Two studies will be conducted with people who have MS. The first study will include about 240 participants. It will focus on measuring mood changes, particularly depressive feelings, in people with a recent diagnosis of MS. The second study will include about 400 participants. It will examine the changes and severity of disability and fatigue over time in people with relapsing remitting or secondary progressive MS. Studies for MS will run in Milan (Italy), Barcelona (Spain) and Copenhagen (Denmark).

Epilepsy
Due to the complexity of this disorder, a preparatory ‘pilot’ study will be performed in a hospital including about 200 participants. In this study, researchers will examine the possibility of using certain mobile devices to measure when seizures have happened.

In the next stage, the devices that show the best results will be used to monitor participants with epilepsy in their home environment. The aim will be to collect a set of daily measurements that can help predict and manage seizures at a distance. The epilepsy studies will run in London (UK) and Freiburg (Germany).
Clinical Study Sites

**Major Depressive Disorder:** King’s College London, VUmc, Parc Sanitari Sant Joan de Déu

**Epilepsy:** King’s College Hospital, Uniklinik Freiburg

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