Neuronaute® smart clothing for the diagnosis and monitoring of epilepsy

TIMEFRAME: Estimated earliest commercial availability in the UK

**Now** | **6 months** | **1 year** | **18 months** | **2 years** | **Over 2 years**
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Currently unclear

**TECHNOLOGY**

Neuronaute® is a smart clothing system developed by BioSerenity. It is intended to aid in the diagnosis and monitoring of patients with epilepsy in their own home.

Neuronaute® consists of a smart shirt and smart cap containing biosensors that monitor physiological characteristics, such as muscle activity and heart and respiratory rate. Data from the clothing is sent to a smartphone app for analysis. The clothing can be worn for a prolonged period at home to improve the diagnosis of suspected epilepsy. In addition, patients with diagnosed epilepsy can be monitored and a warning sent to carers or clinicians as soon as a seizure is detected, with advice on the correct procedures to follow. Data can be uploaded to a Cloud platform to aid clinicians in fine tuning the diagnosis and management without patients necessarily having to attend a hospital clinic. The company anticipates Neuronaute® will allow long term data recordings, reduce diagnostic errors and help patients receive appropriate care quickly.

Neuronaute® obtained CE marking in May 2016 and the company anticipates launching the system in the UK during in 2017.

**POTENTIAL FOR IMPACT**

Epilepsy is estimated to affect more than 500,000 people in the UK. It varies in severity with some people remaining alert and aware of what is going on (e.g. some types of focal seizures) whilst others experience generalised seizures with loss of consciousness. The symptoms are caused by abnormal firing of electrical signals in the neurons of the brain. It is not possible to identify a specific cause triggering the seizures in the majority of patients. Similar symptoms may also present in other conditions including migraines, panic attacks...
and low blood sugar levels.

Diagnosis of epilepsy involves assessing the medical history of the patient including a description of any seizures remembered by the patient and any witnesses. The most reliable method of detecting the brain activity associated with epilepsy is an electroencephalogram (EEG) test, which is normally conducted as a hospital outpatient. EEG recordings during seizures are sometimes needed to fine tune a diagnosis. Portable EEG recording devices can be used to monitor activity for longer periods, usually from 1 to 48 hours, but this may not always be sufficient to record a seizure.

Complete diagnosis can take some time and it is estimated that up to 50% of patients thought to have epilepsy have an erroneous or incomplete diagnosis and consequently may be receiving inappropriate or inadequate treatment.

The Neuronaute® system can be worn by the patient at home, collecting data for longer periods in an effort to improve the diagnosis. The suit includes biometric sensors to record the electrical activity of the brain, heart and muscles, and an accelerometer, gyroscope and compass to provide information about what activities trigger a seizure. Data is analysed using a smart phone app. In addition to its diagnostic use, the system and app can detect the onset of seizures in patients with diagnosed epilepsy and send an alert to carers and clinicians. The company anticipates that the app may also be capable of providing alerts of impending seizures and may help to identify triggers in individual patients. The data will be sent to Cloud storage for clinicians to review between hospital appointments.

The company anticipate that an anonymised version of the data collected by the system and app will be made available to medical researchers to develop better understanding of the types of seizures patients suffer. This research may be useful in identifying causes of sudden unexpected death in epilepsy, an unexplained condition that results in about 600 patients each year dying in their sleep.

This technology is predicted to have an impact on the following domains of the NHS Outcomes Framework (https://www.gov.uk/government/publications/nhs-outcomes-framework-2016-to-2017):

Domain 1 Preventing people from dying prematurely;
Domain 2 Enhancing quality of life for people with long-term conditions.

**EVIDENCE**

**COMPANY INFORMATION**

A trial on paediatric patients is currently underway at two hospitals in France.

A six month clinical trial at the Brain and Spine Institute at the Pitié-Salpêtrière Hospital in Paris, France was reportedly conducted to gather evidence leading to securing the CE marking.
Lay summary

The Neuronaute® system is a combination of a shirt and cap and a mobile phone app that people suspected of having epilepsy can wear at home to help with their diagnosis. Epilepsy is caused by unusual electrical signals in the brain and can cause people to lose control of their bodies and lose consciousness.

To help diagnose epilepsy doctors measure electrical signals in the brain using a test called an electroencephalogram (EEG). An EEG during a seizure is a good way of diagnosing epilepsy, but seizures are often unpredictable. The Neuronaute® clothing can record the patient’s brain activity and other things like heart and breathing rate over a long period of time while the patient is at home. The results are sent to a smart phone app, which can detect when a seizure is happening and alert carers and doctors.