Empowering Health

Hospital uses wearable device to create new healthcare reality for people with epilepsy

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—Dr. Rupert Page, Chief Clinical Information Officer, Consultant Neurologist, Poole Hospital NHS Foundation Trust

Poole Hospital NHS Foundation Trust helped form the Epilepsy Care Alliance, which aims to change the way clinicians evaluate and treat people with epilepsy. Together with Graphnet Health, Shearwater Systems, the University of Kent, and Microsoft, Poole Hospital is developing and evaluating a solution using Microsoft Band and the Graphnet myCareCentric platform to engage patients and help doctors deliver more effective care. The project will help providers deliver timelier treatment at less cost and could create a new reality in epilepsy care.

Poole Hospital NHS
NHS Foundation Trust

Poole Hospital NHS Foundation Trust

3,700 employees
www.poole.nhs.uk
United Kingdom
Healthcare

Company profile

Poole Hospital NHS Foundation Trust delivers health services in Dorset, United Kingdom. The Dorset Neurology Service is based in Poole and serves 760,000 residents, including patients with epilepsy.

Microsoft

Our entire experience of reality—every new day, bright idea, tasty bite, or bee sting—relies on electrical activity between the brain cells in our heads. People with epilepsy suffer from a tendency for their brains to periodically interrupt that complex and delicate interplay with abnormal electrical discharges. The end result is a potentially dangerous and sometimes life-threatening seizure. The cause of the seizures may be one of a wide range of neurological conditions.

Many people who have a single seizure will never have another. Some will be at higher risk of further seizures—due to a range of factors that includes genetics, brain injuries, and tumors. Antiepileptic medication is the mainstay of medical treatment and can prevent further seizures in as many as 80 percent of these patients. But in reality, current medications keeps less than 60 percent of people with epilepsy completely seizure free.

"It can take months or even years to optimize a treatment plan for an individual patient," says Dr. Rupert Page, Chief Clinical Information Officer and Consultant Neurologist at Poole Hospital NHS Foundation Trust in Dorset, United Kingdom. "Health, life quality, sleep habits, mood, alcohol, drugs, psychiatric or psychological issues, and myriad other factors can all influence a patient's seizure risk."

In the United Kingdom, the National Health Service (NHS), Poole Hospital NHS Foundation Trust, and the University of Kent have teamed up with Microsoft and healthcare IT developers Shearwater Systems and Graphnet Health to fundamentally change how doctors evaluate and treat people with epilepsy.

"With the large scale collection of data from Microsoft Band wrist devices, we will be able to build machine learning classifiers to accurately detect epileptic seizures and alert care teams, friends, and family when a seizure has occurred."

—Christos Efstratiou, Lecturer, School of Engineering and Digital Arts, University of Kent

The Epilepsy Care Alliance

Typically, when a person experiences an initial seizure, they may be admitted to the hospital for observation, but are usually scheduled for a clinic appointment to be evaluated by a neurologist. The interval between initial presentation and review can vary widely.

Although each patient usually has a follow-up examination, many won't need further medical attention. When assessing for epilepsy, the neurologist has to rely on the patient's memory of events that can cause altered awareness, so the information a patient reports about their experiences with medication or seizures is likely to be subjective, inaccurate, or incomplete. In traditional models of care, the neurologist will schedule more follow-ups and adjust treatment based on the same type and quality of information. "This approach makes managing an already complex condition more difficult, protracted, and costly, while patients have to suffer high rates of isolation, depression, and injury," says Dr. Page. "Sometimes patients can even die as a result of injuries sustained during a seizure or, rarely, as a result of the seizure itself."

In 2015, Poole Hospital, Shearwater Systems, Graphnet Health, and the University of Kent began the Epilepsy Care Alliance with funding from Innovate UK, a non-departmental public body. The partners combined their expertise and knowledge to develop and evaluate a technology solution that can provide doctors with the data they need to deliver more effective care and engage people with epilepsy in their own treatment.

A wearable solution

Shearwater Systems and its sister company Graphnet Health, both members of the Microsoft Partner Network, worked together to build a data collection and analysis platform called myCareCentric. It uses the Microsoft Health and HealthVault platforms and Microsoft Band wearable devices to collect patient data, which is supplemented with other data entered by the patient through a mobile app. The platform uses Graphnet's CareCentric shared-records software to add related data from community, social care, and clinical settings. The combined data is stored in Microsoft HealthVault and hosted in Microsoft datacenters, where it can be safeguarded and still accessed by clinicians and patients.

"We built an enterprise platform for mobile clinical applications on top of a wide area network of shared records," says Ian Denley, Chief Executive Officer at Shearwater Systems. "Patients can use the platform to access their own health records and connect with their care communities."

In 2016, Dr. Page supervised evaluations of the solution at the Poole Hospital Neurology Center with volunteer patients. For several months, patients wore Microsoft Band devices and automatically generated a range of physiological data. With the myCareCentric mobile app on their smartphones, they recorded additional data about their diet, sleep, social activity, or medication, and they noted when they suffered a seizure.

The solution makes it possible for doctors to access the combined data in HealthVault and analyze it to better understand their patients' seizure risk and respond appropriately. "This technology can help us identify patterns of stress, behavior, lifestyle, and other factors that contribute to seizure risk and frequency," says Dr. Page. "This will help us deliver more effective care to the at need population."

The University of Kent is leading the project to evaluate and validate the solution. It assessed 22 wearable devices and selected the Microsoft Health platform because Microsoft Band includes a sophisticated range of sensors, such as movement, heartrate variability, and galvanic skin response. Additionally, researchers can use the Microsoft Health software development kit (SDK) to enable Microsoft Band to collect data remotely.

"We found that Microsoft Band provides the sensor data we want in a reliable manner, and the Microsoft Health SDK works the way we need it to," says Christos Efstratiou, Lecturer in the School of Engineering and Digital Arts at the University of Kent. "It was definitely the best option available."

"We want to break down boundaries and challenge traditional ways of interacting with patients. That's one way we can strike the balance between high-quality care and cost control."

—Ian Denley , Chief Executive Officer, Shearwater Systems

More data, machine learning, and swift action

By the second quarter of 2016, the university began analyzing data from the Poole Hospital trials to evaluate and fine-tune the software. Formal trials at Poole Hospital are scheduled to start in the third quarter. Researchers will process the increased data sets to build intelligence about seizure patterns. They'll use Microsoft Azure Machine Learning to develop algorithms and classifiers that could ultimately be used to detect seizures with Microsoft Band and Microsoft Health for a large proportion of patients.

Preliminary analyses suggests that movement data could be a primary indicator for specific types of seizures, and that heartrate and galvanic skin response may act as secondary indicators. If the Epilepsy Care Alliance can apply machine learning to detect and track seizures, it could further clinical understanding and help doctors optimize drug combinations and other treatments.

"We're just in the early stages," says Efstratiou. "But with the large scale collection of data from Microsoft Band wrist devices, we will be able to build machine learning classifiers to accurately detect epileptic seizures and alert care teams, friends, and family when a seizure has occurred."

No more clinical guesswork

The Epilepsy Care Alliance has demonstrated that myCareCentric, Microsoft Health, and Microsoft Band can provide objective ways to evaluate treatment, manage medications, and identify risk factors.

Patients can now receive timely, data-driven support to reduce their seizure risk. They can use the discreet, wearable Microsoft Band without stigma and provide their care teams with real-time data that enables more informed conversations that help them avoid adverse drug interactions, make appropriate lifestyle choices, and spend less time taking unnecessary medications.

"We can use this solution to deliver effective treatment when our patients need it, instead of four times a year in routine, often unproductive appointments," says Dr. Page.

Through myCareCentric, doctors will have complete, relevant, objective, always up-to-date patient information at their fingertips. Instead of waiting months or years to see

results, they'll know better and faster which interventions made a difference and can adjust treatments as a patient's condition changes.

"With the data from Microsoft Band and innovative data visualizations in myCareCentric, we can get an overall picture of the patient, find patterns, and uncover opportunities to influence outcomes," says Dr. Page. "We are using technology to provide an individually tailored, responsive service which is truly in the hands of the patient."

After witnessing a demonstration of myCareCentric, one patient called it revolutionary. "This is going to make life so much easier for everyone living with epilepsy," he says. "I can't thank you enough."

A new day in healthcare

The Epilepsy Care Alliance is still in early stages of its work, but myCareCentric will soon help healthcare providers deliver better epilepsy care at less cost. They will schedule fewer unnecessary appointments, address issues earlier, and avoid hospital admissions. Project lessons will apply to other chronic conditions, and Shearwater Systems and Graphnet are already developing myCareCentric modules for congestive heart failure, diabetes, and elder care.

The project partners are excited that Microsoft has opened new Azure datacenters in the United Kingdom and hope that this will open the NHS to faster healthcare IT innovation. "We want to break down boundaries and challenge traditional ways of interacting with patients," says Denley. "That's one way we can strike the balance between high-quality care and cost control."

Many people with epilepsy are eager to be better understood and to have more power over their condition. Some of them might call this a new day.

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