Capturing the Itch: Using Digital Wearable Devices to Help Patients with Atopic Dermatitis

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For people who have atopic dermatitis (AD) — an autoimmune condition that causes painful, itchy, and inflamed skin — symptoms often flare up at night, leading to disrupted sleep. Until recently, there hasn’t been a way to truly capture how much a person’s quality of life is impacted by these nighttime symptoms. Patients enrolled in studies are asked to complete sleep journals, but these self-reports are based on recall and are often not fully accurate.
To address this issue, Pfizer’s Digital Medicine & Translational Imaging (DMTI) scientists have developed a system using wearable devices to quantify a patient’s scratching and sleep disruption. Using accelerometers, a technology frequently utilized in fitness wearables, this device can accurately detect and measure wrist movements typically associated with scratching. “Having the ability to objectively, remotely and continuously measure scratch and sleep disturbance is very important, because it can supplement patient questionnaires and represents a clinical endpoint that really impacts their daily lives,” says Tim McCarthy, Head of Digital Medicine and Translational Imaging at Pfizer in Kendall Square, Cambridge.

**Staying on top of technology**

The AD scratching sensor, as well as other similar projects striving to use wearable devices as novel clinical endpoints, are being developed in the Pfizer Innovation Research (PfIRe) Lab. Established at the heart of Kendall Square in Cambridge, the PfIRe Lab is a fully instrumented and clinically compliant incubation space where scientists test currently available digital devices and develop plans to deploy them into clinical trials. Digital health sensors, apps, and other mobile health technologies have been available for years, but selecting the right ones and optimizing them for use as novel clinical endpoints takes rigorous work. “The key for our group is staying on top of the technology,” says David Caouette, an Executive Director in the DMTI group. “The PfIRe Lab enables us to carefully evaluate devices and ensure they can collect exactly the data we need before deploying them into expensive and lengthy clinical trials.”

As clinical studies increasingly seek to incorporate real-world data, sensor-based technology will become a critical tool for capturing patient information in the context of their daily lives. “Our main driver is patient-centricity; making clinical trials easier for participants by enabling them to wear a device in their home environment rather than having to come into the clinic. These continuous measurements, captured in a real-world setting, help us better understand the impact of our medicines on a patient’s disease state,” says McCarthy.

**Potential Digital solutions for Understanding AD**

The DMTI team is currently testing the scratch sensor in several ongoing studies in collaboration with academic partners such as the University of Rochester and Boston University, where the sensors are being evaluated in a pediatric population for the very first time. In those studies, patients with AD spend a night in a sleep lab wearing the scratch detectors, while also being recorded on video. This allows scientists to compare
device data against the video footage and confirm that the wearable is truly capturing scratch. “We can then develop machine-learning algorithms to detect scratching events based solely on accelerometer data, without needing to deploy a camera in every patient’s home,” says McCarthy. Ultimately, it’s about harnessing recent technological innovations to improve patients’ lives. “It really gives us a handle on the disease burden for these patients and whether we can intervene with a therapy to improve their lives,” he adds.

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