

How Sleep Data from WHOOP is Helping Researchers Detect Early Liver Disease



Adam Buckholz, MD MSc, an Assistant Professor at Weill Cornell Medicine specializing in non-alcoholic fatty liver disease (NAFLD) and cirrhosis research, is unearthing new diagnostic tools that can help detect a major complication, Hepatic Encephalopathy (HE), earlier—helping patients get the treatment they need sooner.

Dr. Buckholz uses WHOOP to study sleep patterns in patients with and without liver disease, looking to further understand the link between changes in sleep and the ability to diagnose this disease in its earlier stages.

“Sleep matters to patients. People care about their sleep in a way that they don’t care about abstract things like neurocognitive changes. Everyone can speak a little sleep.”

Adam Buckholz, MD MSc, Assistant Professor
Weill Cornell Medicine



Finding Innovative Ways to Detect Covert Disease

While the liver is a resilient organ, after long term damage from stressors such as alcohol, viruses, or NAFLD, it can develop irreversible scarring called cirrhosis. NAFLD is the most common chronic liver disease, and along with the ongoing epidemic of obesity, diabetes and high cholesterol is increasing in the United States.

NAFLD and other liver diseases are often not caught in patients until they progress to cirrhosis, where they are at risk of life threatening complications like HE. HE is caused by high levels of a toxin called ammonia in the bloodstream, which builds up in the brain and causes confusion or even coma.

Patients with early HE, or “covert encephalopathy” don’t show signs or symptoms until the disease progresses to a more severe—or “overt”—form. This occurs in about 1 of every 5 patients with cirrhosis every year—and once it does, it often recurs and can be life threatening, with a liver transplant being the only cure.

Typically, patients with covert encephalopathy are only diagnosed through specialized cognitive testing. However, only about 1 in every 10 physicians performs this testing, as it’s a cumbersome process that requires extensive training.

Through his studies, Dr. Buckholz is uncovering a better diagnostic tool for discovering covert encephalopathy, in the hope that patients can receive treatment for their disease in its earlier stages, evaluate risk levels for disease progression, and be active participants in their own health journeys.

Using Longitudinal Sleep Metrics to Understand Health

Polysomnography (PSG), the gold standard for measuring sleep, has suggested that there are clear differences in [sleep patterns](#) between those with and without covert encephalopathy. However, PSG is not universally accessible. “It’s [only] one night, and it’s very expensive,” Dr. Buckholz said. “Not every patient has a willingness or ability to access this.”

In need of an accessible, cost effective, and user-friendly tool that would give patients and researchers precise, objective insights into

sleeping habits, Dr. Buckholz chose WHOOP—the wearable that accurately tracks sleep within [one breath per minute](#) of the gold standard and offers insights on sleep duration, REM sleep, deep sleep, and more.

Dr. Buckholz hypothesized that he could use WHOOP metrics to longitudinally measure sleep patterns, helping diagnose and evaluate covert encephalopathy so that doctors can intervene as early as possible.

“WHOOP has been evaluated in automatic detection mode for four-stage sleep in a way that matters to the scientific community.”

Spearheading a Different Kind of “Sleep Study”

The covert encephalopathy study’s pilot phase began in the winter of 2020, featuring 25 participants who were a mix of those with and without covert encephalopathy. With the use of WHOOP Unite, Dr. Buckholz analyzed metrics like respiratory rate, HRV/RR intervals, heart rate, and accelerometry to stage sleep (light, wake, REM, SWS).

Equipped with this highly accurate data, Dr. Buckholz’s study was able to comprehensively collect sleep data on patients—while encrypting and fully anonymizing patient data for maximum security.

Uncovering Dramatic Differences in Sleep Patterns

Dr. Buckholz’s findings were significant: while those with and without covert encephalopathy appear the same in terms of physical appearance and clinical lab results, their sleep patterns are strikingly different.

WHOOP sleep data showed that patients with covert encephalopathy experience drastic reductions in REM sleep, losing almost 50% of their REM sleep per night—even when they’re sleeping for the same number of hours as those without the disease.

Additionally, patients with covert encephalopathy experience more sleep disturbances and less sleep efficiency and consistency. This data was consistent over the six-month period and aligns with findings from smaller polysomnography studies.

Empowering Patients with NAFLD

Dr. Buckholz hopes to use sleep data from WHOOP to evaluate potential medicinal interventions (such as encephalopathy medications or melatonin) or behavioral interventions (such as more exercise or less caffeine) that might improve sleep and help prevent disease progression. Earlier diagnosis and treatment of encephalopathy has the potential to reduce hospital admissions and reduce deaths in cirrhosis.

“Patients are more and more wanting to have access to their own information, their own data, so that they can be active participants in their care.”

By giving patients effective tools and support, they can be in the driver's seat of their own health journeys. Armed with the knowledge of what their sleep patterns should look like, they can evaluate the data collected by their WHOOP devices and determine whether or not they need to take medical action. Ultimately, this could help at-risk patients initiate dialogues with their providers and get treatment for covert encephalopathy before the disease progresses.

In other words, WHOOP provides a common language between provider and patient, helping patients take a more proactive approach to care. In turn, this leads to better health outcomes, lower healthcare costs, and higher satisfaction with providers.

Leveraging WHOOP Data Across Additional Research Areas

Based on the success of the pilot study, Dr. Buckholz envisions other ways of harnessing WHOOP data to better understand sleep patterns, identify opportunities for early intervention, and inspire patients to take control of their own health.

WHOOP Unite is helping innovative researchers like Dr. Buckholz develop preventative care and treatment in areas of research that have been traditionally under-funded or lacking access to vital data collection technology. The insights uncovered are leading to better disease detection, novel treatments, and more informed and empowered patients.



To learn more about how WHOOP Unite provides the data and insights to propel purpose and results along the patient care journey, visit whoopunite.com/healthcare.