

THE NEW SLEEP GADGETS: WHAT TECHNOLOGISTS NEED TO KNOW

By Tamara Sellman, RPSGT, CCSH

The personal sleep technology marketplace came of age at the Consumer Electronics Show (CES) in Las Vegas last January when the event introduced an entire wing of personal sleep technology products as part of an effort launched in partnership with the National Sleep Foundation.

As sleep technologists, it's important that we have a firm grasp on what these new DIY healthcare tools can do (or can't do) to help a patient with their sleep problems. Why?

By now you've likely encountered some sort of do-it-yourself sleep tracking app, either through a friend, a family member, or a patient. You may have even adopted the use of one or more of these devices yourself.

Patients may (and do) turn to these options first before considering a trip to their primary care doctor because they're easy to access, affordable, and aesthetically alluring.

So what exactly is this new branch of sleep technology?

DIY SLEEP TECHNOLOGY CATEGORIES

Among ordinary users, this technology is called "personal sleep technology," "consumer sleep technology," "home sleep technology," or just "sleep technology." It might be more accurately called "do-it-yourself sleep technology" to differentiate it from technology found in the sleep center.

This DIY sleep technology breaks out into the following categories:

Wearables

These devices are worn and may or may not include the use of a sleep tracking app. Iterations include bracelets, necklace pendants, rings, watches, sleeves, personal pulse oximeters, masks, earbuds, headbands, headphones, forehead pads, eyewear, pajamas, and waist/chest belts.

Functions: To track sleep quality and quantity, to measure and record movement, to check heart rate, to capture respiratory rates and patterns, to measure brain signals, to deliver relaxation, to note changes in body temperature, to elicit wakefulness in the morning.

Sleep Tracking Apps

Smartphone-synched apps, which may or may not incorporate wearables or other technology.

Functions: To track anything from sleep apnea to insomnia to sleep quality/quantity to REM cycles to snoring to whole family sleep habits.

Embedded Technology

Objects that include sensors and trackers that are not worn, such as smart mattress pads and smart pillows, and which may or may not incorporate sleep tracking apps.

Functions: Many of the same functions as wearables.

Light Technology

This includes both light fixtures and light-blocking technologies.

Functions: To improve melatonin production in the early evening, to awaken the user, or to improve alertness in the morning once awake.

Sound Technology

Often also wearable, but includes any technology using noise or music to encourage sleep onset.

Functions: To encourage relaxation and sleep onset, and to block noise in the sleep environment (externally, such as traffic, or internally, such as people talking in the next room).

Interactive Technology

Technology that incorporates a therapeutic management team, which can be comprised of a live consultant, a hosted 24-7 website, a text or email communication arrangement with a sleep specialist, or other direct access to a coach, therapist, educator, or other professional.

Functions: To provide guidance for first-time or struggling CPAP users, to encourage compliance to therapies, to help insomniacs by way of CBT-i applications.



TAMARA KAYE SELLMAN, RPSGT, CCSH

Tamara Kaye Sellman RPSGT, CCSH, is a science journalist and sleep health activist. She is currently writing a book on sleep hygiene for mainstream audiences which she hopes to launch in 2017. She is a web consultant for the [American Sleep Apnea Association](#) and curates the sleep health information clearinghouse, [SleepyHeadCENTRAL](#).

Miscellaneous Technology

Specific technologies meant for specific populations (i.e. babies, schoolchildren, pets, drivers, CPAP users, those with hypersomnia, fatigued employees).

Functions: Anything from monitoring infant breathing to smart alarm clocks to drowsy driving prevention gadgets to apnea detection sensors and nap pods.

Combinations of all of the above...

Innovative combinations of these different technologies arise when manufacturers and developers find ways to distinguish their products from the rest of the competition by combining functions.

BUT DOES DIY SLEEP TECHNOLOGY WORK?

Some of it does, some of it doesn't. Some of the functions aren't particularly useful for the end user. Collecting data is only useful if it can be applied in a way that solves a problem.

How they *can* work is a different matter. As sleep technologists, we know how the technology *should* work. These products mirror the basic functions of the tools we already use, such as actigraphy, oximetry, plethysmography, vital sign collection, even basic EEG and EOG.

The challenge, however, lies in the value of the end result.

How accurate is the technology? DIY sleep technology can vary widely in what it purports to do; accuracy is an ongoing challenge for developers.

Are the sensors collecting enough data to be useful? These are not the high-quality lab tools we use; if they were, consumers would be outpriced. These instruments also don't capture the full picture of sleep like an overnight polysomnogram can: Imagine running a diagnostic test without EEG, for instance.

Do users apply this technology properly? It's hard to say. These tools require patient education to work; developers design them for the lowest common denominator to use.

Do users know how to interpret the results? Some kinds of data seem easy to interpret (i.e. physical movement) but in the context of other data that isn't being recorded (such as brainwave activity to distinguish sleep from wake), how useful is that data?

Also, users tend to focus on numbers without appreciating that there is a range of what is considered normal. They can misinterpret the most accurate data as either positive or negative when, in fact, the reality could be quite the opposite.

WHY PEOPLE CHOOSE DIY SLEEP TECHNOLOGY

They have heard that sleep matters.

This is a positive! It means they are paying more attention to their sleep health. They choose it as a way to get some insight into their sleep patterns, often to determine whether they need to get additional help.

Friends, family members, colleagues, and influencers advocate it.

Word of mouth is powerful. Many use it as a first-line approach for addressing insomnia or daytime sleepiness.

It comes with their fitness technology, so why not track sleep as well?

Some people love to collect data and follow statistics (baseball fans!). Sleep tracking can become a hobby as well as a habit. Meanwhile, wearables have become a fashion trend.

They know they have problems but resist seeing a sleep specialist.

Why? Because they have inadequate insurance coverage; they fear medical procedures; they don't trust doctors; they don't see sleep as critical to wellness; they believe they'll only be given drugs or a "breathing machine."

HOW SLEEP TECHNOLOGISTS CAN STAY ON TOP OF THIS TREND

Learn everything you can about these technologies.

You could start with the list of categories above and spend an hour a week doing research on each until you get a feel for what these technologies claim.

Try printing out reviews from tech websites or watching how-to videos from manufacturers. A simple search in eBay or Amazon can highlight claims and technical specifications.

Another reason to attend sleep conferences and technology conventions in person: there are booths displaying these products, with representatives to address questions about functionality, purpose, and accuracy. You can also take their brochures to refer to later.

When patients bring them in, ask them how they use them.

During your patient encounter process, take some notes (brand, model) and find out what inspired the patient to choose that particular gadget. That can tell you a lot about their motivations for getting help. Listening without judgment works well in this case.

Be prepared to discuss product functions with patients.

Once you do the research, you'll see how the engineering behind these gadgets mirrors what you are doing in the sleep center.

If a patient shares their use of a product, you can help them to better understand how it works by comparing it to the multiple

technologies built into a polysomnogram and explain why the in-lab sleep study remains the “gold standard” for sleep diagnostics.

Be prepared: If a patient visits a sleep clinic for a consultation and testing, he may use gadget data as grounds to “prove” a self diagnosis or disprove the sleep doctor’s diagnosis.

Be wary of impedances issues and potential interference.

If patients want to use these gadgets in the sleep center, you’ll need to first confirm that they won’t compromise the quality of your sleep study.

Most patients will understand after the hookup that they are using sleep technology “on steroids” when compared to their little gadget and probably won’t demand using their own, but if they do, be prepared to explain why interference is a no-no.

Don’t discount their use of these products.

We all know sleep patients are pretty defensive about a lot of things (snoring, for starters). We can’t stop patients from using these devices, but we can listen to their stories. While this technology may or may not help them, it’s the intent behind their usage that matters most.

Patients who go this route are seeking information to solve a problem. By using these products, they could become better educated about sleep. Informed patients are empowered patients, more likely to stick to a therapy than those who don’t care about their sleep health.

THE BRIGHT SIDE

Sleep is “the new black”.

People who use DIY sleep technology are being proactive and should be acknowledged for their self advocacy. They also shine a spotlight on the value of sleep when they do so. This has been a *huge* public health roadblock up until now. Awareness matters, however it occurs.

Technology before drugs.

These users also use these tools because they want nonpharmaceutical solutions, which is a healthy trend away from previous drug-seeking behaviors.

This is not to say that gadgets can or should replace medications for some patients.

However, in light of the current opioid epidemic, habituation to zolpidem, and black market for “performance drugs” like modafinil, the pivot toward technology and away from unnecessary medications should be considered positive.

➔ **Continued on Page 22**

AN APP THAT FOSTERS SLEEP RESEARCH

One of the ways in which DIY sleep technology can have a lasting and helpful impact on sleep health is through its ability to collect and analyze data. Who needs data more than sleep patients, but sleep researchers?

The free SleepHealth App and Mobile Study download (iOS only, with Android launching later this year) records data from its users in a vault for researchers to access.

The premise behind this effort is multifaceted: “Become a citizen researcher, get support, give us your insights and help us to direct future research.”

The app, powered by IBM Watson and launched in March 2016, is the product of a new patient-led effort led by the American Sleep Apnea Association (ASAA) in concert with sleep researchers led by principle investigator Carl Stepnowsky PhD, Associate Adjunct Professor at the University of California, San Diego.

The SleepHealthApp is more than a tracker. It’s an actual mobile research study (Protocol No. 20150142) which investigates connections between the user’s sleep and general health, medical conditions, daytime alertness, and productivity.

This technology uses the iPhone and/or the Apple Watch to advance clinical research on sleep and sleep disorders with relation to other medical conditions. You can already guess at what some of these are: diabetes, COPD, and heart disease, for starters.

The app also personalizes insights into the user’s sleep habits and general health and well-being. But, more importantly, this app is a patient-led research study that allows participants to be equal partners in the monitoring and management of their symptoms.

Anyone age 18 or over can use the app; it does not limit participants by gender, health status, or any other demographic. Currently the app has only an English language version, but the ASAA plans to generate it in other languages in the future.

➔ **Continued on Page 22**

A way in for CBT-i.

The rise of Cognitive Behavioral Therapy for insomnia (CBT-i) can be better supported by the interactive features of personal sleep technology.

Apps, wearables, and embedded gadgetry can work together as part of a sleep health program for insomniacs who cannot get the therapy they need where they live.

There's a shortage of professionals who can provide CBT-i, which research shows can be effective for treating multiple types of sleep disorders. Digitized options combining one-on-one support with technology and telemedicine may solve this supply-and-demand problem.

We're only at the beginning.

Finally, the new sleep technology may be limited in its functionality, accuracy, and usefulness for now, but all new technology begins with glitches and bugs.

As more people use it, the best products in terms of engineering and design will succeed, while the least effective technologies will fail. And, more feedback from users means more chances to refine and perfect these devices.

Final analysis, relevant to sleep clinics: Whether this technology becomes so good that it replaces the actual work of an RPSGT is up for debate, but suffice it to say, it does us no good as sleep technologists to ignore these tools: they are not going away any time soon. ❖

↳ Continued from Page 21

Principle investigator Dr. Stepnowsky reports that in the first nine months, 18,000 people downloaded the app and 9,500 consented to participate in the study. Interestingly, he points out that two thirds of users are first-time research study participants.

The app is designed to be easy to use: After download, you register an account (free), learn about the study, review consent information, complete some health surveys, and perform very simple daily tasks (up to 20 minutes of tasks a week); meanwhile, the app collects your data for research purposes.

Its developers see a wide range of longitudinal research opportunities for using it in the future. Envision the Wisconsin Sleep Cohort, which took decades of clerical and research labor to complete. Using today's data collection technology apps, we can now employ Big Data to work for us in ways which could be a boon for researchers seeking solutions for our most pressing sleep health problems.

Sleep technologists are highly encouraged to download the app and participate in the study.

To learn more visit: <https://sleephealth.org/sleephealthapp/>

“Final analysis, relevant to sleep clinics: Whether this technology becomes so good that it replaces the actual work of an RPSGT is up for debate, but suffice it to say, it does us no good as sleep technologists to ignore these tools: they are not going away anytime soon.”