Parkinson's Monitoring Technology: What's Here and What's Coming?

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Despite advances in Parkinson's disease research and medications, over 10 million people have been diagnosed with no cure in sight. However, the number of new wearable devices and apps designed to help monitor symptoms and manage care has increased over the last few years. It is hoped that this new technology will individualize treatment for Parkinson's disease to help slow disease progression and to improve quality of life while we wait for a cure.

Key takeaways:

- New technologies monitor and assist in the treatment of symptoms of Parkinson's disease, which has no cure.
- Technologies that monitor symptoms provide objective data on the effects of medication on Parkinson's disease symptoms.
- Neurologists can make adjustments in medications and individualize treatment plans with the real-time data provided by these technologies.

→ In-home monitoring with these new technologies can allow for adjustments in your plan of care between office visits, thus improving your quality of life.

Challenges of monitoring patient symptoms

Parkinson's disease is a devastating neurodegenerative disorder that has no cure. No single test or biomarker allows a neurologist to diagnose Parkinson's disease or track its progression. Instead, physicians look for two of three neurological symptoms to diagnose Parkinson's disease. These symptoms include slowed movements, tremors, and muscle rigidity. The examination is subjective, especially in the early stages when symptoms may be mild.

Monitoring disease progression is subjective as well. It is based on patient diaries and family observations. Neurologists spend 30 minutes with you every three to six months, which does not provide a true picture of your symptoms and limitations. This is especially true if you come to the appointment several hours after taking medication that reduces symptoms.

Neurologists need to know what symptoms are occurring, the severity, the response of the symptoms to medication, and how long the medication works. To get a real-time objective picture of movement, tremors, muscle rigidity, and the effect on gait and daily living, researchers have begun to develop technology

that will allow symptoms to be measured and recorded in your home while you go about normal activities. For example, watches or belts with monitoring devices detect and track mobility issues through apps and other software. Neurologists can adjust medication based on this monitoring data rather than subjective information in a patient diary or family report.

Technology improves patient care

New technologies are helping to individualize patient care in a number of diseases, but especially in Parkinson's disease. Monitoring apps and technology have the greatest impact in assisting neurologists and other practitioners in designing an individualized care plan and seeing the real-time effects and duration of medications.

If you have Parkinson's disease, some devices help you to keep walking when your legs feel heavy or frozen. They can prevent falls by vibrating when the gait or muscle movement is abnormal, stimulating you to continue walking. Technology that looks like a fork or spoon calms hand tremors allowing you to feed yourself.

Many new technologies can also be used for patients with other neuromuscular disorders. However, the problem with this technology is that many neurologists are still not prescribing these devices. Many have no Food and Drug Administration (FDA) approval, so there is often no insurance coverage for the technology.

The "right" technology for Parkinson's

Looking for that "right" technology to help yourself or a loved one can be difficult. It is hard to keep up with changes in this technology. In addition, products are not "advertised" in one place, so it is hard to see what's new, the effectiveness of the technologies, or which technologies have been FDA-approved.

Some technology is used for several disorders and will not be identified as specifically recommended for patients with Parkinson's disease. This makes it hard for someone with Parkinson's or their family to search for technologies that may help a loved one. Manufacturers of this technology also find it difficult to locate customers and prescribers as those with Parkinson's disease have a wide range of symptoms and needs.

One way to look for updates on new technology is to go to the websites of some of the non-profits in the United States that provide information, referrals, education, and support programs for individuals with Parkinson's disease and their families. They are usually not affiliated with any manufacturer and can objectively review new technologies.

Who is doing research?

The Morris K. Udall Parkinson's Disease Research Act of 1997 authorized the National Institutes of Health (NIH) to form the National Institute of Neurological Diseases and Stroke Udall Centers of Excellence. It is a network of

research centers that collaborate with other research institutions that the NIH funds to work on the cause, monitoring, and treatment of Parkinson's disease.

These Udall Centers also work with patients and their caregivers to help develop solutions to the daily issues that arise when living with Parkinson's disease. In addition, the National Institute for Neurological Disorders and Stroke has also funded a technology laboratory at the University of Rochester for Parkinson's research. These scientists worked with Apple on Smartphone apps that assess for Parkinson's symptoms.

New technologies for monitoring Parkinson's disease

It is important to know your symptoms and their severity. You will need to talk to your neurologist or the manufacturer or read the literature on the device to be sure the technology suits your symptoms. For example, if you have trouble with fine motor skills, you may be unable to navigate an app on a phone.

Cost is also a consideration. Try to identify any hidden costs you may not have considered, such as app subscription fees. Another consideration is whether you will be able to set up and use the device independently or whether you have a loved one or caregiver to help with the device. Obtaining the help of a private caregiver to assist you with the device may also add to the cost of using the technology.

The following is a list of some of the newer technology available to monitor or help you live with the symptoms of Parkinson's disease.

Real-time monitoring devices

There are a number of devices that help monitor mobility issues in real-time in your home so that data can be sent to your neurologist for adjustments in medication or treatment plans. [GIEDRE, THIS ARTICLE REQUIRES TABLES AS DISCUSSED]

- **Smartwatches.** Watches with specific apps can help monitor and/or record mobility, rigidity, and tremors.
- **Artificial Intelligence (AI) technology.** Web apps can help detect early warning signs of Parkinson's. A video recording of you doing tasks is made with your computer and uploaded to the web-based app. Furthermore, AI software tracks and compares your movements with Parkinson's symptoms.
- **Wearable.** These devices go around your waist to prevent gait freezing.
- **Sensors.** These can be worn on wrists or ankles to monitor tremors, muscle slowness, mobility, posture, and gait.
- **Five-device system.** Monitors all motor symptoms coming from any limb or trunk.
- **Melanin-tinted glasses.** These help to maintain balance and manage tremors.
- **Walker on wheels.** This aid helps to reduce gait freezing. A laser forms a line under the

front wheels to stimulate you to move the walker. A rhythmic audio cue and a vibration in the handles help you form a walking rhythm.

- **Invasive devices.** These devices use leads implanted in the brain to control gait freezing, tremors, and speech issues.
- **In-home wireless device.** These are still in trial stages but are convenient for monitoring symptom progression and medication response. For example, MIT's study of 50 people was equipped with a small in-home router to detect and record radio signals that deflect off their bodies as they move.
- **Sock sensors.** Sensors in these socks connect to an app that provides live feedback on your gait. The device is under clinical development to help assess gait issues.
- **Vibrotactile stimulation.** A wearable device uses vibrotactile stimulation through an adhesive patch usually placed on the sternum. Pulses or cues are sent to stop gait freezing. The device is still under development.

Fine motor tremors

With Parkinson's disease, the voice often becomes very soft, and your speech is hard to understand. Fine motor tremors also affect your ability to feed yourself without dropping food off your fork or spoon. The following devices amplify your voice and decrease fine motor tremors to allow you to eat without assistance.

- Wireless voice amplifiers with a microphone and headset improve the volume of your voice.
- A tremor stability device with a small computer with motors built into the handle of fork and spoon utensils has been developed. Tremors are decreased while using these utensils.

Symptom-improving devices

These devices provide assistance that improves your symptoms, making you stronger, safer, and more independent.

- Exercise apps for your electronic devices or computer for mobility, dexterity, and speech, which feature walking to a beat, improving steadiness.
- Low-level hand-held lasers provide light therapy to help with fibromyalgia and other flexibility symptoms.
- Infrared therapy helmets send light impulses into the brain to energize the nerve cells to improve mobility.
- Using a laptop or computer to access 10-week exercise programs specifically for those with Parkinson's.
- Motorized exercise bike with arm exerciser for improvement of leg and upper arm strength.

Devices for improving independence

Some devices can be used to assist with a chronic condition, to improve independence, such as:

- App for a smartphone to manage medications.
- Medication dispensers with alarms.
- Smartwatches with apps that can track and record simple vital signs, sleep, and will detect a fall.
- Voice-driven devices allow you to set alarms and reminders, play music, change the TV channels, turn on and off lights, order groceries or other services, and make calls. Helpful for diminished dexterity and mobility issues.
- Sleep and oxygen monitors detect signs of sleep apnea to decrease fatigue and stress, depleting dopamine already in short supply in Parkinson's disease.

While researchers work towards a cure for Parkinson's disease, they are also developing in-home technology that will allow neurologists to monitor and treat symptoms of Parkinson's to improve your quality of life. By minimizing gait and rigidity issues, technologies can help prevent falls and maintain independence. To explore current technologies, review the websites of the various Udell research centers or non-profit Parkinson's disease support organizations and contact your neurologist's office.

Resources:

1. Parkinson's Disease: Challenges, Progress and Promise.
2. Parkinson's Disease Patients Experience Significant Reduction in Symptoms with Non-Surgical Focused Ultrasound Treatment.
3. Monitoring gait at home with radio waves in Parkinson's disease: A marker of severity, progression, and medication response.
4. A New Paradigm in Parkinson's Disease Evaluation with Wearable Medical Devices: A Review of STAT-ON™.
5. New Sensor and Wearable Technologies to Aid in the Diagnosis and Treatment of Parkinson's Disease.