

BROOKS[®]
Rehabilitation

BEYOND

FALL / WINTER 2025



INNOVATIONS that
are Shaping Rehabilitation



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QUALITY BAR**



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Innovation is one of our core values at Brooks. We are constantly seeking new ways to empower our patients and provide them with the most advanced care available.

As the year winds down, I find myself reflecting on all we've been able to accomplish together. For more than five decades, we've remained committed to outstanding patient care, and we're incredibly proud that our dedication has once again been recognized by U.S. News & World Report, ranking Brooks as the best rehabilitation hospital in Florida and among the top 20 in the nation. This achievement is a direct result of the passion and tireless commitment of our staff, who are always focused on achieving the best outcome for our patients and their families.

Innovation is one of our core values at Brooks. We are constantly seeking new ways to empower our patients and provide them with the most advanced care available. This issue highlights two groundbreaking technologies, ARCEX and Vivistim, that are changing what is possible in rehabilitation. We also highlight work done by our Center for Innovation for the FDA submission for the Portable Neuromodulation Stimulator (PoNS®) device. By integrating the latest technology advancements into therapy, we're helping stroke survivors and individuals with spinal cord injuries regain even more function and independence.

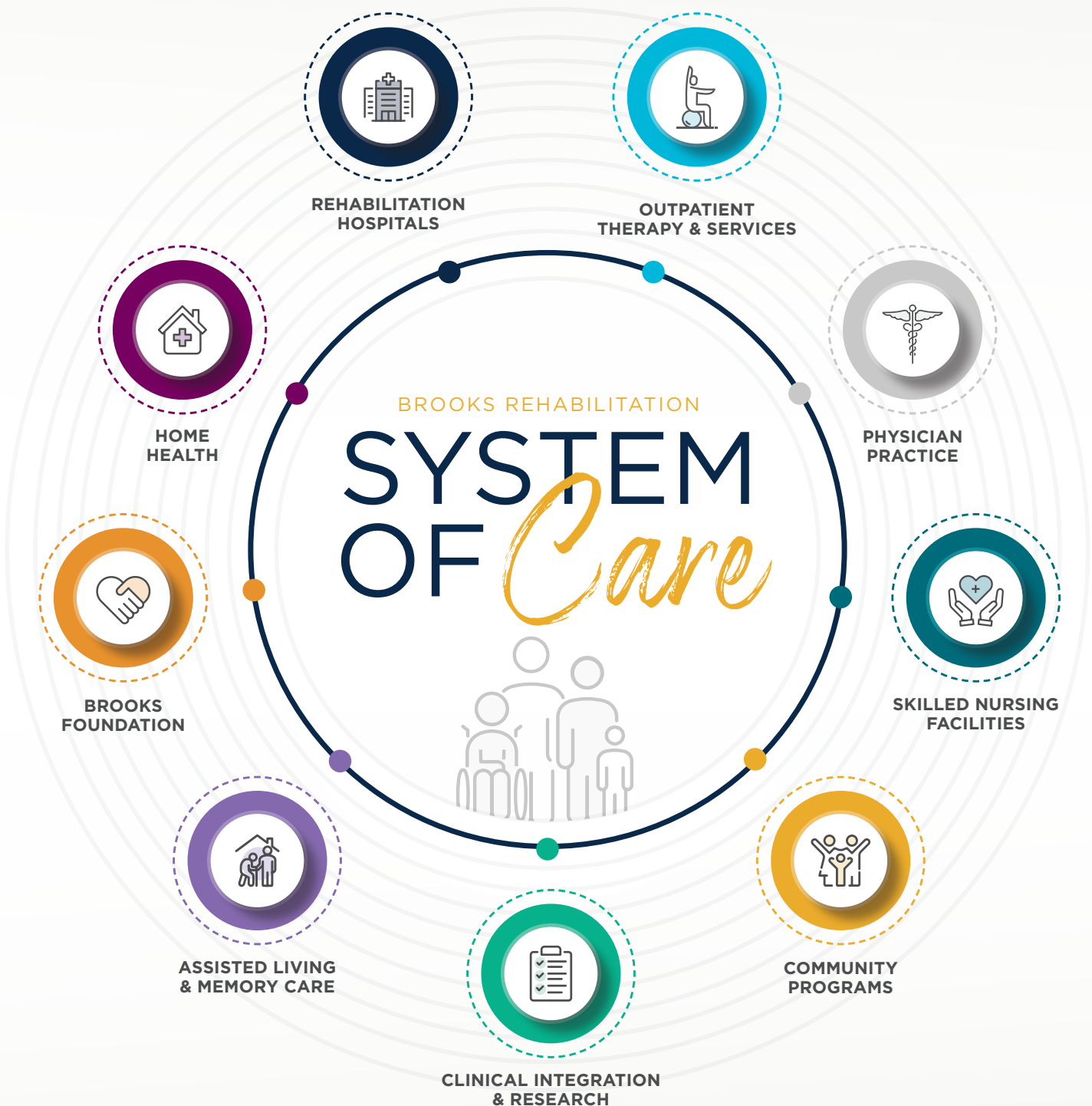
Our dedication to quality also sets us apart. Our system-wide, data-driven quality initiatives aren't about fixing what is broken. We're committed to making what is already great even better. I am incredibly proud of our team's proactive approach, which is reflected in our national rankings and, most importantly, in the successful recoveries of our patients like Jon Dasher and Izzy Quezada.

None of this would be possible without the extraordinary people who make up the Brooks family. From our dedicated clinicians and researchers to our supportive administrative staff, I'm grateful for each of you. I also want to thank our partners, hospitals, physicians and the broader community for their collaboration and trust. And to our patients and families: you are at the heart of everything we do.

On behalf of everyone at Brooks, I wish you a safe, happy and healthy season ahead.

Sincerely,

Douglas M. Baer
President & Chief Executive Officer



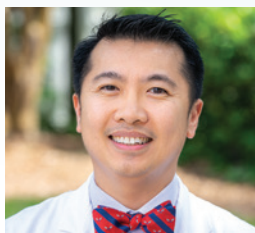
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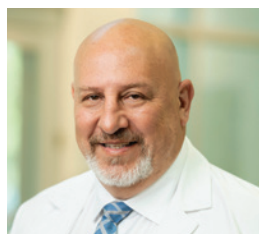
Charles Dempsey, MD
Staff Physiatrist



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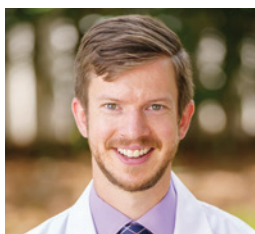
Carolyn Geis, MD
Associate Medical Director,
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Amputee Program



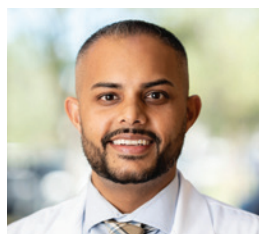
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Katelyn W. Jordan, OD
Director, Vision Rehabilitation Services



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Erum Usman, MD
Staff Physiatrist



Jennie Valles, MD
Neurologist



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Medical Director, Amputee Program



Q & A



KATELYN W. JORDAN, OD, FAAO, FNAP

Katelyn W. Jordan, OD, FAAO, FNAP, director of Vision Rehabilitation Services, has been with Brooks for 12 years. Dr. Jordan graduated with her doctor of optometry, Magna Cum Laude, from the University of Houston, College of Optometry. She also holds a bachelor's degree in exercise science from Florida State University. Dr. Jordan is a member of the American Academy of Optometry and the American Optometry Association. Dr. Jordan has been honored with numerous awards, including the Reubin O'D Askew Young Alumni Award, Excellence in Low Vision Award, Presidential Graduate Fellowship, the Nelson Reber Eye Open Award and the Dr. A.C. Marcaccio Memorial Scholarship.

Dr. Jordan started the Brooks Center for Low Vision, dedicated to helping individuals with vision loss regain the ability to participate in tasks that provide fulfillment and independence. "Low vision" is a very specific term that defines a loss of vision that cannot be corrected with regular glasses, contact lenses, medicine or surgery. Low vision is usually caused by eye diseases or health conditions, which can include age-related macular degeneration (AMD), cataracts, diabetes, glaucoma, traumatic brain injury and stroke. This type of vision loss can affect a person's ability to participate in everyday activities.



How did you become interested in treating low vision patients?

In college I did an internship in the ophthalmology department at Mayo Clinic. I shadowed an optometrist and got to see the different specialties in optometry and ophthalmology. The optometrist did a low vision clinic once a week — and I found it to be unique in that every patient that came in had a different story, a different problem, and the way that it impacted their life was different. That meant that the way that we cared for them also had to be different. We had to take time to get to know the person, understand what they needed and then come up with a plan that was going to work specifically for them. That kind of personal level and creative problem solving really appealed to me.

How did the Center get started, and how did you get involved?

It came about through donations by a community nonprofit, the Eye Research Foundation, for the purpose of making the low-vision services more well-known and more available. And at the same time a number of Brooks therapists were saying, "Hey, we've got these patients in rehab who have vision problems. It's definitely impacting their rehab, and we don't know how to deal with it."

I was very familiar with Brooks and its reputation. I saw a position posted for a low-vision occupational therapist and thought, "Well, they'll need an optometrist, too." I met with some of the Brooks leadership and those involved with starting the Center, and we decided it was a good fit.

We learned together — me learning more about rehab and the rehab world, Brooks learning more about optometry and vision care, all to further what our patients need.

How is the Center special for an organization like Brooks?

It's very unusual for a rehabilitation system like Brooks to treat low vision. Most of the time, you'll find low-vision

services in big ophthalmology departments or optometry schools. You'll also find some private practice low-vision doctors. Often there will be a low-vision occupational therapist involved. But the depth of the system that Brooks has, and the low vision services inside of it, is what's rare. We have a unique setup.

How does the Center function?

It is really more of a system-wide program now, functioning beyond the walls of the Center for Low Vision. In our inpatient hospitals, people are often admitted for a stroke or a brain injury. Somewhere between 60 to 70% of people with an acquired brain injury will experience an impact on their vision. So, as our therapists get them walking, taking care of themselves and doing well enough to go home, vision tends to be a really important piece. We have a vision rehab service in the hospital where initially every patient with a neurologic diagnosis gets screened for a visual impairment. All of our occupational therapists are trained to do the screening, and anyone on the team can request a consult from one of our optometrists to see the patient while they're in our rehab hospital. We can follow up with discharged hospital patients in our outpatient clinic as well.

Outpatients generally come to us after their eye doctor or eye surgeon says, "There's nothing more I can do." It may get to the point that there's nothing else that practice can do — because they may have no other services. But at Brooks, it's not the end. The process usually starts with a low vision exam. This is how we determine any remaining vision and how it can be maximized. After that, our therapy team can then work with them to apply the recommendations for low vision glasses, magnifiers, technology and environmental adaptations to help them continue to manage their everyday activities — anything from brushing your teeth to managing your mail to taking your dog for a walk.

How has the Center grown?

We've recently hired Crystal Kasper, OD, as a consultative optometrist. She primarily sees our inpatient consults at our rehabilitation hospitals and skilled nursing facilities, while I now primarily see outpatients.

We've grown a whole inpatient "vision council" of therapists who take extra time to ensure that the vision screening is up to date, build up patient education, and make sure other team members who may not have as much vision screening experience have the resources they need. We are in the process of piloting a new site lead at the Brooks Rehabilitation Hospital - University Campus to improve the depth of interventions that are available for patients during their inpatient stay.

With outpatients, I've worked with our occupational therapist Sarah (Sarah J. LaRosa, OTD, MOT, OTR/L, SCLV, CLVT) for years, and we've added two more occupational therapists



for outpatients, all of whom have advanced training in low vision, neurologic rehabilitation or both.

A new project that we added last year involves physical therapists with our program. We brought to Brooks a special "orientation and mobility" collaboration course for our physical therapists. People who have trouble getting around due to visual impairment will meet with an orientation and mobility specialist who teaches them white cane skills and safety skills. However, they don't necessarily address other mobility issues. So, we've bridged the gap with physical therapists who can build patients' balance and fall prevention skills and get them better prepared for the actual orientation and mobility training.

What would you say to those unfamiliar with Brooks' Center for Low Vision?

What we're doing at the Center for Low Vision is taking care of a person, not a set of eyeballs. Brooks has the resources to really help somebody's mind, body and soul. We have adaptive sports to help them get back into some sort of activity — and they realize that they can still do recreational activities. We have our behavioral medicine department — psychologists to help you cope with the health changes that are dramatically affecting your vision and your life.

We're still fighting this mentality that with vision loss — that's the end. It's not. If you injure a leg, we don't leave you in a bed for the rest of your life. We fit you with braces. We give you physical therapy. We use wheelchairs, we use all kinds of devices so that you can still get around. And you're not living isolated in a room. In a very similar way, when somebody has vision loss, we shouldn't just leave them to figure out the world by themselves. We have so many people who could help them navigate it. There's so much technology. There are so many different options to help them continue or learn to lead a more independent, a more fulfilling life.

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BIG UPDATES FROM ARIZONA!

**OPENING
FALL
2026**

Our new, state-of-the-art Brooks Rehabilitation Hospital — Arizona is making steady progress. The frame is complete and we are on track for a Fall 2026 opening!

Our employees are the heart and culture of Brooks, and we're excited to have more than 10 teammates so far bringing that culture from Florida to Arizona. We're excited to expand to the West Coast and are looking for passionate individuals to join our team.

► **NOW RECRUITING FOR NEUROPSYCHOLOGISTS, PHARMACY MANAGER/TECH, RESPIRATORY THERAPY LEAD AND DIRECTOR OF REHABILITATION.**

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Always Raising the Quality Bar at Brooks

When Heather Kendall, MSN, BSN, RN, CHPQ, LSSBB, stepped into the newly created role of System Director of Quality and Product Safety at Brooks Rehabilitation in 2020, she brought extensive clinical experience and a relentless drive for improvement. With a background as a bedside nurse and case manager, she understands firsthand what frontline healthcare workers face — and she's leveraging that insight to lead a data-driven transformation aimed at one goal: excellence in every patient outcome.



"My philosophy has always been, 'work smarter, not harder,'" she said. "How can we get a better outcome and make it easier to do that?"

A CENTRALIZED, STRATEGIC PUSH FOR QUALITY

Kendall's position was designed to bring a more strategic, system-wide approach to quality and performance improvement across Brooks' expanding network, which includes the hospitals, skilled nursing facilities and other divisions. Her team is central to Brooks' Learning Health System and its Center for Outcomes Analytics and Research (COAR), where clinical practice and data intersect.

"We're aiming for a minimum of the 90th percentile in every measurable outcome," said Kendall, who has a master of science in nursing leadership, a Black Belt in performance improvement and is a Certified Professional in Healthcare Quality (CPHQ). "This is our goal even though we take in the

most complex rehab patients from across the country. We admit complex patients and take care of them really well."

BUILDING A QUALITY INFRASTRUCTURE

In just a few years, Kendall has expanded her team with full-time staff at all three Brooks hospital locations along with a new quality position for skilled nursing. These local experts serve as a resource to front line staff — and their projects often begin with a simple observation: determining that a process could be safer, smoother or more effective.

Using a triage approach, Kendall and Brooks prioritize projects as they come in. The most urgent are those that could impact patient or staff safety. After that, projects are aligned with strategic goals, performance metrics and staff-submitted suggestions to improve workflow.

One discovery: a cleaning product was unintentionally making floors slippery. "We hadn't had a fall yet," Kendall said, "but we don't wait for problems to show up — we prevent them before they happen."

PREDICTIVE TOOLS FOR DISCHARGE SUCCESS

One of Brooks' standout projects focuses on improving "discharge to community" rates — sending patients home instead of to a secondary facility. The quality team worked with COAR to develop a predictive analytics tool using historical data to score patients on their likelihood of returning home.

"Whatever the barrier is — mobility, family support, training — we try to break it down early." The tool, combined with tailored clinical interventions, has raised discharge-to-home rates by 20%.

"My philosophy has always been, 'work smarter, not harder.' How can we get a better outcome and make it easier to do that?"

— HEATHER KENDALL





CUTTING READMISSIONS AND LOWERING INFECTION RATES

Kendall's team has also tackled hospital readmissions with sharp focus. At Brooks Rehabilitation Hospital — Bartram Campus, a project called the Brooks Early Intervention Team (BEIT) uses real-time data to flag high-risk patients. A dedicated team responds to changes in condition before they escalate. "We're identifying problems before they become problems," she said. "That early intervention has made a big difference."

At Brooks Rehabilitation Hospital - University Campus, readmission rates dropped from 12.6% to 11.4% year over year. Bartram saw a reduction from 13% to 11.3%. "Working so closely with our medical providers has been critical," said Kendall.

Both inpatient and skilled nursing teams maintain extremely low rates of facility-acquired infections, with metrics in the 90th percentile. "Our infection preventionists are working tirelessly," Kendall said. "From the basics of handwashing to the proper use of isolation gear, we're protecting patients every step of the way."

QUALITY THAT RESULTS IN TOP RATINGS

The quality team's work is reflected in Brooks national rankings and ratings. U.S. News & World Report ranks

Brooks as the best rehabilitation hospital in Florida and among the top 20 in the nation. Brooks' skilled nursing facilities, Bartram Crossing and University Crossing, each earned a "High Performing" rating on the U.S. News & World Report Best Nursing Homes list. In addition, both hold a five-star Medicare rating, the highest possible.

NO REST IN THE PURSUIT OF EXCELLENCE

Brooks' quality efforts extend across the entire continuum of care, including innovative programs like hospital-at-home and home health initiatives. Kendall is quick to give credit to other leaders, like Felecia Hudson, director of performance improvement and education at Brooks Home Health division, who are pushing boundaries in their own areas.

As the organization improves, it faces a common communications challenge: how to talk about progress without implying that something was wrong. Kendall frames it simply: "We don't look at it as we're doing poorly and need to improve. We look at it as an opportunity to do better — even when we're already great."

Her mission is clear: provide the highest level of care for every patient, every time. And then push it even further. "Even when it is the best possible," she said with a smile, "we want to make a 'more best' possible."

HOME HEALTH: A “BEAUTIFUL SCIENCE” OF INTERCONNECTED QUALITY INITIATIVES

Felecia Hudson, DNP, RN, NEA-BC, CRRN, ICM, is director of performance improvement and education at Brooks Rehabilitation Home Health. Exposed to the value of healthcare from an early age when her grandfather suffered a stroke, her desire to make an impact led her to nursing, and then to administration, nurse leadership and process and performance improvement.

Brooks Rehabilitation Home Health provides a wide range of skilled, professional medical services performed in a patient's home under the order and direction of a physician. Medical services include those performed by registered nurses (RNs), licensed practical nurses (LPNs) and certified nursing assistants (CNAs) as well as those from licensed physical, respiratory, speech and occupational therapists. Home Health can also include social workers as necessary. We asked Hudson about her work and the quality initiatives currently underway.

For home health in general, what are key performance indicators or measurements that you look for?

The biggest challenge we're all looking at is how to keep individuals safely at home and decrease the risk of them re-admitting to the hospital. The length of stay is drastically decreasing in hospitals and patients are not discharged from hospitals as often to skilled nursing facilities to recuperate. So, they're coming to us in the home health space more clinically complex. We look to manage a changing home health patient population and maximize outcomes that keep them out of the hospital.

Of course, patient satisfaction is one of our top quality indicators. Data shows that the more engaged and active a patient is in their plan of care, the more satisfied they are and the better their outcomes are. So patient satisfaction is a huge indicator of success.

How do specific performance improvement projects come into being?

The first phase of looking at a project is really what our guidance is from a regulatory standpoint. The Centers for Medicare Medicaid Services (CMS) is a huge driver of those national-type quality indicators. We are now all in the world of value-based purchasing, in terms of our payers that we work with, so that will drive a lot of our quality initiatives.

We look to what we as Brooks set as our own internal measures. We want to make sure that we're in the 90th percentile or greater in terms of performance and how we compare with other providers. The beautiful thing now about healthcare is that you can put your finger on a lot of data. So, we'll look at those dashboards

to determine our quality initiatives.

We listen closely to our partners, such as local referring hospitals and other organizations. This will also determine what quality projects we undertake — we want to be a good partner.

What are some of the specific projects you're working on right now?

Regardless of how good our measurements are, we're always looking at rehospitalization reduction. We work very closely with strategic healthcare programs to get information on risk factors that are driving those readmissions. I'm able to look at region by region, or team by team, and prioritize what the challenges may be within those particular areas. We take a deeper dive into that for a root cause analysis.

Just as an example, let's say a patient has gone back to the hospital because of a urinary tract infection (UTI). I need to dig deeper into the readmission data. Did we catch all the signs and symptoms in our documentation? Did we order labs that we could have done in the home? Did we adjust our visit frequency? Those are some of the things I look at — reviewing trends to know how to allocate our resources for education and follow up.

How does a patient's home itself fit into quality initiatives?

We're working on a project regarding functional outcomes. Patients want to stay in their homes, they want to age in place, but the data shows us as people age in place their functional level in their homes isn't the safest. That's a big push for us. We are looking at the patient's mobility in their home. Are there fall hazards? Can they transfer in and out of bed safely? Can they make it to the restroom with no toileting issues? Maybe that distance between the bedroom and the kitchen is too far, so they're not eating enough because they get tired just trying to walk there.

We connect all those dots that could cause the patient to readmit or have a decline in their outcomes that makes it more unsafe for them to be at home. To me it's a beautiful science. I get very passionate about it because I think sometimes people don't really see the beauty in the challenges and complexity of home health care. Those are the pieces we navigate to make sure we keep satisfied patients safely at home and medically stable.



Leading with Heart: Brooks Rehabilitation Celebrates Two Visionary Nurse Leaders

At Brooks Rehabilitation, we believe that exceptional patient care is built on a foundation of outstanding nursing leadership. We are proud to celebrate two of our most inspiring leaders, Pamela Lambert and Golda Parillon, whose dedication and vision are shaping the future of rehabilitation nursing and fostering an environment of compassionate, expert care.

A NATIONAL HONOR FOR NURSING EDUCATION

Pamela Lambert, MSN, MBA, RN, CRRN, CHSE, our nursing education and professional development leader, has been honored with the prestigious 2025 Nurse Educator Award by the Association of Rehabilitation Nurses (ARN). This national award recognizes her exceptional contributions to teaching, mentoring and inspiring the next generation of rehabilitation nurses.



A true visionary with over a decade of experience, Pamela founded the Brooks Rehabilitation Transition to Practice Program, a residency accredited by the American Nurses Credentialing Center. This program is a testament to her ability to merge clinical excellence with innovative education, preparing newly licensed nurses for the profound responsibilities of their roles.

"They're moving from an academic setting as a student nurse to a setting where suddenly our patients depend on them," Lambert explains. "We want to ensure they are as prepared as possible by providing a dynamic, interactive and diverse professional learning experience."

Her program design, centered on the Brooks Interdisciplinary Practice Model, places patients and families at the heart of care. It provides a structured, immersive learning experience with unique components like patient safety escape rooms and mock trials. Since its start in 2022, 75 nurses have successfully completed the residency, ready to provide expert, compassionate care.

Beyond her work at Brooks, Lambert is a sought-after speaker and a key member of the Nurse Well-Being Advisory Board, championing mental health support for nurses across Florida and underscoring the vital link between caregiver well-being and patient outcomes.



CULTIVATING COMPASSION AND EXCELLENCE

We are also thrilled to recognize Golda Parillon, BSN, RN, as the recipient of the 2025 DAISY Nurse Leader Award. This honor celebrates leaders who, while not always in direct patient care, are instrumental in creating an environment where skillful and compassionate care can flourish.



Parillon's journey with Brooks began in 2012 as a certified nursing assistant (CNA), and she has since embodied the core values of service, compassion and teamwork. Her exceptional leadership as an assistant nurse manager at Brooks Rehabilitation Hospital - University Campus has been a source of inspiration for her entire team.

Her colleagues' heartfelt nominations speak volumes. One shared, "What sets Golda apart is her exceptional ability to lead by example. Whether she's stepping in during a staff shortage, staying late to support a teammate or demonstrating respectful and transparent communication, she inspires everyone around her to meet the same high standard of excellence."



Golda's unwavering commitment to both patients and staff has been a hallmark of her career. In a testament to her leadership, she was recently promoted to Director of Nursing for the new Brooks Rehabilitation Hospital - Arizona, a role she will fully transition into in May 2026.

Please join us in celebrating Pamela and Golda for their remarkable achievements. Their leadership not only elevates our standard of care but also inspires a brighter, more compassionate future for everyone we serve.

Jon Dasher's Brain Tumor Recovery: From Immobility to Independence

Jon Dasher's health journey began unexpectedly in 2020 when subtle changes in his behavior signaled that something was wrong. His wife, Missy, noticed that he wasn't acting like himself. He spoke less, often answering questions with only "yes" or "no," and his tone of voice seemed off. Concerned, they decided to visit the emergency room.

Jon was shocked to learn he had a brain tumor since he had none of the typical symptoms, such as headaches or physical discomfort. After undergoing surgery to remove the tumor, he made a swift recovery and returned to work.

However, in 2025, during a routine scan, doctors discovered that the tumor had returned. This time recovery was not as easy. After surgery, Jon was left unable to perform even the most basic tasks like walking, talking or eating on his own.

THE ROAD TO RECOVERY: ARRIVING AT BROOKS REHABILITATION

Brooks Rehabilitation Hospital – University Campus was strongly recommended as the next step in his recovery so the Dashers made the trip from their home in Statesboro, Georgia, to Jacksonville, Florida. Upon arrival, Jon required a two-person assist with a Hoyer lift just to get out of bed. Missy recalls, "He could barely say his name or birthday. It was heartbreaking to see him like that, but the team at Brooks immediately gave us hope. They explained every step of the process and made us feel like we were in the best hands."

Under the care of Trevor Persaud, DO, medical director brain injury rehabilitation program and the brain rehabilitation team, Jon participated in a combination of physical therapy to rebuild his strength and mobility, occupational therapy to restore his ability to perform daily tasks and speech therapy to improve his communication and cognitive skills. The first three weeks were slow, with minimal visible progress, but the team remained steadfast.

Jon's physical therapist, Schuyler White, PT, DPT, CBIS, recalls when she first met Jon.

"Jon's progress at Brooks can be summed up in one phrase: 'good things take time,'" she reflects. "From the moment he arrived, I knew his journey would unfold as a blessing in disguise. His determination and openness to working with his therapy team paved the way for his success.



A TURNING POINT

Around the three-week mark, Jon's progress took a dramatic turn. The swelling in his brain began to subside, and he started responding to therapy.

"Skylar was amazing," Jon's wife shared. "She pushed him in the best way possible, always positive and encouraging. She explained everything and made sure I was involved in the process."

Jon went from being unable to sit up to walking without a walker by the end of his six-week stay. His cognitive improvements were equally impressive, progressing from a score of 5 to a perfect 30 on the orientation scale.

"The transformation was incredible," Missy said. "The care and dedication of the entire team were beyond anything we could have hoped for."

"I can't take credit for the incredible progress he's made or the amazing things he'll achieve in the future, I was simply a helping hand in his story," said White.

A NEW CHAPTER

Jon was discharged on August 8 and returned home to Statesboro, where he continued outpatient therapy. Today, he's walking two and a half miles every morning and preparing to return to work.

"If you talked to him now, you'd never know what he's been through," Missy said proudly.

Jon's journey isn't over as he's set to begin six weeks of preventative radiation and chemotherapy, but his progress so far is a testament to his determination and the exceptional care he received.

"I can't say enough good things about Brooks and the care I received by the entire team. From the doctors to the nurses and therapists, everyone played a vital role in my recovery," Jon shared. "They gave us hope when I needed it most."

"I can't say enough good things about Brooks and the care I received by the entire team. From the doctors to the nurses and therapists, everyone played a vital role in my recovery."

— JON DASHER



A NEW HORIZON IN SCI THERAPY: ARC^{EX}



For individuals like Jared Hogg, new technology is offering a bridge to independence.

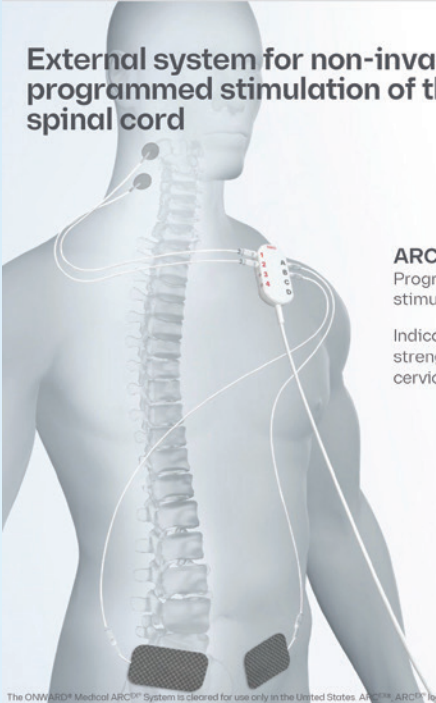
In March 2018, the 17-year-old fitness and health fanatic was with friends at the beach when he dove headfirst into the ocean, hitting a sandbar. Hogg was immediately paralyzed from the neck down with a severe spinal cord injury (SCI).

"If you are living with a spinal cord injury, regaining hand and arm function is often a patient's highest priority in rehabilitation," said Brian Higdon, MD, SCI medical director at Brooks Rehabilitation. "While significant strides have been made, restoring meaningful hand and arm control remains a critical challenge, particularly in the chronic phase of injury."

"Patients like Jared are the reason we are so committed to finding and researching the latest emerging technologies that can help improve these challenges," said Robert McIver, PT, DPT, NCS, director of the Center for Innovation at Brooks.

One of those emerging technologies is ONWARD Medical's ARC^{EX}. By integrating this cutting-edge tool into our expert-led therapy programs, we are hoping to address this unmet need.


External system for non-invasive, programmed stimulation of the spinal cord



ARC^{EX} Therapy
Programmed transcutaneous electrical stimulation to the spinal cord


Indicated to improve hand sensation and strength for people with a chronic cervical spinal cord injury

ARC^{EX} Stimulator



ARC^{EX}

System Overview



ARC^{EX} PRO app
via ARC^{EX} Programmer

ARC^{EX} Therapy
Individual stimulation parameters can be optimized for each person's unique needs

The ONWARD Medical ARC^{EX} System is cleared for use only in the United States. ARC^{EX}, ARC^{EX} logo, O* logo, and ARC^{EX} PRO are proprietary and registered trademarks of ONWARD Medical. Unauthorized use is strictly prohibited. © 2025 ONWARD Medical. All Rights Reserved. 20230202

“Patients like Jared are the reason we are so committed to finding and researching the latest emerging technologies that can help improve these challenges.”

— ROBERT McIVER



What is ARC^{EX}?

ARC^{EX} is an FDA-cleared, spinal cord stimulation system that targets areas of injury on the spinal cord with programmed electrical pulses through the skin. It delivers programmed, transcutaneous electrical spinal cord stimulation (tSCS) in conjunction with occupational therapy to improve hand sensation and strength.

Unlike traditional functional electrical stimulation (FES) which directly contracts muscles, ARC^{EX} targets the spinal cord itself. When combined with task-specific therapy, this process helps promote neuroplasticity, allowing the brain to form new neural connections. This can lead to lasting improvements in voluntary movement, strength and sensation.

The Science and Success Behind ARC^{EX}

The development of ARC^{EX} is built on decades of research into spinal cord stimulation. The promising results of the Up-LIFT clinical trial published in Nature Medicine, peaked a lot of interest. The multi-center study involving patients with chronic incomplete quadriplegia showed that patients experienced significant improvements over three months after the ARC^{EX} was introduced into their therapy sessions. Encouragingly, patients sustained improvements even after stimulation, suggesting neuroplastic changes.

“We were aware of the technology and following its development,” said McIver. “When the study was published and the ARC^{EX} system was named one of TIME Magazine’s Best Inventions of 2024, patients started approaching us about getting one in the clinic.”

Once the technology received FDA clearance in early 2025, Brooks decided to make that a reality.

How ARC^{EX} is Changing Lives at Brooks

Thanks to the generosity of four donors who were all either patients or caregivers of patients, Brooks was able to acquire an ARC^{EX} this summer. We are grateful for their commitment to advancing patient care, allowing us to bring this innovative technology directly to individuals who stand to benefit most.

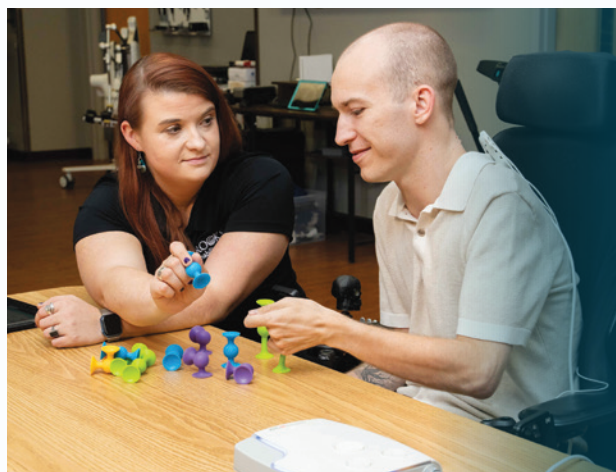
Within our Innovation Clinic, occupational therapist Perry K. Barnhill, OTD, OTR/L, CNS, NREMT, incorporates the ARC^{EX} into therapy sessions for patients who have chronic, cervical-level spinal cord injuries.

“Most patients do not have full hand function so we’re putting stimulation to the back of their neck, on their cervical spine, and then putting the ground at the base of their spinal cord. The goal is to help make a bridge over their spinal cord injury,” said Barnhill.

While only in use for several months, patients are already reporting progress in their daily activities, including:

- **Improved hand function:** Gaining the ability to open their hands more easily, leading to increased grip strength.
- **Greater independence:** Performing tasks like cooking, opening jars and packages, and getting food out of the microwave.
- **Enhanced mobility:** Experiencing easier transfers and improved ability to roll over in bed.
- **Increased overall strength and energy levels.**
- **Improvements in bowel and bladder function,** a significant quality-of-life factor for many with SCI.

For Jared Hogg, progress means being more independent. Using the ARC^{EX}, he is now able to cook himself basic meals and travel independently. He also now has an internship with the Brooks Clinical Research Center.



“Most patients do not have full hand function so we’re putting stimulation to the back of their neck, on their cervical spine, and then putting the ground at the base of their spinal cord. The goal is to help make a bridge over their spinal cord injury.”

— PERRY K. BARNHILL



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Other patients at Brooks are also seeing lasting improvements from the technology. “With our basic electrical stimulation, you’ll see the movement happen in the moment, but then once you turn the machine off, you’re right back to where you started,” Barnhill explains. “With ARCEX, functional movements get easier while in therapy and that continues at home. I would say that’s the difference I’m seeing versus other stimulation devices.”

Patients with SCI looking to improve arm and hand function are now seeking care with the ARCEX through our Innovation clinic at the Brooks Center for Innovation. This demand keeps the system in use eight hours a day, five days a week. As we continue to test this new device and if its positive functional outcomes continue, Brooks will plan to add additional devices throughout our system of care to address the growing need for functional improvements using the ARCEX.

“The ARCEX helped improve my strength, build muscle and improve my hand extension. It’s exciting to be one of the first to use the device and I hope they continue to bring other technologies to market to better serve the spinal cord injury community.”

— JARED HOGG

Breathing Less Oxygen May Help SCI Survivors Breathe Better, Brooks and UF Researchers Find



For spinal cord injury survivors, being able to breathe effectively is a significant problem affecting their quality of life. Now, Brooks Rehabilitation and University of Florida (UF) researchers believe that combining respiratory therapy with bouts of breathing air with less oxygen might be a solution to help them breathe better.

Numerous studies have shown that breathing impairments are consistently a leading cause of illness or rehospitalization for people living in the community with spinal cord injuries.

Though there has been a significant amount of data demonstrating that respiratory issues affect the length and quality of life of spinal cord injury survivors, there hasn't been significant advancement in the development of rehabilitative therapies that improve respiratory health and outcomes.

Over the past five years, researchers from Brooks Clinical Research Center and the UF Center for Breathing Research and Therapeutics (BREATHE) have been focused on providing solutions for the respiratory issues SCI survivors face.

CHANGING THE NARRATIVE ON RESPIRATORY THERAPY FOR SCI PATIENTS

Over two decades of breathing research eventually led to a 2018 research collaboration with Emily Fox, PhD, director of neuromuscular research at Brooks Rehabilitation and of the Brooks-UF PHHP Research Collaboration, and Gordon Mitchell, PhD, director of UF Center for Breathing Research and Therapeutics (BREATHE), for the study *Fluctuating Oxygen for Recovery after SCI (FLO₂)*.

Over the years, Dr. Mitchell's breathing research using rats had found something unexpected: breathing air with less oxygen for short periods might help people with spinal cord injuries.

Dr. Fox and Dr. Mitchell decided to collaborate on this further by translating his findings from rats to humans who have chronic spinal cord injuries. By taking knowledge and evidence already established and applying it in a new way, they began conducting what is known as clinical translation research.

The key to the collaboration was Dr. Fox's experience as a clinical researcher with expertise in spinal cord injury and Dr. Mitchell's experience as a basic scientist. Basic science is a type of research that aims to improve scientific theories to better understand the laws of nature, while clinical research is the study of the safety and effectiveness of medical interventions on humans.

The approach they used to test this theory is called acute intermittent hypoxia (AIH). The FLO₂ study specifically tested the idea that combining breathing low oxygen with respiratory rehabilitation training is better than either intervention alone. Study outcomes were focused on the effects of combining these two treatments.

Another important part of these two researchers working together was establishing bidirectional translation within the research. This is where the researchers ensured that what was learned in the basic science lab could be safely applied or tested with humans, and, in turn, what they learned about human spinal cord injury was applied back in the basic science research.

WHAT IS THERAPEUTIC ACUTE INTERMITTENT HYPOXIA?

Study participants would come to the clinical research center at Brooks and participate in a series of breathing treatments:

- The person breathes air with lower oxygen, 9% instead of the normal 21%, for just one minute.
- Then they breathe normal air for 1.5 minutes
- This pattern repeats about 15 times in a session.

"For the FLO₂ study, it is very mild," said Dr. Fox. "We ask our participants, 'Do you think you got room air or low oxygen?' And it was about a fifty-fifty chance that they even knew they had received AIH."

When taken to the extreme, hypoxia can be unhealthy or dangerous, such as in people who suffer from sleep apnea. However, in a mild application, such as with AIH, it is proving to have rehabilitative benefits for people with chronic incomplete spinal cord injury, including those with quadriplegia or paralysis from the neck down.

WHY AIH WORKS

The lack of oxygen boosts the body's ability to better accept rehabilitative treatments. This brief exposure to lower oxygen triggers changes in the brain and spinal cord that make nerve cells work better. According to Dr. Fox, it is "turning up the volume" on the signals that control breathing and movement.

When oxygen levels drop briefly, it causes special sensors in a person's neck to detect the change. These sensors then alert the brain, and the brain releases a chemical called serotonin. The serotonin release triggers neuroplasticity, which are changes that help nerve cells work better. This makes muscle contraction stronger, including breathing muscles.

"It helps create stronger connections between the neurons, so when we rehab, activating those neurons, they fire more and fire in a more connected fashion," said Dr. Fox.

The benefits of this treatment expand beyond respiratory rehabilitation. AIH could help improve arm movements like grasping or standing and walking in SCI survivors. And this treatment could even expand to other conditions such as ALS, multiple sclerosis, stroke and brain injury.

THE IMPACT OF RESPIRATORY WEAKNESS ON THE SCI COMMUNITY

Globally, 15.4 million people are living with spinal cord injuries. In the United States, that number is estimated to be over 300,000 annually, with about 18,000 new spinal cord injuries occurring each year.

Respiratory issues and breathing impairments are common in the SCI community because a spinal cord injury causes weakness or paralysis of the muscles that help a person breathe in and out or cough.

Muscles used to breathe or cough include the diaphragm, intercostal muscles, abdominal muscles, neck muscles and upper airway dilator muscles. When these muscles are weakened, it makes it hard for SCI patients to breathe well or properly cough. This increases the chances of secretions and the development of infections in the lungs, often leading to complications such as pneumonia and respiratory failure. Many SCI survivors need lifelong ventilator support.



FLO₂ STUDY OUTCOMES LAUNCH FURTHER RESEARCH



468 Study Assessments



584 Study Interventions



4,350 Exposures of Acute Intermittent Hypoxia



292 Sessions of Respiratory Strength Training

The FLO₂ study was conducted over five years and involved over 30 participants with SCI. Analysis of the data set is currently under way and study results are promising. However, clinical trials are rarely one-size-fits-all. The researchers have already determined that some participants showed little to no benefit from the treatment while others demonstrated a positive response. The results are now a central focus of a new clinical trial with Dr. Fox and Dr. Mitchell named BioFLO or *Genetic Biomarkers of Fluctuating Oxygen*.

The study will focus on improving the effectiveness of AIH and better understanding the diversity of response to AIH treatment in the FLO₂ study.

BioFLO will test whether combining therapeutic AIH with a slight increase in carbon dioxide will enhance outcomes for patients with a spinal cord injury versus AIH alone. In addition, they are seeking to identify genetic biomarkers that will help predict which individuals will benefit the most or the least from this type of treatment.

Initial investigations with uninjured individuals have shown that when there is a slight elevation of carbon dioxide in the breathing mixture, it indicates a higher activation of the diaphragm (primary breathing muscle) and neuroplasticity, which are the changes that help nerve cells work better.

BioFLO kicked off in January 2024 with its first spinal cord injury patient. The study is looking to evaluate 62 participants with a spinal cord injury. It is supported by a \$3.6 million grant from the Department of Defense.

THE SIGNIFICANCE OF BIOMARKER RESEARCH IN PHYSICAL REHABILITATION

The focus on biomarker genetic research in rehabilitation therapy has become an important factor for the researchers at Brooks and UF, as well as the larger physical rehabilitation community, as medicine moves away from a “one size fits all approach.”

However, challenges exist in the use of biomarkers and genetics in physical rehabilitation research around standardizing data, development of comprehensive databases, and data that unifies “interindividual heterogeneity,” which is the different characteristics or responses people exhibit to stimuli due to multiple factors: genetics, environment and life experiences. This can make it difficult for research departments to prioritize and identify genetic biomarkers.

“This study is a critical step in our research programs (at Brooks and UF) to develop therapeutic approaches that amplify the effects of rehabilitation and advance recovery for people with spinal cord injury and other neurologic conditions,” said Dr. Fox. “This study will not only advance the understanding and use of therapeutic intermittent hypoxia but also help ensure future trials and use in the clinic target those most likely to benefit.”

INTEGRATING SCIENCE INTO PRACTICE

For Brooks’ clinical research team, the work doesn’t stop there. More testing needs to be done before AIH can be integrated into clinical practice; however, the research team is working towards that goal.

A full-scale clinical trial at multiple sites will need to be conducted to gather more data on the efficacy of therapeutic acute intermittent hypoxia as a treatment.

Currently, the research team is working with clinicians across Brooks to bring the infrastructure into place to conduct clinical trials for this study at Brooks hospitals. They are also working with key stakeholders toward developing methods and steps needed to bring research breakthroughs such as this into practice at a system level to empower Brooks clinicians to help patients go beyond what is currently possible.

“The FLO₂ study is giving us a better foundation of understanding what our patients do and how they change under our care,” said Dr. Fox. “This will then allow us to bring these new therapies we are researching into clinical practice.”



Brooks Rehabilitation and Helius Medical Technologies Announce Breakthrough in Stroke Recovery with PoNS Device

Brooks Rehabilitation played a pivotal role in a successful clinical study for the Portable Neuromodulation Stimulator (PoNS®) device. In collaboration with Helius Medical Technologies and nine other clinical sites for stroke rehabilitation across the United States and Canada, the study demonstrated that PoNS therapy, when paired with physical therapy, significantly improves gait and balance for individuals with chronic stroke. This breakthrough offers new hope for the millions living with the lasting effects of a stroke.

Vice President of Clinical Integration and Research, Mark Bowden, PT, PhD, said, “Brooks is thrilled to have played such an important role in this scientific breakthrough, as the exploration and testing of emerging technology is a major emphasis of the Brooks Center for Innovation and is directly in line with the mission of the organization.”

Falls are a major complication after a stroke, and the risk of major injuries increases per fall. The rate of falls for chronic stroke survivors is reported to be as high as 73%. The PoNS device, which delivers mild electrical stimulation to the tongue to enhance neuroplasticity, is authorized in Canada and Australia for patients recovering from stroke, multiple sclerosis and traumatic brain injury. In the United States, it is currently cleared only for use in patients with multiple sclerosis.

The overall goal of the clinical trial was to evaluate the effects of the PoNS device on stroke survivors’ ability to maintain a stable posture and gait. A total of 159 patients were enrolled across the three studies, with 130 patients completing both the 12-week study treatment phase and the 12-week post treatment follow-up period. Study participants received the (active or sham) study treatment in combination with physical therapy according to the current guidelines for functional rehabilitation of people with chronic stroke.



The results showed that patients using the PoNS device experienced statistically significant improvements in their ability to walk and maintain balance, a critical step in regaining independence and reducing the risk of falls.

“This is a major breakthrough in utilizing neuromodulation to augment therapy for recovery of balance and gait for those post-stroke,” said Dr. Bowden. “The sound theoretical framework of the device, the ease of utilization and the use of best contemporary practice as the paired intervention make these findings unique in this field. The likelihood is very strong for the Helius PoNS to highly impact rehabilitation in those exhibiting balance and gait deficits after stroke, and this research will be a model for testing future emerging therapies.”

The positive outcome of the PoNS Stroke Registrational Program supported a September 2025 submission to the U.S. Food and Drug Administration (FDA) for market authorization under its Breakthrough Device designation. Brooks is proud to be at the forefront of research that brings life-changing therapies from research to our patients, reaffirming its commitment to advancing the standard of care and empowering recovery for all.



“This is a major breakthrough in utilizing neuromodulation to augment therapy for recovery of balance and gait for those post-stroke.”

— DR. BOWDEN

A Breakthrough for Chronic Ischemic Stroke Survivors



In 2023, TIME named the Vivistim® Paired VNS™ System by MicroTransponder® to its list of Best Inventions. Brooks Rehabilitation strives to provide patients with access to the latest technology and were the first in Jacksonville to offer treatment to patients using this groundbreaking technology.

The FDA-approved Vivistim System is an implanted medical device that uses vagus nerve stimulation (VNS) during rehabilitation therapy to help improve upper limb function for ischemic stroke survivors. Small enough to fit in the palm of your hand, Vivistim is placed under the skin in the upper left chest area during an outpatient procedure.

Ischemic stroke survivors are often asking what more can be done to improve their functional recovery, particularly those that are months and years post-stroke. This often begins a conversation about VNS to those who may be appropriate candidates.

Lauren T. Shapiro, MD, MPH, FAAPMR, medical director of the Stroke Rehabilitation Program at Brooks, answers some frequently asked questions.



WHAT IS VNS?

VNS is a treatment in which electrical signals are sent to a nerve in your neck (the vagus nerve) using a small device. It is thought to promote neuroplasticity, which is the process by which the brain adapts and changes in response to experiences, learning or illness or injury. It has long been used in the treatment of seizure disorders and depression.

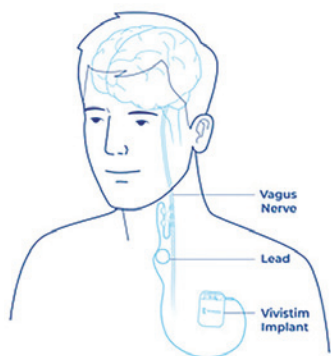
More recently, it has been shown to help with upper limb motor function in stroke survivors when used in conjunction with rehabilitation.

HOW DOES PAIRED VNS WORK?

One to two weeks after the Vivistim device is placed, the stroke survivor begins rehabilitation therapy.

- During rehabilitation therapy, an occupational therapist will use a wireless transmitter that communicates with proprietary software to signal the Vivistim device to deliver a gentle pulse to the vagus nerve while the stroke survivor performs a specific task, such as putting on a hat, brushing hair or cutting food, etc.

- The simultaneous pairing of the rehabilitation exercise with vagus nerve stimulation releases neuromodulators that help create or strengthen neural connections to improve upper limb function.



- Over time, this process helps stroke survivors regain function and movement of their affected arm and/or hand better than with rehabilitation alone.

WHO BENEFITS FROM PAIRED VNS?

People with chronic upper limb motor impairments following an ischemic stroke most benefit from paired VNS.

The Ideal Vivistim Candidate

- Chronic ischemic stroke survivors
- Six months or more post stroke
- Have moderate to severe upper extremity impairment
- Have plateaued from previous ongoing rehabilitation
- Maintain some active arm motor function, including in the wrist, thumb and at least two fingers

It is important that the use of the device is paired with repetitive task training in rehabilitation to have the most impact.

WHAT BENEFITS AND OUTCOMES ARE YOU SEEING AT BROOKS FROM PAIRED VNS?

Our patients have consistently had significant gains in the functional use of their affected arm and/or hand. Many of these patients were years out from their strokes, a time at which we don't typically see further motor recovery.

Emily Johnson wasn't able to use her left hand after her stroke. She was determined to live independently and go back to work so her therapist at the Brooks Osceola clinic recommended Vivistim. "I describe it as a little turbo booster that helps my brain make those neural connections," she said. Emily is now able to use sign language again and cut a steak when out with friends at dinner. Both were huge improvements for her quality of life.

David Garns had a stroke in 2016 that left him unable to walk, speak or move the right side of his body. After an inpatient hospital stay at Brooks and outpatient therapy, he made significant improvements but still had challenges with his right hand. After Vivistim and occupational therapy with Ramona Moraska, COTA, at the Brooks Healthcare Plaza

outpatient clinic, Mr. Garns is now able to feed himself, tie his own shoes, drive and use household tools again.

Overall, studies in chronic stroke survivors have demonstrated that upper limb rehabilitation used in conjunction with the Vivistim System resulted in two to three times greater arm and hand function than rehabilitation therapy alone. Complications are extremely rare, and the stimulation is usually very well-tolerated.

WHERE CAN A STROKE SURVIVOR BE EVALUATED FOR PAIRED VNS?

Brooks has several physiatrists who are double board-certified in both Physical Medicine and Rehabilitation (PM&R) as well as Brain Injury Medicine. They are happy to evaluate patients for this technology in Brooks' outpatient PM&R clinic at Health Care Plaza. Brooks also has several outpatient occupational therapists across our system of care who have been trained to evaluate patients for paired VNS and provide them with appropriate therapies post-implantation.

Individual results may vary. For full safety information about Vivistim, please visit vivistim.com/safety.



Our patients have consistently had significant gains in the functional use of their affected arm and/or hand. Many of these patients were years out from their strokes, a time at which we don't typically see further motor recovery.

— DR. SHAPIRO

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From Paralysis to Possibility: Izzy's Determination to Reclaim Her Creative Life

Last Christmas was supposed to be a time of joy and celebration for Isabel “Izzy” Quezada. Instead, what began as a common case of influenza A would challenge everything she knew about herself and her future. The virus that typically causes seasonal flu took an unexpected turn, attacking her central nervous system and resulting in transverse myelitis.

Transverse myelitis is a rare neurological condition caused by inflammation of the spinal cord. It causes symptoms like weakness, numbness and loss of motor function. For Izzy, the diagnosis came with a C5 to C7 spinal cord injury classification, significantly impacting the use of her arms and requiring her to use a wheelchair for mobility.

THE ROAD TO RECOVERY BEGINS

In mid-February, Izzy arrived at Brooks Rehabilitation Hospital – University Campus, where she would spend five transformative weeks under the care of the spinal cord injury team. What she found there was more than medical treatment. Her clinical team became like family, providing not just therapy but emotional support and hope for the future.

Her occupational therapist, Lauren Rainone, OTD, OTR/L, BCPR, witnessed Izzy's journey from the very beginning.

“When I first met Izzy, she was experiencing lots of pain, impaired sensation and significant muscle weakness while adjusting to a whole new way of life,” Rainone recalls. “But with all of that, she was determined and willing to dive into every part of her therapy.”

Physical therapy sessions focused on helping Izzy learn to stand again using equipment like the EasyStand, despite initial challenges with blood pressure regulation that caused dizziness and nausea. She progressed to leg presses, eventually reaching 35 pounds, and worked on fundamental leg movements.

Occupational therapy took a more creative approach, incorporating activities that felt almost like games. Volleyball with inflatable balls, cornhole and object manipulation exercises helped rebuild strength and coordination. Elastic bands became tools for rebuilding muscle strength in her arms, slowly restoring function to her right hand.

“Every day, Izzy showed up ready to work, always pushing herself a little more than the day before,” Rainone



remembers. For her, small victories were monumental, like learning to shower independently, using the bathroom again, mastering the manual wheelchair and even enjoying simple pleasures like Starbucks runs and tie-dyeing t-shirts.

RECLAIMING IDENTITY THROUGH ART AND ADAPTATION

Before her illness, Izzy was pursuing a double associates degree in studio art and digital media. She was an artist, a musician who played bass guitar, a gamer and an avid reader of horror and mystery literature. The spinal cord injury initially stripped away many of these beloved activities.

“I couldn't play guitar or video games anymore. Holding books was a challenge and drawing was difficult at first,” she explains.

As time went on and her right-hand strength returned, Izzy discovered she could draw again on her iPad, a breakthrough moment that helped her reconnect with her artistic side. She could hold her Kindle and return to reading, diving back into the literary worlds she loved.

The rehabilitation team also introduced her to adaptive technologies. Speech-to-text devices were essential for when she might return to her studies. For gaming, creative solutions emerged. A Nintendo Wii remote could be operated with one hand, depending on the game. These weren't perfect substitutes, but they were bridges back to joy.

"There are little loopholes, depending on what I want to do. I just needed help from Brooks to find them," Izzy says.

A SUPPORT SYSTEM THAT GOES BEYOND MEDICINE

What made Brooks special wasn't just the medical expertise — it was the human connection. Izzy's nurse Katie would share pictures of animals from her farm during emotionally and physically difficult days, reminding her that "there's so much life outside." Brian Higdon, MD, Izzy's physical medicine and rehabilitation physician, broke down language barriers to communicate with Izzy's Spanish-speaking mother, ensuring the whole family understood Izzy's needs and felt supported.

This holistic approach extended to preparing Izzy's family for her return home. They received guidance on appointments, prescription medications, lifestyle adaptations and emergency contacts. When discharge day came, it felt "almost like a graduation" and everyone in the family was prepared for the next chapter of Izzy's story.

LOOKING FORWARD WITH DETERMINATION

Today, Izzy continues her outpatient therapy at Brooks' Osceola outpatient clinic in Kissimmee, Florida. "In PT, we have been working a lot on her lower extremity strength, standing balance and walking with the Arjo, an upright walker," said Rebecca Turner, PT, DPT. "In one session, she was able to walk 96 feet total! And she is pushing 100 lbs. on the shuttle press now."

In occupational therapy, Izzy is learning to type with one hand, teaching herself to hold a game controller again and researching accessibility devices so she can drive a car in the future.

Her approach to recovery is driven by what she calls "vengeance for what the universe gave you." If the universe put her in a wheelchair, she's going to fight against it and

refuse to let that define her. She's determined to find ways to live the life she wants, even if it looks different than before.

"I'm going to constantly try to be who I was even if it looks different," she declares. "The feeling of being able to live life again is very rewarding and that's a good enough reason to keep going."



"I'm going to constantly try to be who I was even if it looks different. The feeling of being able to live life again is very rewarding and that's a good enough reason to keep going."

— IZZY QUEZADA

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