

**Advanced Platform Technology Center (APTC)
Louis Stokes Cleveland VA Medical Center (LSCVAMC)
VA Northeast Ohio Healthcare System (VANEOHS)**



VA (RRDT) Broad Portfolio Research Center

<http://www.aptccenter.research.va.gov>

**ANNUAL REPORT
For Activities during the period: October 1, 2023 – September 30, 2024**

2024 Annual Report for activities during the period October 1, 2023 to September 30, 2024

Advanced Platform Technology Center (APTC)

Louis Stokes Cleveland VA Medical Center (LSCVAMC), Cleveland, OH

RRDT Center

RRDT Center funding number: A1871C

Award Dates: January 1, 2020 – December 31, 2024 / January 1, 2025 – December 31, 2029

Executive Director: Ronald Triolo, PhD

Degrees:

Ph.D. Biomedical Engineering 1986, Drexel University, Philadelphia PA

M.S. Electrical Engineering 1985, Drexel University, Philadelphia PA

M.S. Biomedical Engineering 1983, Drexel University, Philadelphia PA

B.S. Electrical Engineering 1980, Villanova University, Villanova PA

Title: Executive Director, Senior Career Research Scientist

Website: www.aptccenter.research.va.gov

Mission of the APT Center

To advance innovative technologies along the translational pathway that address the health and independence of disabled Veterans.

Vision of the APT Center

To be a national leader and valued partner for the discovery and clinical implementation of medical, rehabilitative or restorative technologies for the well-being of Veterans.

APT Center research sites

The APT Center is located on the premises of the LSCVAMC and operates in partnership with Case Western Reserve University (CWRU) Schools of Engineering and Medicine. In addition, our Core Investigators collaborate with clinicians and researchers located at University Hospitals Cleveland Medical Center (UH), MetroHealth Medical Center (MHMC), and Cleveland Clinic Foundation (CCF) and other institutions nationally. The APT Center capitalizes on significant local expertise in the areas of *microelectronics*, *micro/nanofabrication*, *materials science*, and *mechanics* to address unmet needs of disabled Veterans and the broader rehabilitation community. Center research and development activities are focused on four clinical application areas: **Prosthetics & Orthotics, Health Monitoring & Maintenance, Neural Interfaces and Activity-Based Neurorehabilitation.**

Narrative Summary

KEY IMPACTS

1. APTC Commercializes Innovations for Disabled Veterans

With help from the APT Center, the VA Technology Transfer Program licensed two inventions in FY24 prepared for commercialization by the VA Engineering Health Innovations: Cleveland (VehiCLE). A novel assistive device for self-administering eye drops, invented by an ophthalmologist at the San Francisco VA, was licensed to RAIN Eye Drops. The Device for gait Efficiency, and Balance (DEB), invented by a PT assistant out of the Augusta, GA VAMC to assist Veterans prone to falls due to limited leg abduction, was licensed to a start-up company for marketing. Both inventions were engineered, prototyped, and documented under formal design controls by VehiCLE and refined by APT engineers.



2. APTC Investigators Secure Funding to Advance Research for Paralyzed Veterans

APTC Executive Director Dr. Ron Triolo received a \$1.2M VA Merit Award to develop customizable gait-assist systems for Veterans with incomplete spinal cord injuries (SCI) to improve their mobility in both home and community settings. Core Investigator Dr. M. Kristi Henzel was awarded \$200K from the Paralyzed Veterans of America Research Foundation to develop and test the “FootSafe” technology that prevents injuries by alerting paralyzed Veterans of lower limb displacements while using their wheelchairs. Core Investigator Dr. Kath Bogie secured \$190K from the Department of Veterans Affairs for her project focused on pressure injury prevention using the VA-patented, implantable *flex*STIM technology to initiate regular, automated weight-shifting for pressure relief. Associate Investigator Dr. Nathan Makowski was awarded \$3.9M from the Department of Defense to enhance walking and independence after incomplete SCI using a fully implanted neuroprosthesis.

3. APTC Facilitates National and Local Veteran-Focused Engagement

The APT Center sent representatives to several Veteran-focused conferences and outreach events in 2024 where we engaged Veterans, clinicians, potential research subjects and collaborators on a national level, including *The Paralyzed Veterans of America (PVA) National Veterans Wheelchair Games* (July 2024), *Amputee Coalition National Conference* (August 2024), the *PVA Summit + Exposition* (August 2024) and the *Academy of Spinal Cord Injury Professionals Annual Conference* (September 2024), as well as locally at the *VISN 10 Innovators Summit* (March 2024), *Cleveland VAMC Patient Experience Fair* (April 2024), *Limb Loss and Limb Difference Awareness Day Event* (April 2024), and the *Summer VetFest* in Akron (August 2024). Additionally, we had the opportunity to provide information about our research programs with Senator Brown’s (OH) office for the November 2023 *Senate Veteran Affairs Committee Hearing*.



4. APTC Investigator Named Site-PI for ARPA-H OMEGA Project

APTC Center Core Investigator Dr. Sandra Hnat was chosen to serve as site-PI at the LSCVAMC for an Advanced Research Projects Agency for Health (ARPA-H) project. The two-phased “*Orchestrating Multifaceted Engineering for Growing Artificial Joints*” (OMEGA) project is led by Dr. Ozan Akkus from CWRU and aims to engineer, grow and commercialize biological knee replacements that can restore natural function to individuals with degenerative joint disease known as osteoarthritis (OA). Dr. Hnat’s involvement will become vital during Phase II in which she and her team will assess the clinical effectiveness of the OMEGA implants by measuring the kinematics and kinetics of gait and a variety of other clinically relevant maneuvers. Successful completion of this project will accelerate better health outcomes for Veterans and civilians living with OA.

5. APTC Excels in Diversity, Equity, and Inclusion in STEM

Our Wen H. Ko Summer Internship Program (SIP) for Diversity, Equity, and Inclusion, in partnership with CWRU, received national recognition as a 2024 recipient of *Insight into Diversity Magazine’s Inspiring*

Programs in STEM Award. Additionally, the APTC SIP received funding from VA ORD to continue the program for the next five years. Furthermore, the APTC connected with potential applicants by attending Career Fairs at *Case Western Reserve University, Cleveland State University, and Historically Black Colleges & Universities (Florida A&M (HBCU) and Florida State University)* in September 2024 allowing us to expand our outreach and encourage undergraduates from underrepresented groups to consider career opportunities in the VA.



6. APTC Research Featured in National and Local Media Outlets

The APTC was featured in several media outlets this past year. Veteran research participant Danny Werner was featured in a Spectrum 1 News segment that aired on November 22, 2023, as part of *National Veterans and Military Families Month* which highlighted the innovative research being conducted by Core Investigators Drs. Ron Triolo and Hamid Charkhkar. Additionally, local NBC affiliate WKYC aired a piece on February 12, 2024 that showcased our adapted exercise program for persons with lower limb paralysis led by Core Investigators Lombardo with Drs. Ron Triolo and John McDaniel. An article written by Associate Investigator Dr. James Sulzer was featured nationally in the *Boston Globe* on February 4, 2024 which detailed how caring for a family member with a traumatic injury helped to shape his understanding of rehabilitative research.

KEY SERVICES

1. Mentored Trainees to Success

APTC Investigators continue to support and guide our trainees to success. Several APT Center trainees achieved significant accomplishments in 2024. Two previous summer interns, Kevin Xu (*mentored by Drs. Walker and Fu*) and Dario Cabal (*mentored by Drs. Damaser and Majerus*), were awarded esteemed National Science Foundation Graduate Research Fellowships. PhD candidates Eileen Petros and Suzhou Li (*mentored by Drs. Triolo and Charkhkar*) took home first and third place respectively at the 2024 CWRU 3-Minute Thesis competition. Sylvie Crowell (*mentored by Dr. Gbur*) was selected as one of two 2024 Henry DeWitt Smith Scholars by the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. Adam Doleman (*mentored by Dr. Damaser*) received First Place for Best Oral Presentation at the December 2023 annual meeting of the Society of Pelvic Research.

2. Educated National and State Representatives about APTC and VA Research

The APT Center introduced our research programs to a wide variety of distinguished visitors this year including members from the Secretary of Veterans Affairs office, representatives from the VHA Retirement Shared Service Office, State Representatives from the Berea Elks, and members of the Tri-State Occupational Medicine Association (TSOMA).

3. Inspired and Connected Center Trainees at the Inaugural Spring i-Con Research Symposium

On May 30, 2024, the APTC hosted its first ever Inspiring and Connecting (i-Con) Trainees Research Symposium. This event was an invaluable opportunity for trainees to interact with each other, APTC investigators, and professionals advancing the frontiers of rehabilitative research and development. The robust program included a networking workshop led by local entrepreneur Steve Weitzner, a multi-disciplined career panel made up of five members with diverse professional backgrounds, and a keynote address by world renowned bioengineer Dr. Joseph Pancrazio of UT Dallas. The event concluded with a juried trainee poster session in which APT Center trainees Eileen Petros, Suzhou Li, and Hannah Morgan received prizes for best poster.



4. Advanced VehiCLE Technology Transfer Assistance Program

With shared personnel and facilities managed by the APT Center, the VehiCLE Technology Transfer Program successfully developed 10 new prototypes for novel healthcare devices this past year. Several of these projects were conceived by VANEOMS APTC inventors, including *Point-of-Care Vascular Access Monitoring (Core*

Investigator Dr. Steve Majerus) and *Bladder Catheter for Prostate Cancer Radiation Therapy* (Investigator Dr. Kevin Kelley). Also, VehiCLE Program Manager Stephanie Nogan Bailey highlighted the resources available to accelerate innovations along the commercialization pathway at the *Association of the United States Army Annual Meeting* in Washington, DC and at the VA Innovation Experience in Chicago, IL.

5. Facilitated Veteran Research Recruitment Efforts

This year, the APT Center utilized the 119 *Digital Announcement Network* (DAN) Boards present throughout the VANEOSH to advertise ongoing research opportunities to Veterans, caregivers, clinicians, and medical center staff. In February, Investigator Lisa Lombardo and PTA Maura Malenchek conducted an in-service highlighting APTC research to the SCI/D Service as a result of exposure from the DAN advertisements. Additionally, the Center developed a video playlist under the VANEOSH YouTube page to engage Veterans, disseminate information about our research programs, and encourage study participation.

6. Received iNet Projects Impacting Veteran Health

The APT Center was well represented in the FY24 cohort of VHA Innovators Network (iNET) investees with seven Investigators and staff members selected for funding. The project led by Core Investigator Lisa Lombardo entitled "*Optimizing Ventilatory Training Program for Individuals with Paralysis*" collected additional data locally and procured devices to pilot a new respiratory therapy program at the Augusta, GA VAMC. Engineers Will Rasper and Braden Petno moved on to the Seed phase of their cycling projects ("*Upper Extremity Assisted Tricycle*", "*Gravity Assist Trike*") and Engineer Raychel Testa's Spark project ("*Glycemic Stabilizer*") explored new, innovative ways to deliver glucose in conjunction with insulin for patients with diabetes. Other APT Center awardees included PTA Maura Malenchek for the "*Tri-cane: A Convertible Tripod Cane for Intermittent Support*," engineer Dakota Noble for the "*Prosthetic Liner with Routing Sensor Cables*," and engineer Tyler Tevis for the "*SmartVac – Real-Time Monitoring for Clinicians*."

7. Supported Pilot Projects with the 2024 Garverick Innovation Incentive Program

The APT Center's Garverick Innovation Incentive Program is an internal pilot funding mechanism for nurturing new ideas, encouraging pursuit of innovative concepts, and assisting APTC Investigators to obtain preliminary data to support external grant applications. In 2024, projects pursuing "*Feasibility of Monitoring Bladder Pressure at Home in Veterans with Neurogenic Bladder*" (Dr. Margot Damaser), "*An Actuated Orthosis for a Hybrid Exoskeleton for Users with High-Level Spinal Cord Injury*" (Dr. Sandra Hnat), and "*Spinal Cord + Peripheral Nerve Stimulation to Increase Exercise Intensity by People with SCI*" (Dr. Nathan Makowski and Ms. Lisa Lombardo) received pilot funding awards.

8. Expanded Knowledge and Collaboration with Distinguished Lecture Series

We continued our collaboration with the Cleveland Clinic Lerner Research Institute to conduct the *APTC-CCF Distinguished Lecture Series*, where nationally recognized researchers educate, interact and foster collaborations with Center Investigators and trainees. This year's series included Dr. Kip Ludwig from the University of Wisconsin Madison, Dr. Ravi Nataraj from the Stevens Institute of Technology, and Dr. Joe Pancrazio from the University of Texas at Dallas.

9. Contributed to VA Enterprise Initiatives

APTC's Executive Director, Dr. Ron Triolo, and Deputy Director, Dr. Margot Damaser, actively contributed to national committees to support ORD's Enterprise Transformation. In addition, Dr. Triolo served on an ISM Advisory Panel and Dr. Damaser served on the Field Research Advisory Committee and two grant review panels. Core Investigator Drs. Hamid Charkhkar and Clay Kelly conducted several in-services to national VA audiences (Minneapolis, Tampa) VA Medical Centers.

Summary

The APT Center continues to advance the state of rehabilitation technology, fulfill our mission, and improve the lives of Veterans and the general population through important discoveries, contributions to community outreach, and cutting-edge intellectual property that lead to active industry conversations and licensing opportunities. This past year, APTC investigators made important advancements in their projects, continuously engaged Veterans, and demonstrated the impact of our core research programs to the public.