

**Advanced Platform Technology Center (APTC)  
Louis Stokes Cleveland VA Medical Center (LSCVAMC)**



**VA RR&D Research Center**

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

**ANNUAL REPORT**

**For Activities during the period: October 1, 2022 – September 30, 2023**

**2023 Annual Report** for activities during the period October 1, 2022 to September 30, 2023

## **Advanced Platform Technology Center (APTC)**

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

### **RR&D Center**

**RR&D Center funding number:** A1871C

**Award Dates:** January 1, 2020 to December 31, 2024

**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](http://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. CBS 60 Minutes Features APTC and VA Research

Core Investigator Dr. Dustin Tyler and APTC research participant Brandon Prestwood were featured on CBS News' *60 Minutes* program that aired nationally on Sunday March 26, 2023. This episode, titled "*Feel again: Advancements in prosthetics limb technology allow feeling, control*", highlighted APTC research projects that restore the sense of touch for amputees and individuals with paralysis as well as other innovative research being conducted by APTC Investigators such as Drs. Ron Triolo and Hamid Charkhkar.



#### 2. APTC Commercializes Innovations for Disabled Veterans

The VA Technology Transfer Program, with the assistance of the PIA, Techlink, licensed two inventions to AliMed, Inc. The Self-leveling Walker, invented by APT Center investigators, allows users to safely negotiate stairs and inclines while minimizing the cost of home adaptations and rehabilitation training. The Hinged Bathtub Bench, invented at the Chicago VAMC and refined by APT Center engineers, locks on to the tub wall and allows the shower curtain to fully close and prevent water from spilling onto the floor. In addition, APTC Investigators continue to innovate and protect VA inventions by submitting 11 new invention disclosures and receiving 9 new patents in FY23.

#### 3. APTC Disseminates Lower Extremity Sensory Neuroprostheses

APT Center Associate Investigator Dr. Hamid Charkhkar and Core Investigator Ms. Lisa Lombardo received a \$1.49 million, four-year grant from the Department of Defense (DoD) for project entitled "*Neurally Integrated Lower Limb Prosthesis for Home and Community Use*" that expands upon previous research initiated by Dr. Ron Triolo and funded by the Department of Veterans Affairs. This project focuses on real-world use of sensory neural prostheses and extends our work that demonstrated significant potential for restoring plantar sensation in Veterans with lower limb loss. In addition, our Restoring Lower Limb Neural Connections (ReLLiNC) laboratory was highlighted in the *2023 VA Research Week* kick off speech given by VA Under Secretary for Health, Dr. Shereef Elnahal. As part of his speech, Dr. Elnahal highlighted the positive impact our innovative research on sensory feedback using neuroprosthetics has had on a Veteran with trans-tibial limb-loss.

#### 4. APTC Investigators Recognized for Contributions to Ongoing Innovation

APT Center Core Investigator, Dr. Dustin Tyler, was elected as a Fellow of the National Academy of Inventors (NAI), and APT Center Deputy Director Dr. Margot Damaser and Associate Investigator Dr. Pedram Mohseni were named Senior Members of the NAI in FY 2023. Additionally, Dr. Mohseni and a team of APT Associate Investigators (Drs. Evi Stavrou, Umut Gurkan, and Michal Suster) were named 2023 CWRU Research Innovators of the Year at the University's Innovation Week for their work on the life-saving *ClotChip* device. This portable, point-of-care device can assess the clotting ability of a blood sample 95 times faster than current methods, using only a single drop of blood.

#### 5. iNet Funds APTC Projects That Impact Veteran Health

Seven APT Center Investigators and staff were awarded FY23 funding from the VHA Innovators Network (iNET) for projects that address the needs and improve the lives of disabled Veterans. APT Center Core Investigator Dr. Mark Walker advanced his project to develop and test a portable virtual reality system to measure eye movements and assist in the diagnosis of neurological and vision disorders. Core Investigator Lisa Lombardo created a ventilatory training program to strengthen respiratory muscles of paralyzed Veterans and is disseminating it to other VA Medical Centers. APT Center engineers Braden Petno and William Rasper adapted trikes to compensate for gravity, assist with climbing hills and allow simultaneous and synchronized upper and lower limb workouts. Other APT awardees include engineer Raychel Testa for the "*Hinged-Tub Transfer Bench and Simplicity Mammography Biopsy Chair*" projects, engineer Michael Miller for a "*HoloLens Training*

Module for Placing Electrodes” project, and physical therapy assistant Maura Malenchek for the “Tri-Cane: A Convertible Tripod Cane for Intermittent Support” project.

## 6. APTC Expands Community Interest for Adapted Exercise

The APTC team exhibited our stimulation-powered rowing ergometer, virtual reality rowing exercise games, and our newly acquired adapted rowing shells at the 2023 Head of the Cuyahoga Regatta hosted by the Cleveland Rowing Foundation on September 16th. Attending this event generated great interest from local community organizations and media, which will help lead to the ultimate goal of getting Veterans with disabilities safely rowing on the water to promote exercise and allow for a greater sense of community.



## KEY SERVICES

### 1. Coordinated Expanded Summer Internship Programs (SIP)

Core Investigators Drs. Jeff Capadona and Allison Hess-Dunning continued to grow the APTC Summer Internship Programs. During the 2023 summer, the APT Center mentored and generated research opportunities for 19 undergraduate students. Fourteen met one or more of the DEI criteria, including 11 women, two students with physical disabilities, and one underrepresented minority. This program allows the Center to continue contributing to ORD’s efforts to promote diversity in the VA workforce, as well as our own ongoing capacity building, outreach, and inclusion efforts. The APTC’s second annual *Summer Research Symposium* in July featured presentations and a judged poster session by our 2023 interns. Interns John Niezgodka, Kate Li, and Ananya Sundararajan won top prizes and were funded by the Center to attend the 2023 *Biomedical Engineering Society (BMES) Annual Meeting* to present their posters on a national stage.



### 2. Initiated Pilot Studies with the 2023 Garverick Innovation Incentive Program

Our Garverick Innovation Incentive Program is a pilot funding program that nurtures new ideas, encourages innovative concepts and helps APTC Investigators obtain preliminary data that may lead to larger funding opportunities. Three APTC members received funding after presenting their project ideas to the APTC Leadership and staff at the “Garverick Shark Tank” session in July 2023. First place was awarded to APT Core Investigator Dr. Steve Majerus for his “*Point-of-Care Identification of Urinary Tract Risk after SCI (SafeCath System)*” project. Second-place winner was APT Core Investigator Dr. Janet Gbur’s “*Development of Aerosol Jet Printed Sensor for Smart Liner System for Prosthetics*” project. Third place went to APT Core Investigator Dr. Kath Bogie and APTC engineer Tyler Tevis for their project entitled “*Advancing Wound Care for Veterans: Design and Evaluation of a pH Sensor for Remote Monitoring in Vacuum-Assisted Wound Therapy*”.

### 3. Actively Participated in VA ORD Enterprise Transformation

APTC’s Executive Director, Dr. Ron Triolo, and Deputy Director, Dr. Margot Damaser, actively contributed to national committees to support ORD’s Enterprise Transformation. By participating in this historic effort, they will help ensure that VA research aligns with the needs of Veterans in the future.

### 4. Expanded Social Media Presence to Engage Disabled Veterans and Healthcare Professionals

APT Center continued to build its [LinkedIn](#) presence to broadly disseminate information about our VA centric research to the community. In the past year, we have expanded our LinkedIn follower community by over 60% and it continues to grow. The page currently has 440 followers from the U.S. and Internationally, which allows our content to reach a very wide audience. Individuals who follow our page can get timely updates about recent publications, investigator / staff recognitions, recent news or media mentions, announcements about APT Center programs and events, and APT community outreach / conference presence. Having this growing platform provides many avenues for further professional collaboration and development.

### 5. Facilitated Community Outreach Efforts

The APT Center sent representatives to several professional conferences and outreach events in 2023.



We had booths at the *American Physical Therapy Association (APTA) Combined Sections Meeting* (February 2023), *Paralyzed Veterans of America (PVA) National Veterans Wheelchair Games* (July 2023), *Amputee Coalition* (August 2023), and *PVA Summit + Exposition* (August 2023) where we engaged Veterans, potential research subjects, clinicians, and potential collaborators. Additionally, the APT Center connected with potential applicants for our Summer Internship, Co-op, and post-doctoral programs by attending the *Case Western Reserve University* and *Cleveland State University* Engineering Career Fairs in September 2023.

#### **6. Advanced VehiCLE Technology Transfer Assistance Program**

With shared personnel and facilities managed by the APT Center, the VehiCLE (VA Engineering Health Innovations Cleveland) Technology Transfer Assistance Program successfully designed and delivered nine new prototypes for novel healthcare devices to clinical inventors across the national VA system this past year. They developed products such as endovascular wires, telemedicine kits, and novel catheter designs. Additionally, VehiCLE added another biomedical engineer and grew their in-house fabrication capabilities with new hand tools and a multi-color Polylactic Acid (PLA) 3D printer from Bambu Lab. VehiCLE Program Manager Stephanie Nogan Bailey and Innovation Specialist Frank Zitko highlighted the internal resources available to accelerate innovation and move projects into the commercialization pathway at the inaugural two-day *VISN 10 Innovation Summit* in Dayton, OH in April 2023. Cleveland's Technology Transfer Specialist, Dr. Emily Q. Rosenthal, accompanied Ms. Bailey as a presenter in the Developers' Showcase during the annual *Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)* conference in New Orleans, LA in July 2023 where they had an array of prototypes on display.

#### **7. Fostered Collaboration and Knowledge Expansion with APTC Distinguished Lecture Series**

We continued our collaboration with the Cleveland Clinic Lerner Research Institute to organize and conduct the *Distinguished Lecture Series*, where nationally recognized researchers speak, tour local laboratories and facilities, and interact with Center Investigators and trainees. This year's series included Dr. Nicole Pelot from Duke University, Dr. Karunesh Ganguly from the University of California San Francisco, and Dr. Brian Kwon from the University of British Columbia. This activity promotes avenues for future national and international collaborations with experts in the field of rehabilitation and engineering that can lead to research advancements to significantly impact Veterans health.

#### **8. Educated Congressional Representatives about APTC and VA Research**

The APT Center had the opportunity to meet and introduce our research programs to Congressional Representatives Max Miller (Ohio's 7th District) US House of Representatives, and Tom Wike, Veteran and Military Affairs Liaison for Ohio U.S. Senator Sherrod Brown. Our Investigators and staff showcased our innovative research projects and introduced them to the many ways that we continue to positively affect the lives of Veterans.

#### **9. Contributed Significantly to Editorial Boards, Scientific Review Panels, and Professional Societies**

APT Center Core Investigators contributed their time and expertise to advancing the profession of rehabilitation medicine and engineering as editors/associate editors (5), on editorial boards (6), or as reviewers (8) for professional scientific journals, clinical publications, or practice guidelines. We also served as committee members (22) and committee/session chairs (4) of professional societies, or organizational bodies for symposia, conferences, workshops, or meetings.

### **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 leads to active industry conversations and licensing opportunities. This past year, APTC investigators made important advancements in their projects, increased mentoring capabilities, and engaged Veterans through research projects, demonstrating that core research programs of the APTC are impactful and vital to Veterans, other federal agencies, and the public.