

Bionics for Veterans (BIOVET): An International Partnership to Advance Rehabilitation, Education, and Technology for Wounded Warrior Care

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Learning Objectives



1. **Discuss** BIOVET's creation, purpose, and goals
2. **Describe** initiatives to advance rehabilitation, education, and technologies for allied military medical readiness
3. **Examine** global impact on readiness and influence on return to duty outcomes for service members

Partnership Background

Bionics for Veterans (BIOVET) is a collaboration between the **United States (US) Department of Defense (DoD)** and the **Italian (ITA) Ministry of Defence (MoD)**.

The mission focuses on enhancing rehabilitation through advanced prosthetics and orthotics by leveraging civilian and military expertise across 10 partnering organizations.



- DoW
- Civilian
- International

Mission Goals



Global Leadership

Become leaders in surgical and rehabilitation **education and training.**



Innovation

Develop and **test** new assistive technologies and advanced O&P devices.



Research

Clinically **validate** advanced orthotic and prosthetic devices through **research.**



Recovery

Advance neuro-physical recovery for **return-to-duty-readiness.**

BIOVET Research Portfolios

FAST Portfolio

Fusing Amputation Surgeries with prosthetic Technologies (FAST)

Aims to improve surgical techniques, sophisticated prosthetics, and intuitive control methods.

Goal: Advance prosthetic technology and surgical techniques for patients with upper limb loss.

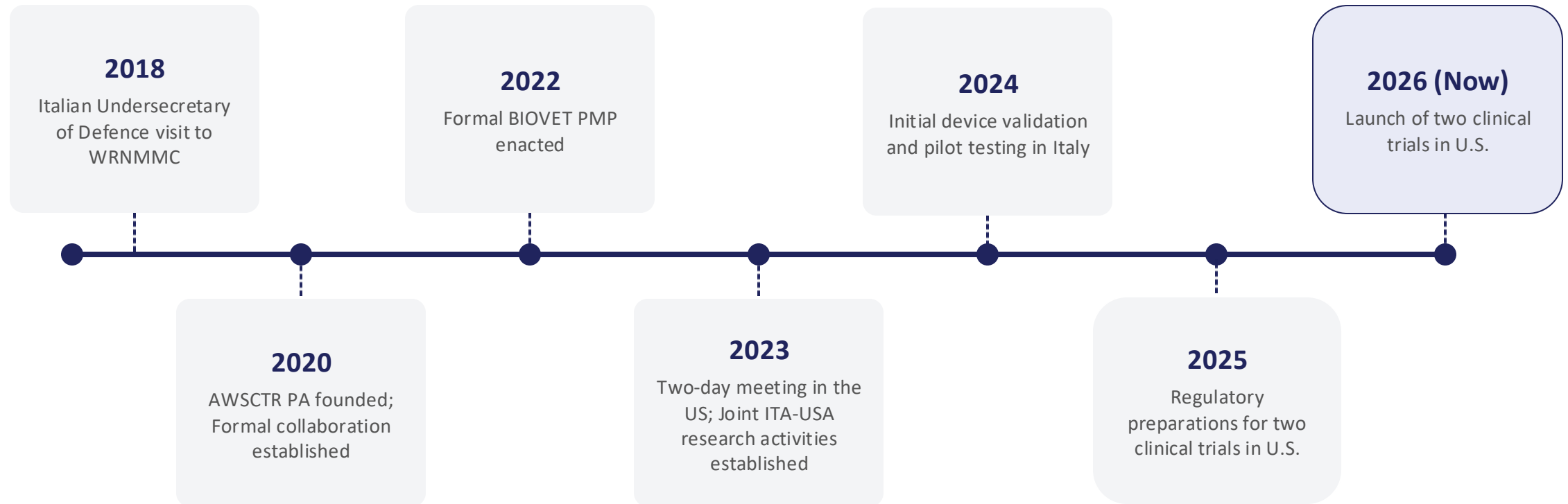
BIONICRUS Portfolio

Personalized Gait Rehabilitation for Veterans with Wearable Robotic Devices (BIONICRUS)

Dedicated to developing and testing lower-limb exoskeletons and assistive orthotics.

Goal: Enhance gait, balance, and stability through wearable robotic technology.

Advancing Wounded Soldier Care Through Robotics (AWSCTR)



Collaborative efforts operate under a 25-year U.S.-Italy Memorandum of Agreement (MOA), focusing on robotic research in prosthetics and exoskeletons. The Advancing Wounded Soldier Care Through Robotics (AWSCTR) Project Agreement (PA) outlines the objectives, scope of work, and shared tasks agreed upon by all collaborators.

Commencement & Joint Activities: 2023

Establishing Joint ITA-USA Operations

- Hosted a pivotal **two-day bilateral meeting** focused on alignment and collaboration.
- Conducted live, interactive **technology demonstrations** highlighting state-of-the-art robotics.
- Successfully aligned strategic goals and established formal **Joint Research Activities**, FAST and BIONICRUS.



Device Innovations

2023 was a critical activation year. By uniting military medical specialists and civilian biomedical engineers, these joint efforts helped identify core capabilities and gave engineers direct clinical feedback. As a result, the team was able to fine-tune the devices ahead of upcoming clinical trials.

FAST

Goal: Advance prosthetic technology and surgical techniques for patients with upper limb loss.



Study Title	Study 1: Usability of an Advanced Multi-Grasp Hand Prosthesis	Study 2: Usability of a Quasi-Passive Prosthetic Wrist with Two Levels of Compliance	Study 3: Vibrotactile Sensory Feedback from a Prosthetic Hand	Study 4: Integrating the Mia Hand with the Neural-Enabled Prosthetic Hand (NEPH) system to Provide Sensory Feedback from a Prosthetic Hand	Study 5: Advancing Surgical Procedures for Optimizing the Functionality of Individuals with Amputation , including: Osseointegration (OI); Targeted Muscle Reintegration (TMR), Regenerative Peripheral Nerve Interfaces (RPNI); and Implanting Magnets (Myokinetic Interface).
Population	Individuals with upper-limb amputations (wrist disarticulation, transradial, or transhumeral) proficient in either pattern recognition or dual control myoelectric systems.	Individuals with unilateral or bilateral upper limb amputation at the transradial and/or transhumeral level(s); proficient osseointegration or socket prosthetic users.	Individuals with upper limb amputation at the transhumeral (with or without osseointegration) or at the transradial level who are proficient myoelectric control system users.	Individuals with upper limb amputations with an implanted neurostimulation system previously enrolled in the NEPH clinical trial at UArk and/or WRNMMC.	Audience: Orthopaedic surgeons, Plastic surgeons, PMR physicians
Device	Mia Hand	Mia Hand	Mia Hand	Mia Hand	N/A
Status	In-Development	Complete; published	Applied for funding	On hold	Ongoing
Lead Partner	US	ITA	US/ITA	US/ITA	US/ITA

BIONICRUS

Goal: Enhance gait, balance, and stability through wearable robotic technology.



Study Title

Study 1: Pilot Study to Investigate Sensory Feedback for Individuals with Functional Impairments

Population

- 1.1 – Individuals with Lower Limb Loss
- 1.2 – Individuals with Lower Limb Dysfunction
- 1.3 – Individuals with Vestibular Impairments

Device

Sensory feedback system (SFS)

Status

Applying for funding

Lead Partner

US/ITA

Study 2: Active Pelvis Orthosis (APO) to Improve Gait for Individuals with Lower Limb Impairment

- 2.1 – Individuals with Lower Limb Loss
- 2.2 – Individuals with Lower Limb Dysfunction

Active Pelvis Orthosis (APO)

In-development

US/ITA

Study 3: Active Knee Orthosis for ACL Rehabilitation

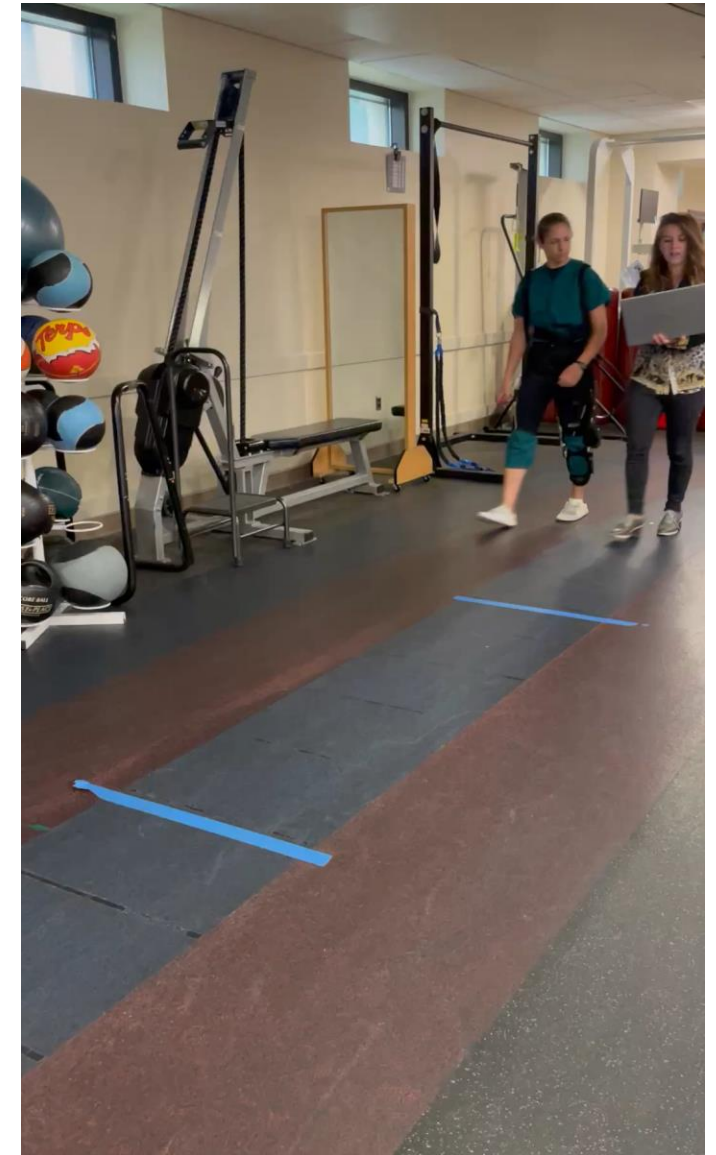
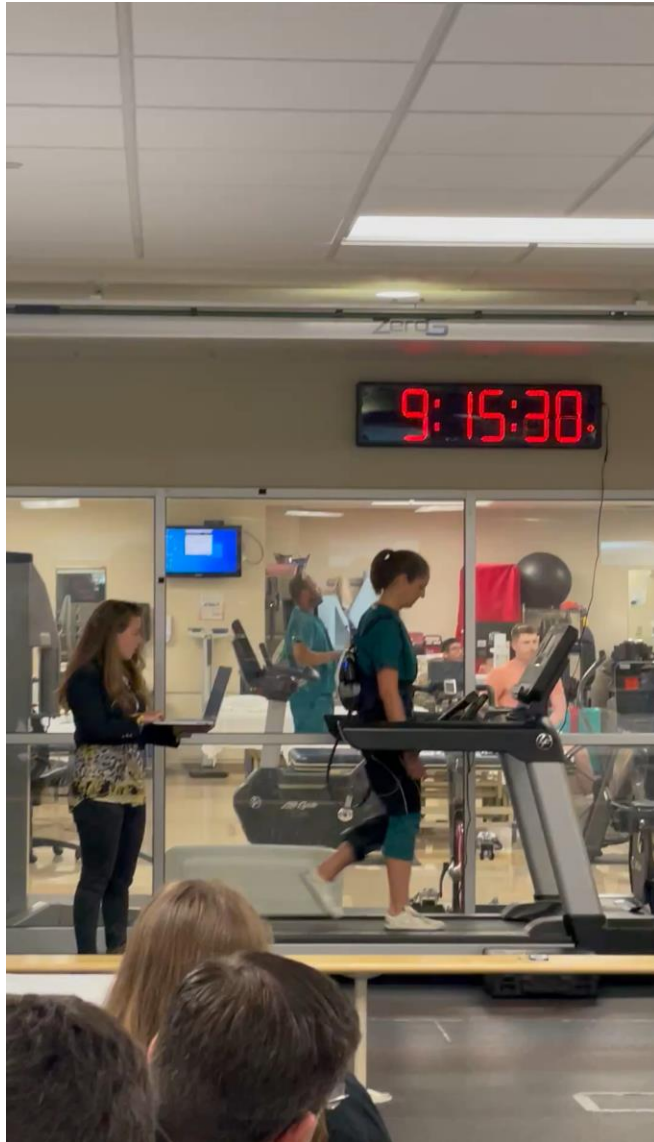
- 3.1 – Individuals who under anterior cruciate ligament reconstruction surgery

Active Knee Orthosis (AKO)

In-development

US/ITA

Active Knee Orthosis (AKO)



2024: Limb Restoration Techniques: Advancing the Care for War Casualties with Amputation



Impact & Mission Alignment

The BIOVET partnership strengthens medical readiness and delivers tangible solutions aligned with our core mission goals:



1

Global Leadership

Standardization of Care:

Facilitating active knowledge exchange across US, Italian, and international systems to establish unified medical and operational frameworks.



2

Innovation

Clinical Validation: Advancing and validating emerging technology, streamlining device compatibility, and integrating US control frameworks.



3

Research

Infrastructure: Utilizing formal MOAs, PAs, PMPs, and research portfolios to ensure complex international initiatives stay structured and aligned.



4

Patient Recovery

Functional Outcomes:

Delivering concrete rehabilitative solutions and assistive tools for veterans and active-duty service members.

Conclusions

- **BIOVET is a globally recognized partnership** making significant strides in wounded warrior care.
- Advances in education, training, and development of assistive tools are **enhancing rehabilitative strategies**.
- Collaborative research continues to **bridge the gap between U.S. and Italian military medicine**.
- Projects are aimed at **advancing return-to-duty readiness and quality of life** for service members and veterans.



Acknowledgements

USA

COLLABORATING INSTITUTIONS

- **Uniformed Services University (USU)**
- **The Henry M. Jackson Foundation** for the Advancement of Military Medicine (HJF)
- **US Department of War (DoW)**
- **Spaulding Rehabilitation Hospital Boston**

ITALY

COLLABORATING INSTITUTIONS

- **University of Sassari (UNISS)**
- **Scuola Superiore Sant'Anna (SSSA)**
- **Prensilia (PRE)**
- **Istituto di Scienze Biomediche della Difesa (ISBD)**
- **ITA Ministry of Defence (MoD)**
- **IUVO**
- **Gemelli University Hospital**

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Principal Investigator:

Paul F. Pasquina, MD

References

INTERNAL RESOURCES

- US DoD - ITA MoD RDT&E Memorandum of Agreement (MOA)
- Advancing Wounded Soldier Care Through Robotics (AWSCTR) Project Agreement (PA)
- BIOVET Project Management Plan (PMP)

EXTERNAL RESOURCES

- <https://pubmed.ncbi.nlm.nih.gov/42243910/>
- <https://www.dvidshub.net/>

Questions?

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