ENHANCING MEDICAL STUDENT DEVELOPMENT THROUGH COLLABORATIVE MILITARY-CIVILIAN RESEARCH FELLOWSHIPS

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BACKGROUND

PAST

Military medicine catalyzes biomedical innovation:

- Hemorrhage Control: Tourniquets, hemostatic agents, whole-blood transfusion
- Trauma Systems: MASH units (Korea), Roles of Care, Joint Trauma System
- Prosthetics & Rehabilitation: Myoelectric arms, osseointegration, muscle reinnervation
- Infectious Disease: WWII penicillin mass production, RTS,S malaria vaccine, COVID-19 vaccine distribution

PRESENT

Modern challenges require multi-domain partnerships:

- Prolonged Field Care: Near-peer conflicts, resource-limited LSCO environments
- AI & Machine Learning: Diagnostics, predictive analytics in casualty care
- Bioengineering & Biotechnology: Regenerative therapies, on-site bioproduction
- Military-Civilian Interoperability: Mission Zero, SC2i for precision trauma care

No formal curriculum at USUHS currently facilitates structured integration with civilian-domain expertise aimed at fostering lifelong innovation.

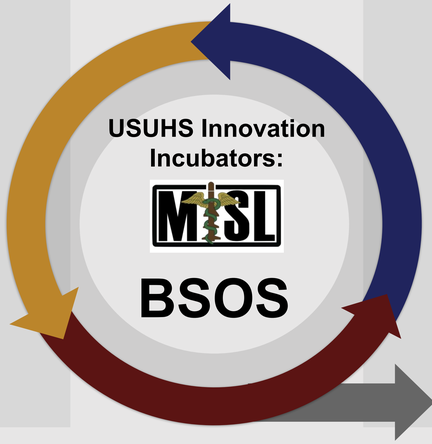
FUTURE

We evaluated, designed, and successfully implemented the **first-of-its-kind military biomedical fellowship program at USUHS in collaboration with MIT Lincoln Laboratory to train Military Physician-Engineers**

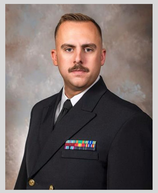
METHODS







2023	2024	2025	2026
			?
LT (Dr.) Bryson Hewins Radiology	LT (Dr.) Robert Weishar Orthopaedics	2LT Jonathan Wang General Surgery	TBD

PROGRAM OVERVIEW

Physician-Engineers: USUHS and MIT-LL Partnership

- Designed as a mini-fellowship pilot to accelerate biomedical innovation.
- 4-12 week program for MS4s (1-3 capstones)
- Hands-on research experiences across advanced labs, including trauma care, AI, biosensing, and more.
- A five-year MOU ensures continuity through 2028.

RESULTS

2023 Fellow

- **Deep Learning Model Development** – Point-of-care ultrasound detection of stress injury
- **Vocal Biomarker-Based PTSD Screening Tool**
- **Artificial Intelligence–Guided Ultrasound Intervention Device (AI-GUIDE)**
- **AI-Enhanced Ultrasound for Identification of Proximal Vascular Control Points in Junctional Hemorrhage**
  - *Accepted for proposal*: Stepping Strong Trauma Innovator Award ($100K)

2024 Fellow

- **Minimally Invasive Surgery Visibility Enhancement For Arthroscopic/Laparoscopic Bleed Detection**
  - *$2.4M NIH grant application submitted*
- **Machine Learning Algorithm for Musculoskeletal Ultrasound**
  - *IRB submission in progress, data collection for 2025*

2025 Fellow

- **Field AI Triage for LSCO and Civilian Mass Casualty Settings**
- **AI-Enhanced Ultrasound for Femoral Arterial/Venous Access (AI-GUIDE)**
- **(SCOUT) Systems for Control, Operations, and Unified Telemetry for Resuscitative Technologies**
- **Smart/Automated Field ECMO for LSCO**
  - *Grant application pending*

CONCLUSIONS AND FUTURE WORK

- **Expand Civilian Partnerships**
  - **Mayo Clinic and University of Maryland**.
- **Expense coverage** to reduce financial barriers for participants.
- **Increased funding** to USUHS innovation incubators
- **Early participation** starting from MS1 through MS4
- **Cultivating physician-engineers** is key to advancing medical innovation.

Disclaimer: The opinions and assertions contained herein are those of the authors and do not reflect those of the Uniformed Services University or the Department of Defense.