



# ***The Power of Mobile: A Summary of Funded Military Medicine Research Initiatives***

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**UNCLASSIFIED**





# Purpose



**To provide an overview of  
funded research initiatives  
ongoing within  
Telemedicine & Advanced Technology  
Research Center (TATRC)  
that are specific to Mobile Health  
throughout the MHS**



# Learning Objectives



- **Understand what research is currently funded within the MHS supporting under mobile technologies**
- **Understand the deliverables for funded research initiatives within TATRC**
- **Understand the potential transition strategies for funded research in the area of mobile technologies**
- **Learn the potential direction for new research in the area of mobile health**



# How Research is Funded



- **Small Business Innovation Research (SBIR) Program:** Multiple phases possible with increasing scope and funding for each phase
- **Joint Program Committees:** DHP RDTE
- **AMEDD Advanced Medical Technology Initiative (AAMTI):** Managed at TATRC; up to \$250k for small-scale technology demonstrations. “Bottom-up innovation with top-down acquisition”



# Concept: Just-in-time Training Delivery



**Concept:** Delivering just-in-time training, anywhere, anytime, to the medical warfighter using the global mobile networks to the user's personal or government issued mobile device.



# Concept: Just-in-time Training Delivery



**Gap:** Training remains one of the most pervasive capability gaps across all medical functional communities, and especially so for personnel transitioning from the MHS to support Operational Medicine missions.

This capability area can help close that gap by allowing users to conduct training in a mobile environment during times convenient to them.

It also allows for distribution of training as new missions/requirements emerge throughout a deployment.



# Concept: Just-in-time Training Delivery

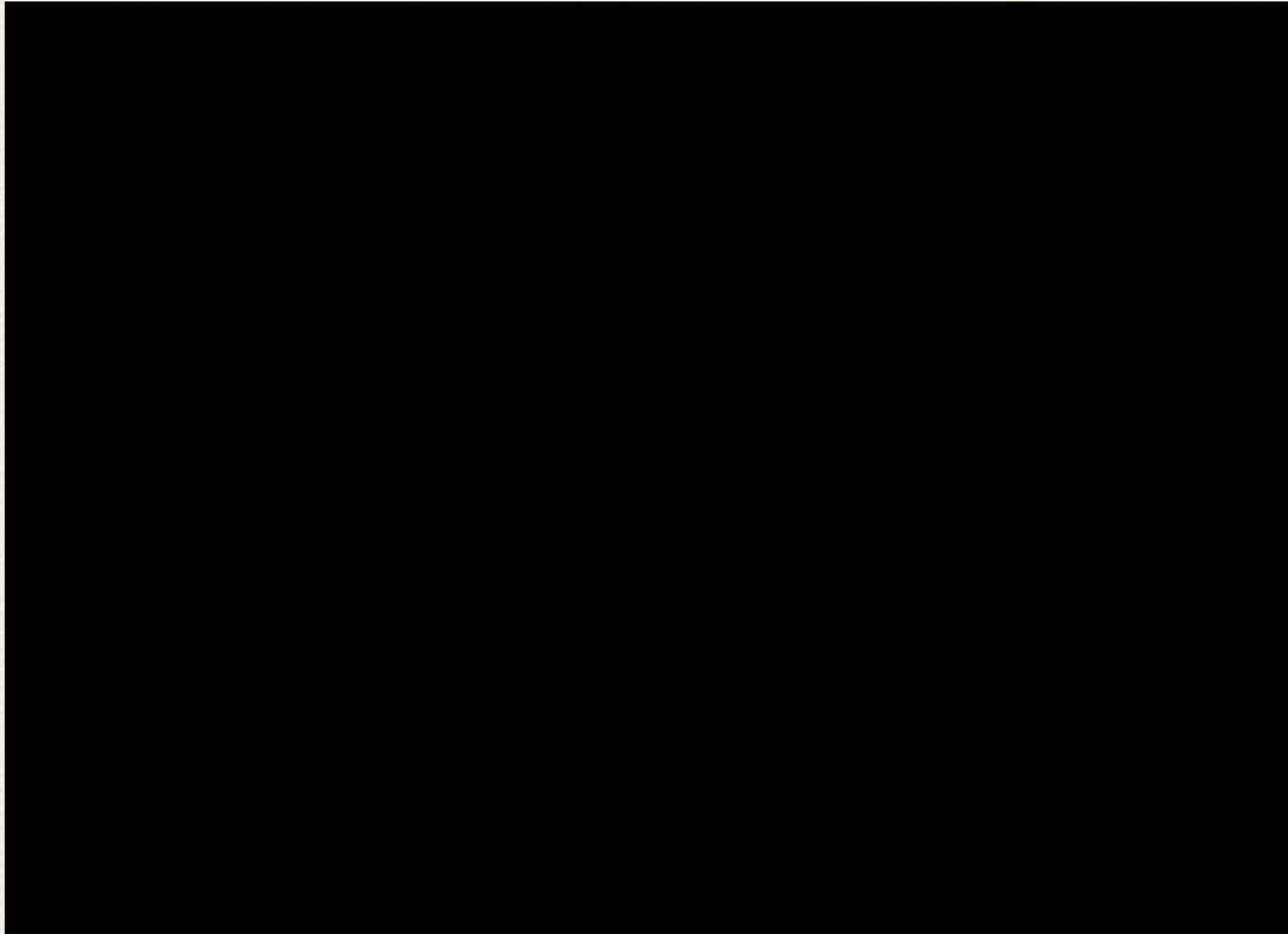


## TATRC Research Projects:

- Mobile Malaria: BiteBack App
- Mobile Training Development & Delivery Platform



# Concept: Just-in-time Training Delivery





# Project to Concept: Mobile Learning Laboratory



**Mission:** To provide the MHS (and DOD) an incubator to drive advancement of mobile learning concepts, solutions and best practices in the unclassified, BYOD space.



## **Capability:** TATRC's mobile learning lab offers:

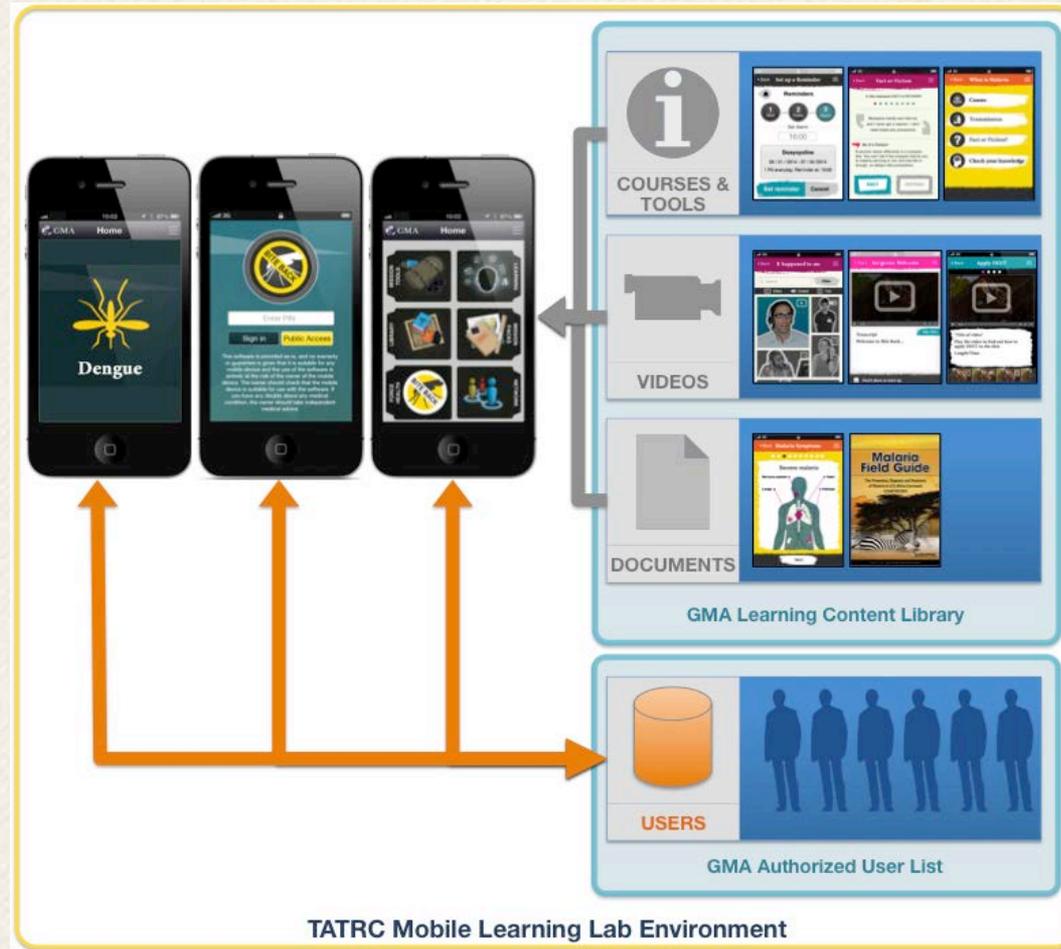
- ✓ **Execution Management:** Experienced staff to develop concepts and plans and lead multi-disciplinary teams.
- ✓ **Content Development:** Engages partners in the design and development of unclassified mobile learning content (tools, informational resources and training). Able to translate materials into foreign languages.
- ✓ **Content Delivery:** An established open-source cross-platform infrastructure operating as a research test-bed.
- ✓ **Research Support:** SMEs/Investigators capable of designing and operating large scale trials with end-users in domestic or international settings.



# Project to Concept: Mobile Learning Laboratory



Comprehensive architecture -not just an App



Partners focused on Force Health Protection: AFRICOM, Army Public Health Command, Joint Knowledge On-Line, University of Miami



# Concept: Telementoring



**Concept:** Telementoring involves procedural guidance of one professional by another from a distance using telecommunications. Includes, but is not limited to, interactions involving audio dialogue, video telestration (video tablet and pen), video teleconferencing, remote biotelemetry and remote guidance of a camera or laparoscope.

Telementoring acts as a force-multiplier for medics operating in remote areas without direct support of higher medical skillsets and has the potential for reducing unnecessary medical evacuations.



# Concept: Telementoring



**Gap:** As the military continues to deploy smaller organizations in more remote environments, the ability to provide direct medical support across a variety of medical specialties will remain challenging.

Telementoring can address this gap by providing real-time reach back to a variety of medical specialties located within the Area of Operations or elsewhere in the military medical enterprise.



# Concept: Telementoring



## TATRC Research Projects:

- Secure Telemedicine (eg TEMPUS-Pro etc)
- SMART Telemedicine (Medic/NETT Warrior EUD)
- Transport Telemedicine System (Sierra Nevada Multi Access Point)
- Finger Mounted Ultrasound Probe for FAST Exams (Focused Assessment with Sonography for Trauma)



# Project: Secure Telemedicine (telementoring)



**Objective:** Enable continuous remote physiological and telemetry monitoring, medical imaging, patient encounter documentation, and secure medical information exchange during casualty assessment, initial evacuation and at Role I MTFs in order to provide telementoring.



# Project: Secure Telemedicine (telementoring)

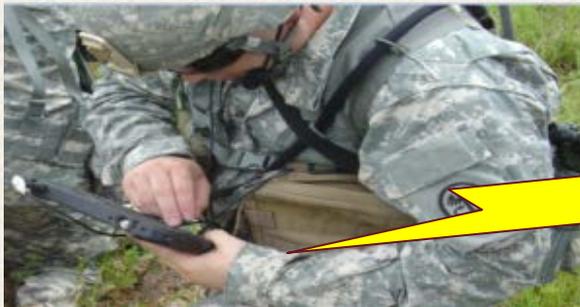


## Technologies:

- Integrated Operational Telemedicine System (TEMPUS-Pro)
- Medic's Ruggedized Secure EUD (Nett Warrior Program)
- Finger-mounted Ultrasound
- Speech data Entry
- Integration of Shock Prediction Algorithm (Compensatory Reserve Index)
- Integrated with JTRS tactical radio networks & mobile cellular 4G LTE



# Project: Secure Telemedicine (telementoring)





# Project: SMART Telemedicine (telementoring)



**Objectives:** Capture and send physiological monitoring data and patient encounter information at point of care to receiving facility, *in advance of patient arrival* and on next generation smart card. Provide alerts and telementoring.

## **Technologies:**

- 4G LTE Cellular EUDs
- Nextgen Smart Card
- Sensors (e.g. digital laboratory
- Sensors) & monitoring devices (e.g. Digital stethoscope)
- Integrated with tactical radios & Army WIN-T



# Project: Transport Telemedicine System (telementoring)



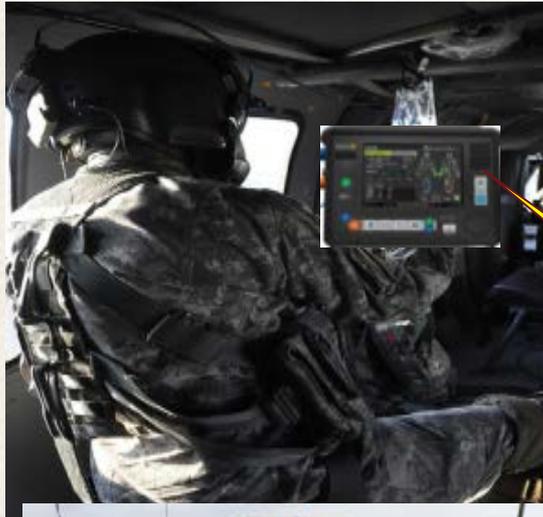
**Objective:** Enable continuous integrated remote physiological and telemetry monitoring, patient encounter documentation, secure medical information exchange, and storage in “the cloud” during casualty evacuation.

## **Technologies:**

- Universal Access Point
- Tactical terrestrial & satellite communications linking air & ground evacuation platforms.
- Integrated patient monitoring, documentation, and telementoring devices.
- Speech data entry



# Project: Transport Telemedicine System (telementoring)





**Objective:** Develop and demonstrate finger mounted probe for Medic conducted FAST Exams (*Focused Assessment with Sonography for Trauma*) and other ultrasound-guided/ telementored procedures such as biopsies, as nerve blocks at Role I & II MTFs

## Technologies:

- 2D, high-frequency, high-resolution, ultrasound transducer probe
- Ultra-wide band wireless connectivity
- Medic EUD & Pre-hospital Operational Telemedicine Device



# Project: Finger Mounted Ultrasound Probe (telementoring)



Finger Probe  
Transducer



Portable/Wearable  
Ultrasound “Front end”  
Processor



Wireless Display/Monitor/  
EUD



**Concept:** To enable simultaneous hand's free capture, storage, and exchange of medical information exchange for combat medics at point of injury, during pre-hospital evacuation, and at Role I & II medical treatment facilities while not interfering with patient transport and treatment.



**Gap:** Numerous AAR documents from 2 separate conflicts and over a decade of mobile device usage indicate a strong desire/need for hands-free documentation and exchange of data when using mobile devices or other similar platforms. Medics indicate a strong desire to enter data using primarily their voice while simultaneously treating casualties/patients.



## TATRC Research Projects:

- Think-A-Move Speech entered patient encounter information
- Situational Awareness Goggles w/ Telemed Capability and synchronized hands-free access to information.
- Virginia Tech Medic's Secure Ruggedized EUD
- SMART & Secure Telemedicine



# Project: Think-a-Move Speech Data Entry & Situational Awareness Goggles



|| Paused ("begin narrative" to start)

A: **Intact** • Adjunct • Cric • Intubated

B: ChestSeal • NeedleD • ChestTube

C: **TQ** • Hemostatic • Packed • PressureDx

Allergies:

Injury: **amputation, right hand**

Tourniquet: **11:24:04 - right | arm**

Drugs: **11:24:15 - morphine 5mg**

Vitals: **11:24:20 - blood pressure: 90/60**

11:23:53 - the patient has an amputation of the right hand due to an explosion

11:24:04 - applied a tourniquet to the right arm

11:24:15 - administered 5 milligrams morphine



## Objective:

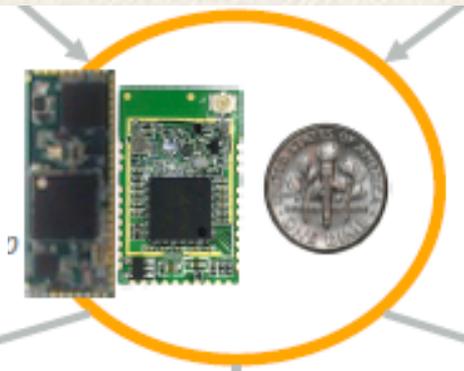
To Provide a heads-up and hands-free solution supporting the Medic's casualty data tasks and uninterrupted treatment of the casualty.

## Technology :

- Heads-up display (HUD) goggles
- Speech generated Encounter documentation (TCCC, MACE, SF60, etc)
- Articulatory Lattice Speech Decoder with a 64,000 word vocabulary for free form transcription in noisy environments.



# Project: Starix Ultra Wide Band



**“Cigarette Pack” UWB transmitter**

Technology Integration

Attachments

Finished Product



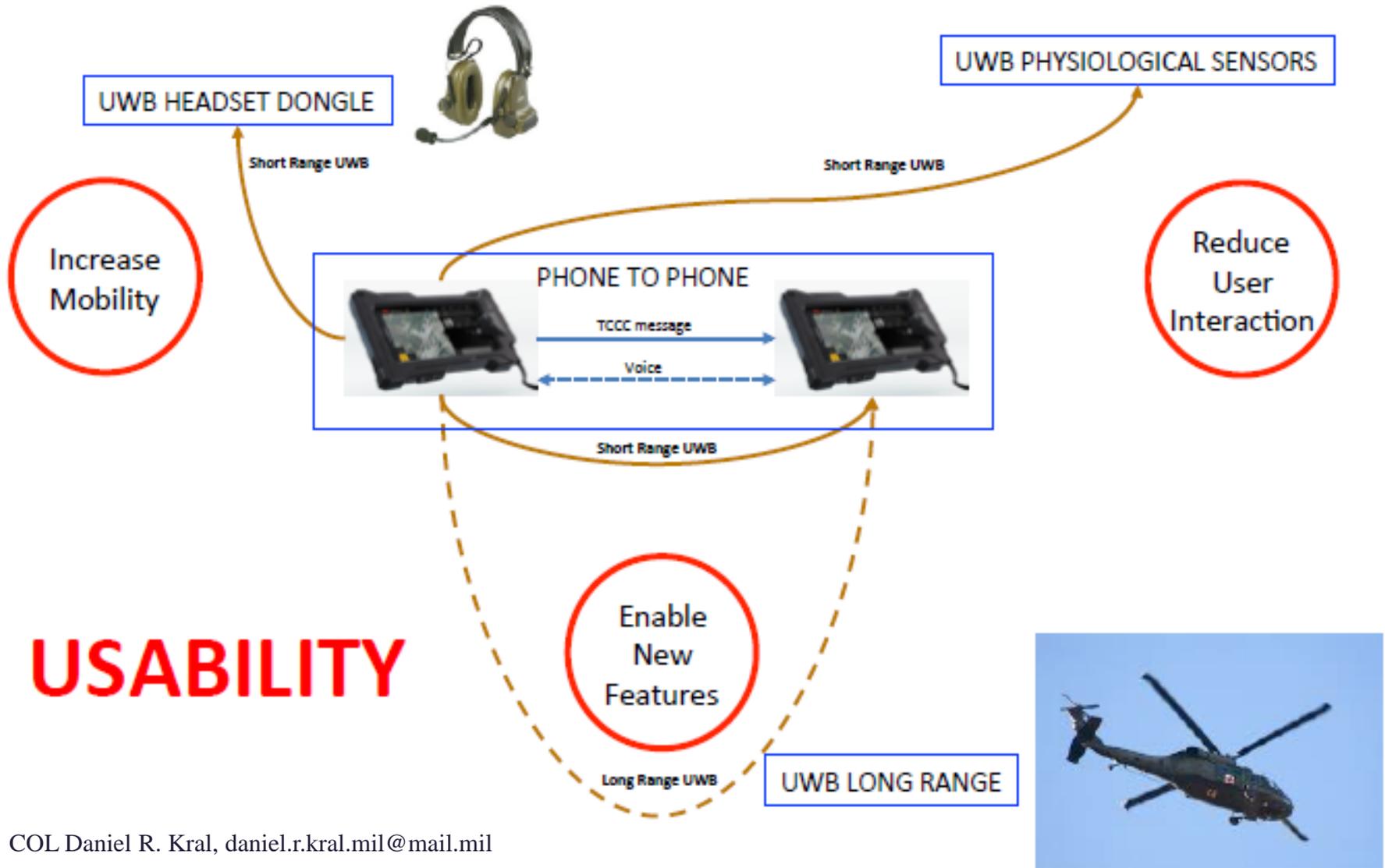
**UWB Data transfer from Zephyr monitor to MEDIC EUD**



**Integrated UWB transmitter sleeve for Android EUD**



**HARDWARE/DESIGN & MECHANICAL**



# USABILITY



**Concept:** Documenting all care provided, from point-of-care and throughout the evacuation process, in a digital format which can support both “actionable” and “permanent” medical enterprise requirements.



**Gap:** The DoD is under several mandates to ensure complete documentation of all care provided to its Service members regardless of where they are stationed in the world.

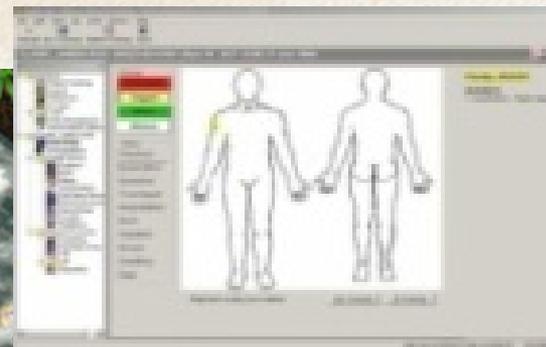
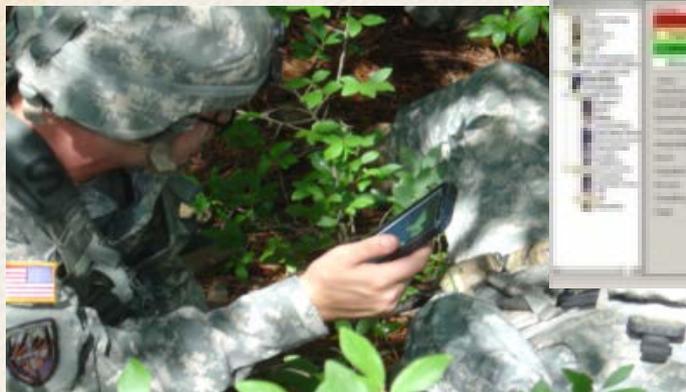
To accomplish this requirement, military medicine has committed to electronic medical records as the primary means of permanent storage.

This requirement supports both follow-on care and the research communities. Additionally, digital capture of patient encounter information also supports the “actionable” data requirements for Role 1, 2, and 3 medical organizations.



## TATRC Research Projects:

- Secure Telemedicine
- SMART Telemedicine\
- Medic/NETT Warrior EUD
- Transport Telemedicine System





# Project: Army NETT Warrior Future Initiatives EUD



Status Bar

Medevac

Buddy Icon

GBI

Stale Buddy Icon

IED

Improvised Explosive Device

Right Side Scroll Bar Soft Buttons

18T WK 81470 59274 (ELE=66ft, AZ=137°)

Chemlite / Tactical Marker

User Position Location



Medical applications implemented on NETT Warrior End User Device (EUD)



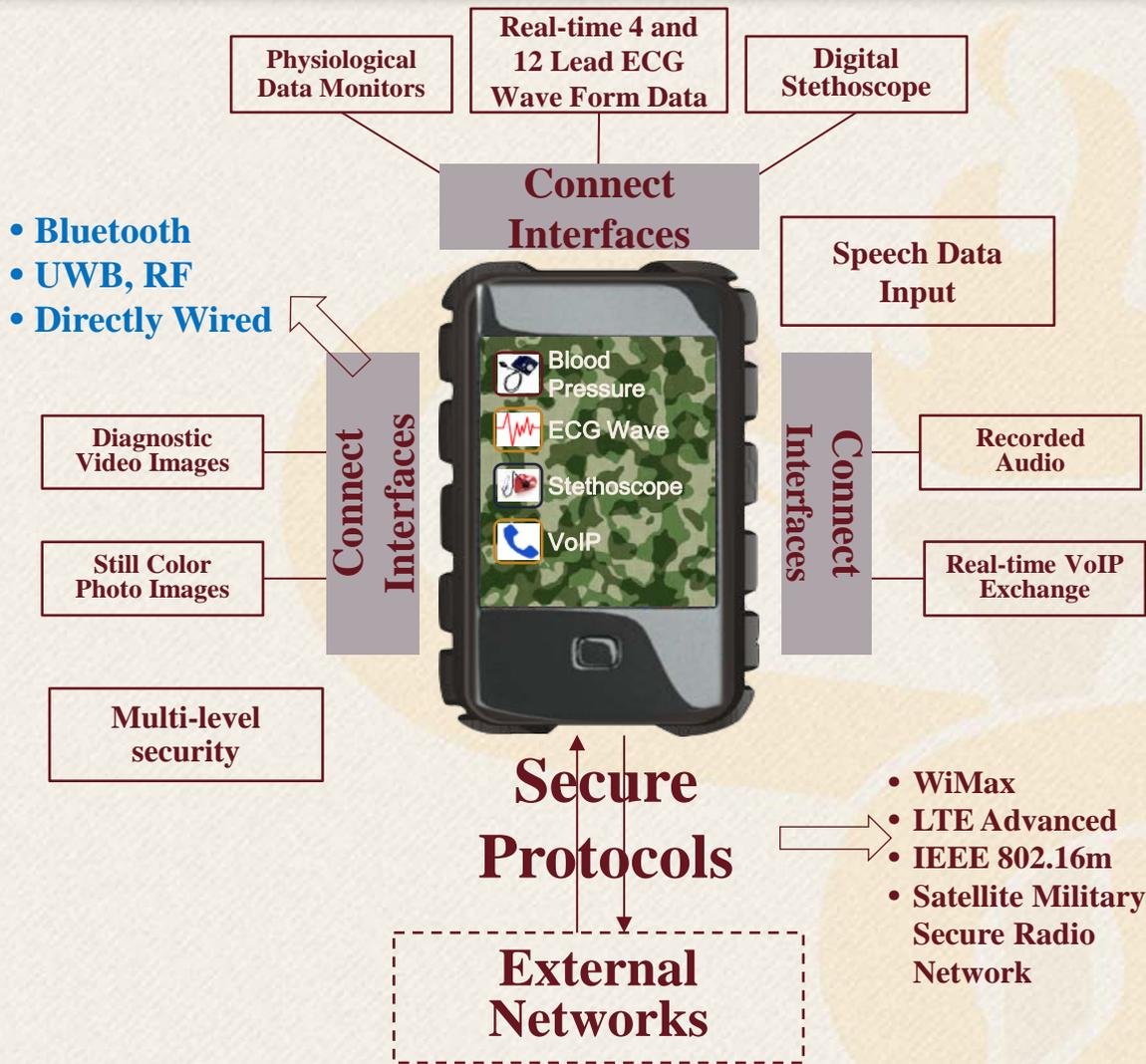
## Objective:

Prototype an ***integrated, secure, ruggedized, wireless*** medic's End User Device (EUD) with similar capabilities to emerging fully integrated ***patient monitoring, patient documenting, and telementoring*** systems (e.g. TEMPUS - Pro):

- Compatible with military-issued Smart Phone devices
- Enable simultaneous secure processing and transmission of medical information
- Hands-free operation
- Use in fixed facilities when not deployed

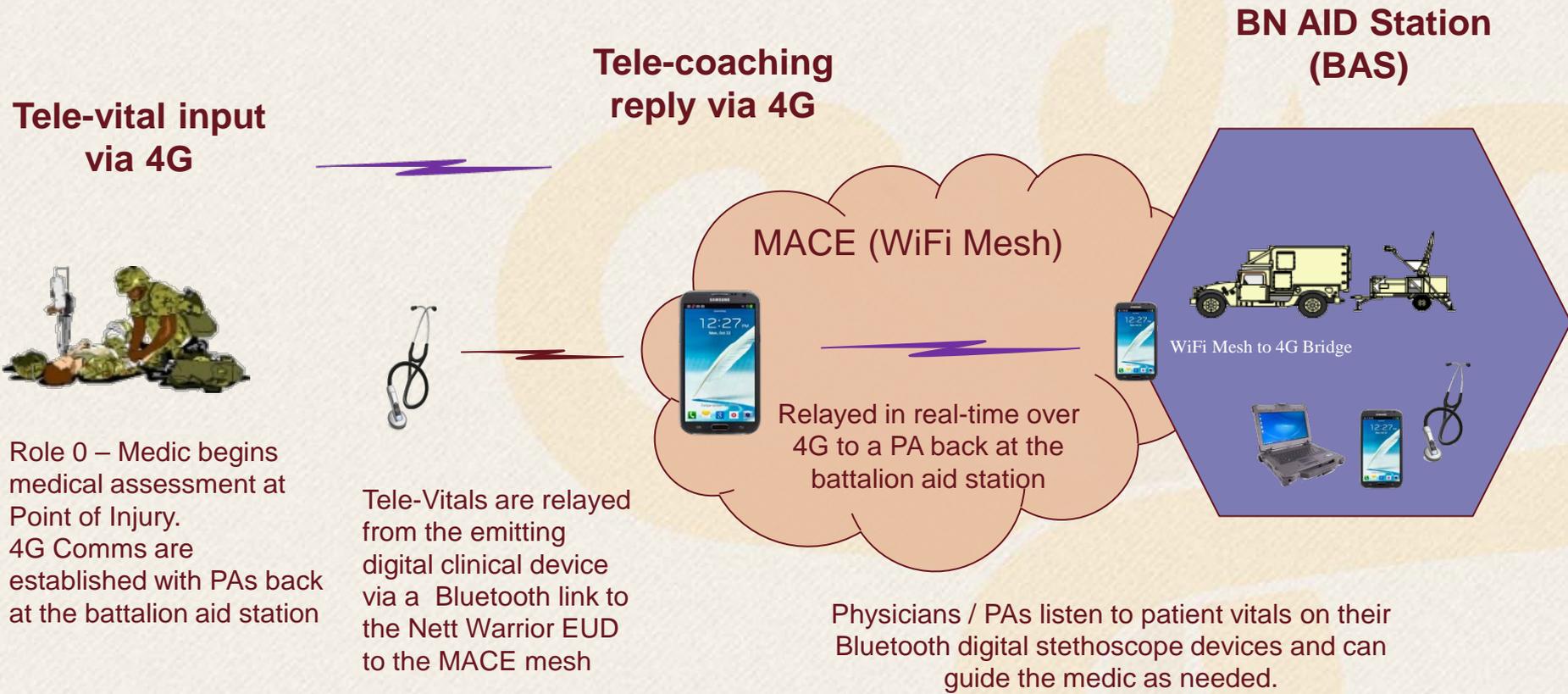


# Project: Virginia Tech Medic's Rugged EUD System Architecture





### CERDEC WIN-T Mobile Extension below Battalion Wireless Communications between Role 0 Medic & Role 1 Bn Aid Station/PA



CONNECTIVITY: provides health information exchange (HIE). Patient care data (encounter & clinical with bio-sensor attachments).



# Concept: Internal Communication & Recall in the Operational Environment



**Concept:** Insertion of COTS technologies into a Combat Support Hospital (CSH) setting to ascertain the technical performance and end user assessment of a communication and recall capability.

**Gap:** Communication and recall is a documented gap in the Role 3 operational environment for medical units, however, to date, resources have not been available to assess the best courses of action to apply information technologies to correct this deficiency. Key members of operational medicine teams are housed in locations that are not normally within shouting distance of the clinical space, resulting in the need to send personnel to act as runners to locate and alert key personnel. This gap in has resulted in numerous observation summaries and requests from medical personnel for an effective means of internal communications between team members in the Role 3 environment.

**TATRC Research Project(s):** Feasibility Study: Addressing Documented Gaps in Internal CSH Communication and Recall with a Garrison Optimized COTS Solutions



# Project: Addressing Documented Gaps in Internal CSH Communication and Recall



**Project Objective:** This effort would be a convergence of the existing infrastructure with two accredited COTS technologies: WiFi communications and a digital paging system in a fashion that could be overlaid onto the IT infrastructure of a CSH.

In the first phase of this project, the configuration would be assessed in a controlled environment.

In the second phase, the test system would migrate from a laboratory setting to a field hospital setting to conduct an end user assessment

**Technologies:** XIRRUS WiFi (Military accredited )  
Vocera Digital System / Hands Free Badges



# Concept: Mobile Health Care Environment (MHCE)



**Concept:** The MHCE provides a construct for mobile health care in the AMEDD and supports four specific areas of communication: (1) patient to provider mobile interactions, (2) patient to system mobile interactions, (3) provider to provider mobile interactions, and (4) provider to system mobile interactions.

- Priorities:**
- Addressing privacy, security (at rest and in transit) and auditing capabilities.
  - Providing bi-directional information exchange with mobile devices; BYOD model that is device and wireless service provider neutral.
  - Flexible interface design for customization without additional developmental costs.
  - Real time and store and forward dual functionality.
  - Seamless integration with EHRs, personal health records (PHRs), non-mobile secure messaging initiatives, clinical system dashboard interfaces and the automated comprehensive care plan (CCP).

- TATRC Research Project(s):**
- Assessing Feasibility and Acceptance of Integrating a Pain Module into the MHCE Platform
  - PCMH Diabetic Home Monitoring via MHCE



# Project: Assessing Feasibility and Acceptance of Integrating a Pain Module into the MHCE Platform



**QUESTIONNAIRE BUILDER**

Questionnaire name: DVPRS

Questionnaire flow: One Question Per Page

Icon: [ ]

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**Question1** What is your pain level today?

Color: [ ] Icon: [ ]

Text Value Format: [ ]

Question type: Single

Mark as Encrypted Data:

**Link Info** [ ]

BgColor: [ ] Icon Answered: [ ]

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**Answer1** 0 - No pain

Color: 000000 Icon: 0

Text Value Format: [ ]

If Checked then Answer is Open Text:

Mark as Encrypted Data:

**Link Info** Question2

BgColor: 2C8942 Icon Answered: [ ]

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**Answer2** 1 - Hardly notice pain

Color: 000000 Icon: 1

Text Value Format: [ ]

If Checked then Answer is Open Text:

Mark as Encrypted Data:

**Link Info** Question2

BgColor: 2F9044 Icon Answered: [ ]

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**Answer3** 2 - Notice pain, does not interfere with activities

Color: 000000 Icon: 2

Text Value Format: [ ]

If Checked then Answer is Open Text:

Mark as Encrypted Data:

**Link Info** Question2

BgColor: 7ABA42 Icon Answered: [ ]

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**Answer4** 3 - Sometimes distracts me

Color: 000000 Icon: 3

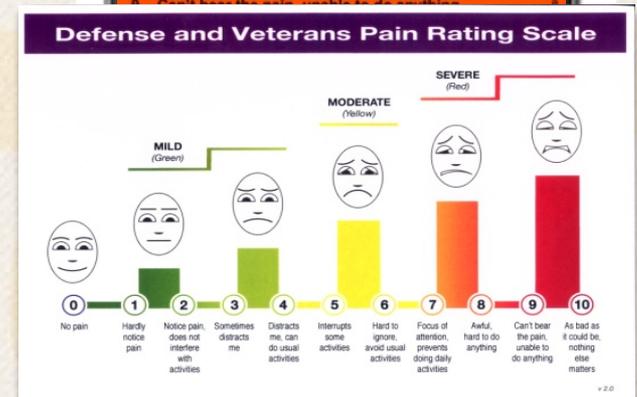
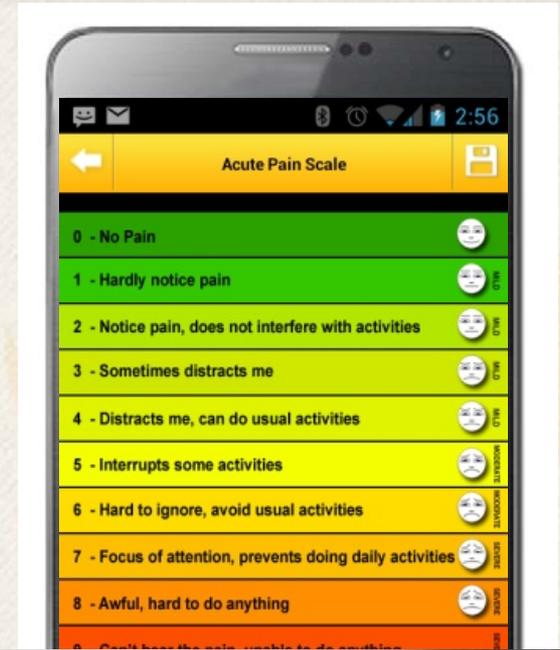
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If Checked then Answer is Open Text:

Mark as Encrypted Data:

**Link Info** Question2

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# Project: PCMH Diabetic mHealth Home Monitoring via MHCE





# Questions/Discussion



*“The enterprise that does not innovate ages and declines. And in a period of rapid change such as the present, the decline will be fast”*

*Peter Drucker*



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evaluations**

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