

Mixed-Reality Applications for Use in Clinical Decision Support

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Purpose: Describe our portfolio of mixed reality (MXR), clinical decision support (CDS) applications to assist with decision-making and patient care on the battlefield

- Background
- Capability Description
- Technical Approach
- Successes
- Challenges
- Applicability to Medical Roles of Care
- Impact to the Warfighter/Significance
- Developmental Status

Problem

- In remote environments, healthcare workers face limitations in resources and advanced medical expertise
- In these situations, clinical decision support (CDS) can fill knowledge and skill gaps, improving patient care and reducing cognitive burden for users

Requirements for CDS Technology

- Wireless, untethered
- Not dependent on network
- Hands-free
- Easy to use
- Easy to understand



Mixed reality (MXR)

- Wireless, untethered
- Not dependent on network
- Hands-free
- Easy to use
- Easy to understand

Possibly (Depending on headset)

Yes

Yes

Possibly (Dependent on software design)

Possibly (Software dependent)



Microsoft® HoloLens 2™

- Wireless, head mounted display
- Not dependent on network, software resides within the headset
- Voice or gesture controlled
- Lab and field testing would be performed to ensure usability and superior performance

Additionally

- Does not use passthrough vision, can see actual surroundings
 - Better patient interaction
 - Reduced risk of cyber sickness
- Planned development the Integrated Visual Augmentation System (IVAS) – now coined Soldier Borne Mission Command (SBMC)

Four applications were developed and tested:

- MXR-CDS Burn
- MXR-CDS Surgical
- MXR-CDS Triage
- Training application



MXR-CDS Burn

- Dashboard containing reference materials with key burn care concepts
 - Written information about caring for a burn patient
 - Pictures and descriptions of burn injuries
 - Best practices extracted for military clinical practice guidelines
 - Written in layman's terms
- Sub-applications
 - Burn size mapping
 - Pain medication dosage calculation
 - Management of burn fluid resuscitation



Technical Approach

Clinical Practice Guidelines

- Burn Care
- Anesthesia for Trauma Patients
- Burn Management in PFC
- Analgesia Sedation Management

TRAUMA PATIENT MANAGER

PRIMARY SURVEY: Complete within 3 minutes

Steps

1. Primary/Secondary Survey
2. Assess Burn Size
3. Fluid Resuscitation
4. Vital Sign Monitoring
5. Pain Sedation Management
6. Interventions

1. A - Airway

- Confirm C-spine is immobilized
- Confirm airway is protected

2. B - Breathing

- Confirm even rise and fall of chest
- Place O2 mask if available

3. C - Circulation

- Stop any active bleeding
- Check pulse

Buttons: Burn CPG Overview, Burn Size Calculator, Fluid Resuscitation, Medication Calculator, Burn Center Contact, References

Patient / IV Bag	Vial Concentration	IV Bag Concentration	IV Dose / IV Rate
Drug	Patient	Route	IV Bag
Morphine	kgs	IV	N/A
Fentanyl	lbs	IM	50 mL
Ketamine	85	IV Push	100 mL
Midazolam	Save Weight		250 mL
Hydromorphone			500 mL

Wound Category

Partial Full Uninjured

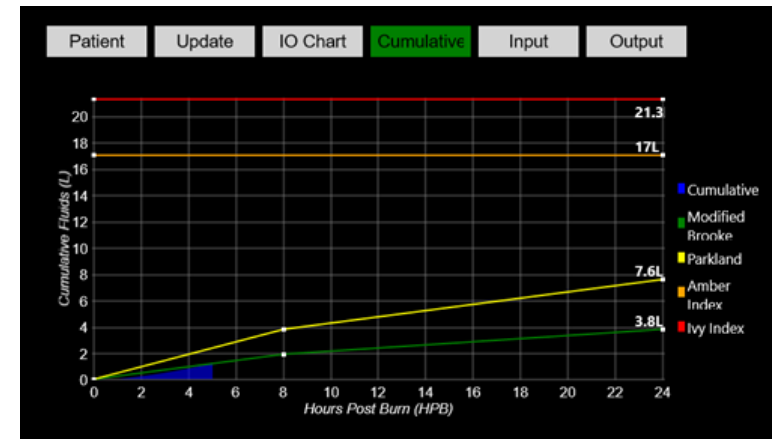
Brush Control

Circle Square

No Over

Burn Percent 43.5

Clear Save

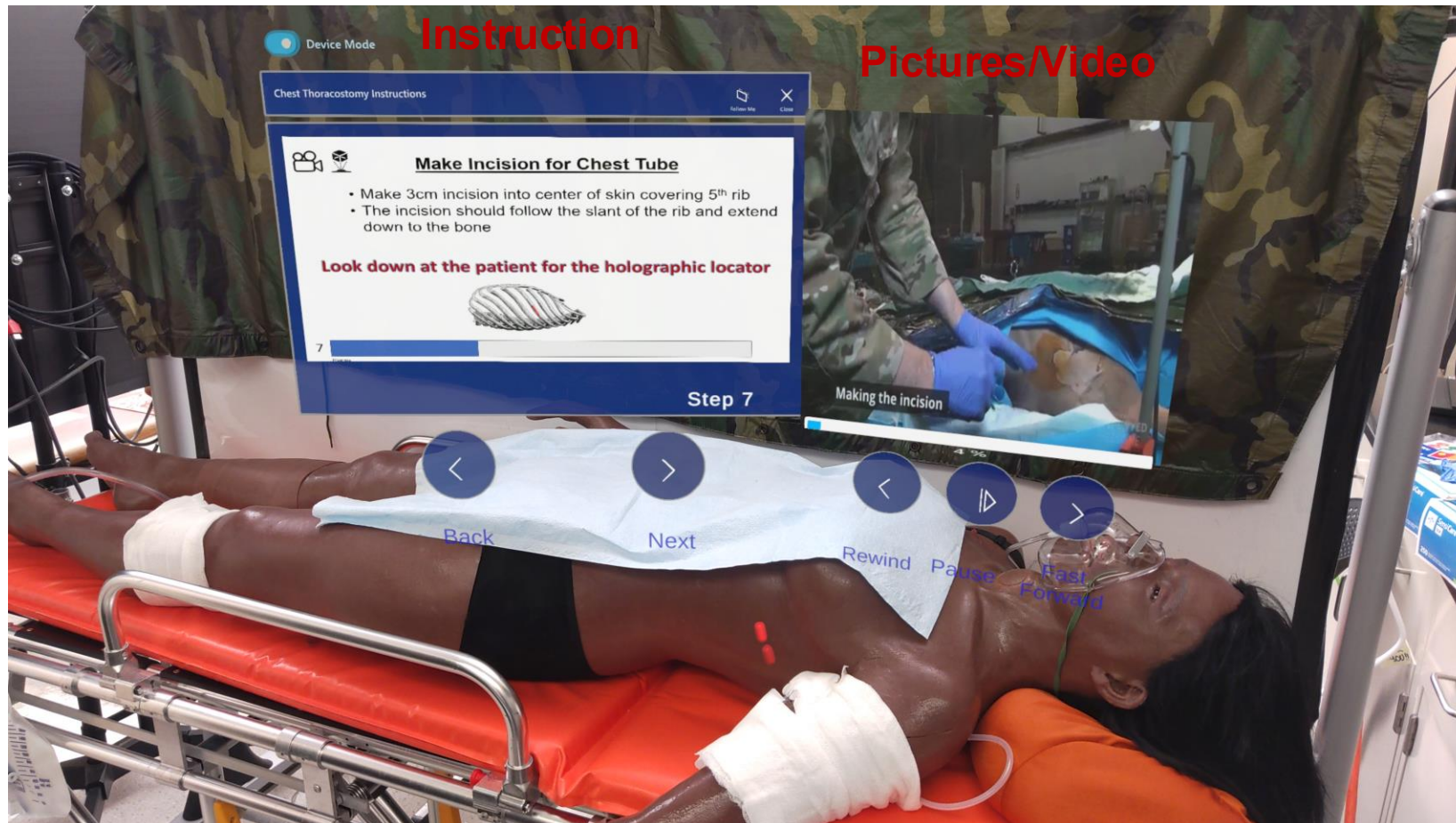


MXR-CDS Surgical

- Provides step-by-step instruction for performing lifesaving surgical intervention
 - Written instructions
 - Pictures
 - Videos
 - Holographic overlays onto patient or manikin
- Sub-applications
 - Burn Escharotomy
 - Cricothyrotomy
 - Chest Tube Insertion



Technical Approach



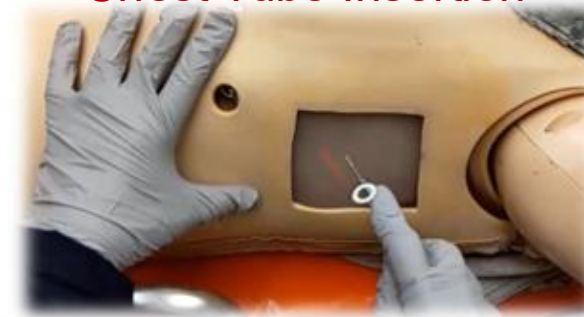
Burn Escharotomy



Cricothyrotomy



Chest Tube Insertion



MXR-CDS Triage

- Multi-patient triage management system – Command + Control
- Connects with an existing military documentation system of record (BATDOK) to stream real-time patient health data
- Features:
 - Visual patient status board
 - Semi-autonomous triage categorization with manual override capability
 - Static and trending vital sign visualization
 - Alerts to changes in patient condition, triage category, network disconnection
 - Patient location tracking
 - Resource requirements for injury type



Technical Approach





MXR-CDS Burn and Surgical Lab-based testing

- Exceeded minimal standard for usability
- Increased clinical accuracy
- Decreased cognitive burden

Training events

- 2025 Military Burn Trauma Course
- Burn Flight Team training
- Pre-deployment training

Field experimentations

- SOAR multi-lateral (MLAT) medicine training event, 2023
- MXR-CDS Burn and MXR-CDS Surgical were field tested at Project Convergence Capstone, 2025
- Burn and Surgical JRTC/ NTC 2027 (Feb-Mar, 2027)
- All 3 applications will be evaluated at Bold Quest 2026 (Aug – Sep 2026)
- MXR-CDS Triage to be evaluated at Arctic Edge (April, 2027)

MXR CDS Burn and MXR CDS Surgical: Officially aligned to S&T Pathfinder Capability Gaps



Hardware

- Need ruggedized, Military-supported heads-up display
 - Extended battery life
 - Optional network connection
 - No drift
 - Ability to see the wearer

Advanced Development

- Commercial partner
- Improved automation
 - Automated patient mapping
 - Pose recognition
 - Additional features/procedures
- Software polishing (UX / UI)

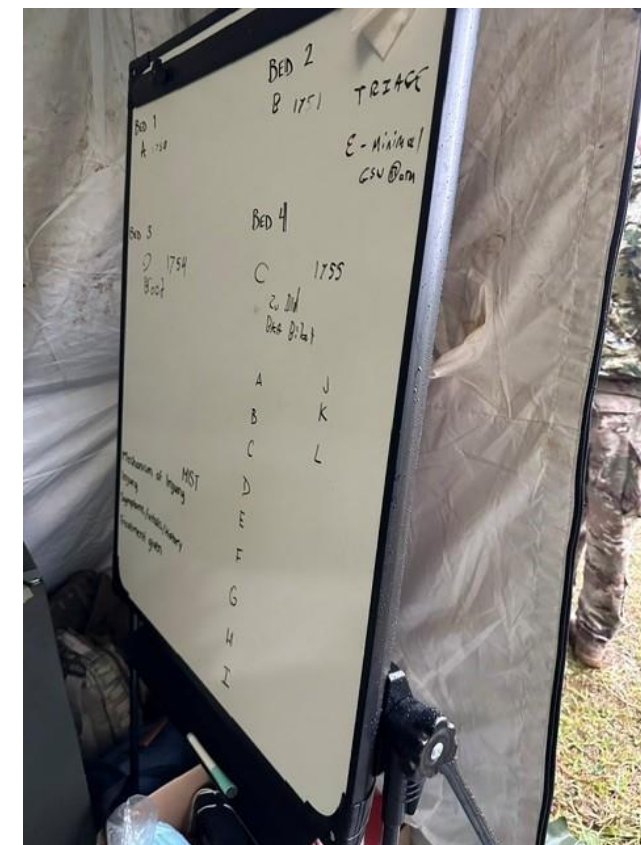
Can be installed on future tactical headsets for use in all roles of care

- Combat casualty collection points (Triage)
- LSCO Roles 1 and 2 (Surgical and Burn)
- Roles 3-4 (All apps for just-in-time training/sustainment)



Potential force multiplier for combat casualty care

- Improve situational awareness
- Improve procedural accuracy
- Decrease cognitive burden
- Increase the number of personnel who can assist in emergency intervention



Patient Management/Triage Board

Achievement

- A provisional patent has been filed for MXR-CDS Triage

Future Plans

- Additional experimentations
- More lifesaving interventions - Diversification
- Guidance for enroute care
- Integration of artificial intelligence (AI) for medical diagnosis

Technology Readiness Level

- MXR CDS Burn: TRL 6
- MXR CDS Surgical: TRL 6
- MXR CDS Triage: TRL 3

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