

## Damage Control Resuscitation

Research is focused on the major cause of death on the battlefield: hemorrhage. Accomplishments of this program include the fielding of safe and effective tourniquets and two generations of improved hemostatic dressings. This research area also focuses on studying and reducing the lethal triad of acidosis, hypothermia, and coagulopathy. Much future effort will be on identifying better means to treat noncompressible hemorrhage as well as investigating genetic, genomic, and immunological responses to trauma and hemorrhage.

## Extremity Trauma and Regenerative Medicine

Research is focused on defining the injuries being incurred and conducting preclinical studies to determine which therapies have the greatest potential for treatment of infection, soft tissue injury, and bone injury. In addition, the regenerative medicine program is investigating stem cell utilization as a therapy for these types of injuries. This group is also involved in a multi-center consortium for clinical trials and with the Armed Forces Institute of Regenerative Medicine (AFIRM).

## Ocular Trauma

Our research priorities are: (1) to understand and model the effects of the primary blast wave on ocular tissues; (2) develop more effective ocular bandage to use after facial burns; (3) reduce scarring of the ocular surface and maximize lid function; (4) understand the tear profile of the eye in severe ocular surface injury and disease; (5) utilize crosslinking technology to reduce scarring; (6) develop stem cell therapies for vision restoration; (7) understand non-ionizing directed energy bioeffects on the ocular system; and (8) develop and use current database technology to mitigate ocular injuries and improve treatment.

## Technology

**Burn Navigator** - mobile decision support platform to assist providers during acute burn resuscitation. (510k Approved)

**Compensatory Reserve Index (CRI)** - the CRI processes non-invasive blood pressure waveforms to assess patients at risk for hemodynamic decompensation before clinical vital signs change significantly.

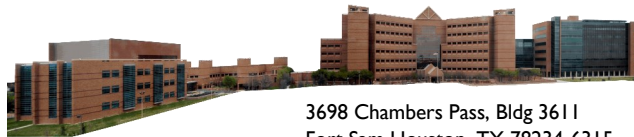
**Gastric Residual Monitor** - automated device for measuring gastric volumes during enteral feeding of ICU patients.

**iFAST (intelligent Focused Assessment with Sonography for Trauma)** - provides automated diagnosis of pneumothorax and/or hemothorax injuries.

**Impedance Threshold Device (ResQGUARD®)** - valve used in CPR to decrease intrathoracic pressure and improve venous return to the heart. (510k Approved)

**Intelligent Tourniquet** - sensor-based wireless tourniquet system for automated deployment with extremity trauma.

## Optimizing Combat Casualty Care



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# U.S. Army Institute of Surgical Research

## Optimizing Combat Casualty Care

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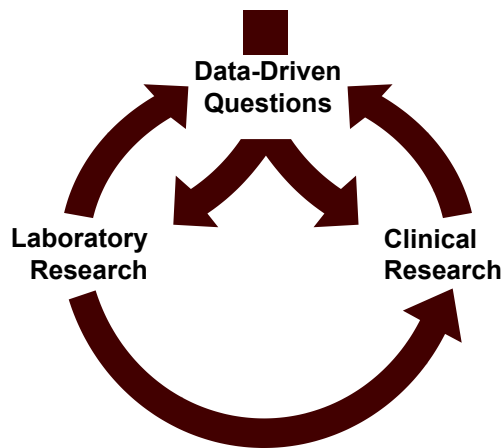


## USAISR

The USAISR is one of six research laboratories within the U.S. Army Medical Research and Materiel Command (USAMRMC). The institute is the U.S. Army's lead research laboratory for improving the care of combat casualties.

### Research Philosophy

Battlefield Medical Problems



### Joint Trauma System

JTS is an organized approach to providing improved trauma care across the continuum of the levels of care to trauma patients and provide for the right care to the right casualty at the right location and the right time. A component of the JTS is the Joint Theater Trauma Registry (JTTR). JTTR captures, maintains, and reports all battlefield injury demographics, care, and outcomes into a single database. JTTR implements a capability to collect the continuum of provided care with outcomes at follow-on medical facilities.

### DoD Burn Center/Clinical Trials

The clinical trials area has two primary objectives. The first objective is to observe current combat casualties to identify emergent challenges and opportunities for improved care. In particular, as the only DoD Burn Center, the USAISR is uniquely positioned to observe patterns of injury and implement programs in order to prevent and better treat burn patients. The second is to translate preclinical research from other task areas within the USAISR into a clinical environment for validation. Examples of translational effort include use of test wound care dressings in donor sites and assessment of damage control resuscitation strategies in the Burn Center operating room.

### Systems of Care for Complex Patients

This program focuses on best evidence-based combat casualty care nursing practice through research on practice variability and patient outcomes in all military echelons of care. A number of nursing care practices are unique to the military: (1) deployed military nurses have inconsistent nursing experience; (2) realities of combat casualty care result in complex patients with mass casualty scenarios; and (3) multiple patient handoffs occur during the movement of the patient from the point of injury through the military care continuum.

### Dental and Trauma Research

The Dental and Trauma Research Directorate (DTRD) is pursuing a full spectrum of research projects from basic science to translational and clinical research to better understand and develop real solutions to mitigate dental disease in service members and optimize treatment of maxillofacial battlefield injuries with the goal of returning them to full function. In fulfilling this mission, the task area focuses its efforts on four major areas of research: combat dentistry; maxillofacial battlefield injuries; bio-film impaired wound healing; and face burns and mitigation of scars.

### Coagulation and Blood Research

The Blood Research Group focuses on the use of blood and blood products in treating combat casualties. These include freeze-dried plasma and platelets, whole blood and red blood cells. Pathogen identification and inactivation in blood are also being studied. Eye injury research encompasses all areas regarding laser-induced injury and combat trauma to the eye.

### Pain Management

The Pain Control group has been investigating pain from battlefield to bedside. Focus is placed on determining the effect of battlefield pain and pain control on short- and long-term outcomes. The use of intranasal ketamine and the use of a virtual reality computer program "Snow World" as an adjunct to opiate-based drugs are two examples of research efforts in this area.

### Comprehensive Intensive Care Research

This group is focused on improving care on the battlefield through development and better use of technology. Technology in this sense means hardware and software systems that incorporate sensors and processors and includes new vital signs and automated critical care.

### Prehospital Monitoring

Research is focused on identifying and integrating physiological measures that reflect the complexity of compensatory responses during the early dynamic phases of hemorrhage. The goal is to apply this knowledge to direct the development of new technologies and devices that advance the medical monitoring capabilities of combat medical personnel for triage, diagnosis, and decision-making relative to combat casualty management.