



**THE POWER OF COLLABORATION
TO CHANGE MEDICINE**

CIMIT[®]

Center for Integration of Medicine
& Innovative Technology

PROGRAM OVERVIEW

CIMIT Programs represent a balanced portfolio of multidisciplinary and inter-institutional research projects in every phase of innovation – from idea to adoption into clinical practice. Directing these programs are clinical or technical champions, each a nationally-renowned specialist in an emerging area of medical innovation.

BIODETECTION & SEPSIS CONTROL

Improving capabilities in the detection and therapy of serious infections in individuals and the population.

BIOMATERIALS & TISSUE ENGINEERING

Helping solve organ shortages through the creation of “living replacement structures.”

CARDIOVASCULAR DISEASE

Reducing deaths and disability from heart disease and strokes through improved diagnosis.

CLINICAL SYSTEMS INNOVATION

Making patient care safer, more accessible, more efficient, and less costly across the entire continuum of care.

GLOBAL HEALTH INITIATIVE

Developing programs to help those in emerging nations help themselves.

IMAGE GUIDED THERAPY

Providing high resolution, 3D images of the operating field in real time for minimally invasive procedures.

INHALATION TECHNOLOGY

Using the respiratory tract for treatment of lung disease and as a “highway” to deliver therapy systemically.

MINIMALLY INVASIVE SURGERY

Making surgery safer and recovery faster and less painful for patients.

NEUROTECHNOLOGY

Finding more effective, minimally-invasive ways to prevent, detect and treat neurologic disorders.

NEW INITIATIVES

Nurturing high-risk, potential high-impact projects.

OPTICAL DIAGNOSTICS

Reducing pain, discomfort and deaths by developing minimally invasive tools and procedures effective at diagnosing diseases.

SIMULATION

Providing realistic training tools for clinicians to avoid practicing painful, risky procedures on people.

TRAUMA & CASUALTY CARE

Preventing deaths in the critical minutes following trauma

CIMIT funding was critical in allowing this project (radiofrequency ablation with a needle-tipped catheter in the heart) to move forward. It fostered several investigative careers and we are anticipating that BWH will be an initial site for human trials after the first feasibility phase is completed in Canada.

William Stevenson, MD

Director, Clinical Cardiac Electrophysiology Program
Brigham and Women's Hospital, Boston

This CIMIT-supported project to study the development of a laparoscopic-based NIFT detection system for the molecular characterization of intraperitoneal and ovarian cancer in women has not yet impacted patient care, but I suspect it will. This (CIMIT) support led to an additional \$2 million grant from the Doris Duke Foundation and a partnership with a commercial partner to build second generation scopes that look both in white light and NIR. The first in human trials will be in early 2010!

Michael Seiden, MD

President and CEO
Fox Chase Cancer Center, Philadelphia

CIMIT is a wonderful concept and made an enormous difference to my career and to the development of a state-of-the-art experimental cardiac electrophysiology lab at the MGH. I hope that CIMIT continues to flourish and expand to all major university hospital campuses.

David Keane, MD

Director, Cardiac Arrhythmia Service
St. Vincent's University Hospital, Dublin, Ireland

IMPROVING PATIENT CARE

CIMIT concentrates on early-stage, high-risk ideas in the first phase of innovation. Many projects got their start because of early funding from CIMIT. Some are already in patient care, many are in clinical trials and dozens more are showing promise while still “in the pipeline.”

Devices & Procedures in Care or In Trials

TRANSFORMATIONAL CHANGE	TRAUMA & EMERGENCY CARE
<ul style="list-style-type: none"> » Allergy documentation and alert in operating room <i>30% error rate reduced to 10% within a few days of implementing system</i> » Reorganizing patient care and workflow in a minimally invasive surgery operating room at MGH <i>Non-operative time compared to standard OR is 40% less</i> » E-visits in primary care practice <i>100+ patients enrolled</i> » Hand washing and compliance training <i>Entering clinical trials 2009</i> 	<ul style="list-style-type: none"> » Real-time incident preparedness simulator (RIPS) <i>Communities and first responders can simulate disaster scenarios</i> » Telestroke <i>Real-time diagnosis can minimize disability</i>
<h3>TREATMENT</h3>	<h3>DIAGNOSTICS</h3> <ul style="list-style-type: none"> » Video rate oct for early diagnosis of glaucoma and macular degeneration <i>Licensed for development and commercialization; in clinical trials</i> » Oct for vulnerable plaque <i>Allows minimally invasive detection pre-event; 93 patients in clinical trials</i> » Sentinel lymph node mapping of breast cancer using invisible nir fluorescent light <i>Entering clinical trials 2008</i> » Sentinel lymph node mapping of lung cancer <i>Entering clinical trials 2008</i> » Seizure prediction and vagus nerve stimulation <i>Enables early detection of seizure onset; 6 patients in clinical trials</i> » Fine needle aspiration and genomics for early detection of lung cancer <i>62 patients in clinical trials</i> » Real-time emergency room breath analysis for infectious disease <i>Early detection improves outcomes; 20 patients enrolled in clinical trials</i>
<ul style="list-style-type: none"> » MR-guided brachytherapy of prostate cancer <i>Fewer complications; quicker return to work</i> » Uterine fibroid surgery with focused ultrasound <i>Shorter hospital stays</i> » Laparoscopic nephrectomy <i>Home in 2 days</i> » Therapy staging for ovarian cancer using near infrared spectroscopy <i>Detects sub-mm tumors as small as 8-10 cells</i> 	<h3>COMMERCIAL COLLABORATIONS</h3>
<h3>RESTORATION, REHABILITATION & MONITORING CHRONIC ILLNESS</h3> <ul style="list-style-type: none"> » Portable gait evaluator and biofeedback intervention tool <i>Decreases falls; 28 patients enrolled in clinical trials</i> » Photochemical tissue bonding: nanosuture approach to skin & vascular repair <i>Entering clinical trials 2008</i> » Remotely monitored inhaler to predict and prevent asthma attacks <i>Allows time-sensitive intervention; 400 patients enrolled in clinical trials</i> 	<ul style="list-style-type: none"> » Radianse <i>RFID systems, now used in 60+ hospitals</i> » Livedata <i>Operating room dashboard now used in 8 hospitals</i> » Omniguide <i>Laser system for tumor ablation</i>

Devices & Procedures in the Pipeline

MANAGING CHRONIC ILLNESS & HOMECARE	THERAPY
<ul style="list-style-type: none"> » Indwelling intrapericardial catheter for long-term access and therapy » Controlled release technology to prevent tracheal stenosis 	<ul style="list-style-type: none"> » Real time MRI-guided cardiac ablation to treat arrhythmias » Cardio-port for minimally invasive, intracardiac beating heart surgery » Endoscopic fiber optic device and biodegradable scaffolds for minimally invasive closure of tracheo-oesophageal fistulas » Fetal positioning device for use during ultrasound-guided, percutaneous <i>in utero</i> cardiac intervention » Transcatheter mitral valve repair with adjustable artificial chordae
TRAUMA & EMERGENCY CARE	RESTORATION, REHABILITATION & MONITORING CHRONIC ILLNESS
<ul style="list-style-type: none"> » A portable abdominal insufflator (for use by first responder) to treat trauma-induced abdominal bleeding in the field » Wearable real-time blood pressure sensor that can recognize reduced cardiac output before blood pressure begins to fall » A portable device to treat hypothermia in the field using warm inhaled mist » A “smart” wearable emergency triage monitor 	<ul style="list-style-type: none"> » Tissue-engineered tooth and jaw replacement » Non-surgical repair of meniscus or ACL » Wearable wireless sensor network to monitor motor recovery in post-stroke patients » Percutaneous, image-guided cochlear implantation » Tissue-engineered pulmonary valves
DIAGNOSTICS	TRANSFORMATIONAL CHANGE
<ul style="list-style-type: none"> » Optically-guided laser therapy for esophageal cancer » A handheld electrical impedance probe for the assessment of neuromuscular disease » Three dimensional ultrasound imaging of testicular perfusion » Improved biopsy for pancreatic cancer » Optical frequency domain interferometry to determine cerebral aneurysm rupture risk 	<ul style="list-style-type: none"> » Surgery without incisions: Natural Orifice Translumenal Endoscopic Surgery (NOTES)

Metrics

460 Projects Funded

500+ Peer-reviewed Publications

200+ Invention Disclosures

200+ Patent Applications Generated

30+ Patents Issued

10+ Licenses

15+ Companies Formed or Redirected into Healthcare

10,000+ Patients Benefiting from CIMIT-supported Devices and Procedures

MILITARY MEDICINE

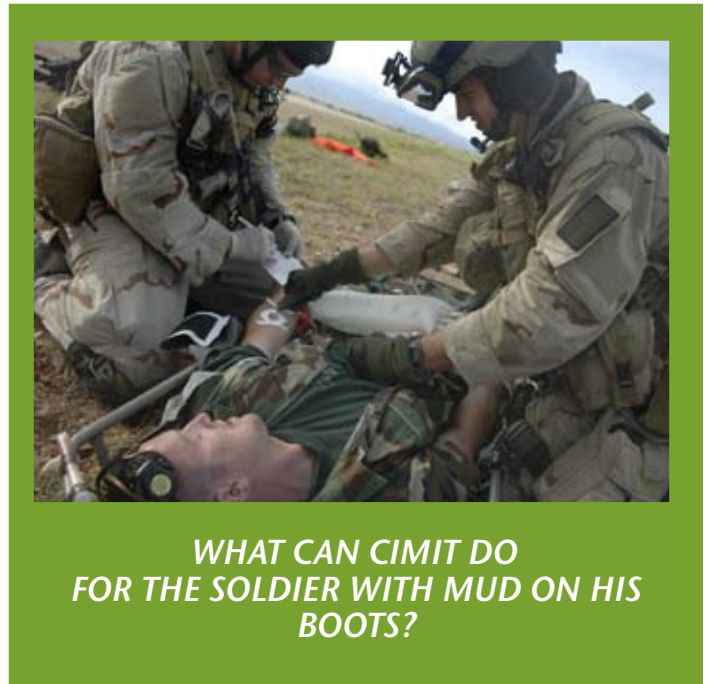
By funding early-stage, high-risk ideas for patient care, CIMIT encourages its project teams to seek solutions that benefit soldiers, civilians and populations in austere environments. During 2008, CIMIT supported 45 soldier care projects, including prevention, diagnosis, treatment, rehabilitation, monitoring of poly-trauma and hemorrhage control.

TEAM IS RESEARCHING BEST SOLUTIONS FOR SOLDIERS ADJUSTING TO RAPID ASCENTS

A team of MGH doctors, led by Aaron Baggish, MD; Peter Fagenholz, MD; and N. Stuart Harris, MD, is determining how soldiers adapt to changes in altitude and which acclimatization routines enable the soldier to adjust most effectively. The team is exploring the impact of moderate altitude staging on pulmonary artery pressure as a means to prepare troops for rapid ascent. One goal is to optimize preparedness for troop operations at high altitudes, such as those found in Afghanistan.

ADVANCING RESEARCH ON ASTHMA

Fully 1,000 military recruits are discharged each year due to asthma. Thousands more are hampered during battlefield operations. Leading doctors and researchers including Bruce Levy, MD, of Brigham and Women's Hospital; Michael Singer, MD, of the Boston VA Hospital; and John Guttag, PhD, of MIT, are developing a remotely monitored inhaler to predict and prevent asthma attacks. The team is engaged in studies with asthma patients and in developing a prototype monitoring system.



**WHAT CAN CIMIT DO
FOR THE SOLDIER WITH MUD ON HIS
BOOTS?**

Devices & Systems to Care for Injured Soldiers

High technology devices and systems are enabling new approaches to characterize and manage acute care, rehabilitation, trauma and disease.

DEVICES FOR SCREENING & DIAGNOSTICS

- » Improved tools for triage
- » Imaging techniques for base-lining and classifying traumatic brain injury (TBI) and post traumatic stress disorder (PTSD)
- » Devices for detection and characterization of infection
- » Serum screens for TB, HIV, and other infectious diseases
- » Tools for early detection of hemorrhage
- » Ways to identify post-acute patients at risk of heart attack and stroke
- » Systems and monitoring devices to help manage large numbers of casualties

TRAINING AND IMPROVED CARE SYSTEMS

- » Realistic trauma simulators for medic and first responder training
- » Systems for improved care safety (hand washing compliance)

THERAPY

- » Treating at point-of-injury for abdominal hemorrhage
- » Improving intravenous access for drug and fluid delivery
- » Designing new systems to characterize and mitigate traumatic pain
- » Predicting seizure onset in traumatized patients to initiate therapy
- » Localizing therapy in the brain non-invasively with focused ultrasound
- » Exploring ways to mitigate TBI: laser therapy, transcranial magnetics
- » Improving vaccines
- » Moderating inflammatory response to traumatic injury (cooling and pharmacologic therapies)
- » Using nerve function sensors to stage therapy

OUR MISSION

In the domain of devices, procedures and clinical systems innovation, CIMIT's mission is to **improve health care** by seeking, selecting and supporting teams of clinicians and technologists.

We serve the patient of the future by facilitating the efforts of clinically-based investigators.

CONSORTIUM INSTITUTIONS

- » Beth Israel Deaconess Medical Center
- » Boston Medical Center
- » Boston University
- » Brigham and Women's Hospital*
- » The Charles Stark Draper Laboratory*
- » Children's Hospital Boston
- » Harvard Medical School
- » Massachusetts General Hospital*
- » Massachusetts Institute of Technology*
- » Newton-Wellesley Hospital
- » Partners Healthcare
- » VA Boston Healthcare System

*Founding Members

INTERNATIONAL AFFILIATES

- » University of Manchester, UK

CIMIT[®]

Center for Integration of Medicine
& Innovative Technology

www.cimit.org