Support Funding for the Military Burn Research Program in FY19

Burns are one of the most painful and devastating battlefield injuries:

- 95 percent of those with burn injuries generally survive but must often cope with incapacitating scarring and other severe limitations in function and movement.
- For the non-survivors, approximately 86 percent of all battlefield deaths occur within the first 30 minutes after wounding, emphasizing the importance of rapidly diagnosing and rendering appropriate initial burn resuscitation and treatment.
- According to the Department of Defense, over 1,100 service men and women suffered significant burn injuries during the wars in Iraq and Afghanistan.

**DoD’s Military Burn Research Program**

The Military Burn Research Program (MBRP) was initiated in 2011 to address capability gaps for treating combat burn injuries. These gaps were identified by the Department of Defense’s Combat Casualty Care Research Program. MBRP-funded projects explore innovative approaches to accelerate the translation of advances in knowledge into new standards of care for the treatment of injured Service members and those within the public at large who sustain burn injuries. The funded research is expected to have a beneficial impact on both the civilian and military communities.

**Funding Levels within DoD Appropriations for the Military Burn Research Program**

This funding also helped create the ABA administrative and clinical science network which conducts rigorous multicenter clinical trials on burns and continues to support competitive, peer reviewed research at burn centers across the nation. To date, the ABA has been directly awarded $21.8 million to support 11 research studies at 43 burn centers.

**FY19 Request: Unmet Needs**

While important advances in military burn treatment have been made, there are still many unmet research needs that, if addressed, will greatly benefit our wounded warriors. Additional high priority research topics include optimizing burn wound outcomes, cell-based therapies to replace muscle and nerve loss/function, prolonged field care and evacuation, and decision support technology to empower medics to deliver lifesaving interventions.

Therefore, the ABA urges inclusion of $10 million in FY 2019 Appropriations for the Military Burn Research Program to address these and other high priority burn research areas. Such investment in key military specific research areas will help reduce the mortality and morbidity resulting from injuries on the battlefield, and help promote the best possible care for all burn-injured Americans.
Evaluation of the Effectiveness of the Burn Navigator in Improving Resuscitation Outcomes

PERIOD OF PERFORMANCE: Sept 2016 - Sept 2018
TOTAL BUDGET: $1,985,800
PRINCIPAL INVESTIGATOR: Jose Salinas, PhD, US Army Institute of Surgical Research (USAISR)

People that suffer a severe burn injury often require intravenous fluid replacement for stabilization. Fluid loss begins immediately following a burn injury, and can continue for up to three days, but the first 24-48 hours following a burn injury are a critical period for fluid replacement. However, complications can arise from administering an insufficient or excessive amount of fluid. Therefore, determining the appropriate rate of fluid replacement is critical and complex. Fluid rate calculations can be assisted by the Burn Navigator, a tablet-sized device that uses advanced algorithms to analyze multiple streams of data and determine the recommended fluid administration rate. Initial testing of predecessors to the Burn Navigator showed that patient outcomes were improved using decision support tools for fluid rate calculation. Notably, computer-assisted fluid replacement resulted in a reduction in the number of days spent in the intensive care unit, and a decrease in patient mortality.

Acute Burn Resuscitation Prospective Multicenter Observational Trial (ABRUPT)

PERIOD OF PERFORMANCE: Sept 2016-Sept 2020
TOTAL BUDGET: $1,922,172
PRINCIPAL INVESTIGATOR: David Greenhalgh, MD, UC Davis/Shriners Hospital

After a burn to more than 20% of the body, there is a massive amount of fluid that leaks out of the blood vessels, causing the patient to go into shock. This leaking fluid also causes swelling (edema), and for a patient with extensive burns the amount of leaking fluid can be massive. Left untreated, anyone who has a burn to greater than 25% of the total body surface area has a high likelihood of dying due to this loss of fluid from the blood vessels. To treat such a major amount of fluid loss, physicians provide intravenous fluids in large amounts. There has been a debate as to whether the use of salt-containing fluids are adequate for fluid replacement or whether a fluid that contains albumin (a natural protein produced by the liver and normally found in the body) is better. Albumin solutions are thought to help reduce the amount of fluid leakage and swelling after a burn whereas salt-containing fluids may be more likely to leak out and create more swelling. This study is to test whether using albumin or a salt solution is better for the treatment of burn patients.
Optimizing Outcomes for Soldiers with Burn Injury: Protective Effects of Propranolol in Adults Following Burn Injury—A Safety and Efficacy Trial

PERIOD OF PERFORMANCE: Sept 2011-Sept 2018
TOTAL BUDGET: $3,932,999
PRINCIPAL INVESTIGATOR: David Herndon, MD, UTMB/Shriner's

Propranolol administration in severely burned children has been shown to reverse muscle catabolism, lipolysis, functional outcome and mortality. However, while propranolol has already been found to significantly and safely abrogate the hypermetabolic effects of burn injury in children, reports of significant cardiac complications and increased mortality in patients treated with other beta-blockers in clinical trials such as POISE raise critical questions as to the overall safety of propranolol in adults at doses needed to provide meaningful clinical benefit. This is a prospective multicenter randomized efficacy and safety trial, examining the physiologic effects and safety of propranolol administered to adult patients with severe burn injury to identify which adult subpopulations may be most likely to benefit from propranolol treatment and to identify propranolol dose levels that are not only safe but potentially effective.

Combat Casualty Care

Multicenter Trial in Burn to Improve Combat Casualties

PERIOD OF PERFORMANCE: Sept 2009-Oct 2019
TOTAL BUDGET: $7,953,145
PRINCIPAL INVESTIGATOR: Steven E. Wolf, MD, UT Southwestern

In military conflicts, severe burn is a common injury comprising 5-10% of evacuated combat casualties; these injuries are commonly associated with explosions. In addition, over 1.2 million people are burned in the United States every year of which 50,000 are moderate to severe and require hospitalization for appropriate treatment. Of these, 2,500 (5%) die from complications related to the burn. Combat casualties with burns are typically in the moderate to severe category with similar rates of morbidity and mortality to their civilian counterparts. From a historical perspective, morbidity and mortality from burns are decreasing in incidence due to improvements in care driven by clinical research. Proposals were sought addressing the role of continuous renal replacement therapy in sepsis during recovery from injury, better methods to determine infection in the severely burned, metabolic manipulations to improve function during and after recovery from injury and accurate diagnosis of inhalation injury. The following five studies were chosen to be part of this multicenter trial:

1. The ABA RESCUE Trial: The ABA Randomized controlled Evaluation of high-volume hemofiltration in adult burn patients with Septic shock and mild acute kidney injury
2. Rapid, quantitative, PCR-based detection of Staphylococcus aureus in burn sepsis patients
3. Effects of a community based exercise program in adults with severe burns
4. Effects of enteral glutamine supplementation on mortality and infectious morbidity in severely burned patients
5. Development of an inhalation injury scoring system to predict severity of inhalation injury
This study was just completed. The findings of this study will have direct impact on the conduct of burn and trauma care in the United States. The predictors of mortality, length of stay, and outcomes will be applicable to the civilian sector as well as the military, since approximately 5% of civilians will sustain combined burn/trauma injury and will guide clinicians in decision-making as well as in treatment. The validation of the NBR (National Burn Registry) and NTDB (National Trauma Data Bank) databases and the development of a statistical modeling package will provide burn and trauma researchers with baseline data on predicted mortality rates that can be used to develop multicenter prospective randomized trials in burn treatment.
MBRP Accomplishments

- **Burn Resuscitation Decision Support System** – enabled providers to accurately resuscitate burn patients from the point of injury to definitive care using an algorithm that automatically generates patient-specific fluid rate recommendations for resuscitation.

- **Disaster Triage Protocol** – developed a triage protocol based on outcomes from the national data set that guide our forces in triage during mass casualty incidents. This triage diagram has been incorporated into regional, state and national disaster planning algorithms and was recently employed in the Taiwan mass burn casualty incident.

- **Predictive Modeling** – developed innovative models to predict resource utilization, mortality, and hospital length of stay, including survival in soldiers with combined burn/trauma injury. These are all key drivers in military readiness.

- **Combined Burn/Traumatic Brain Injury** – developing more effective treatment models to address injuries from IAD and explosives, and reconciling competing treatment priorities in such a way as to minimize or eliminate any adverse consequences.

- **Blood Transfusion Utilization** – successfully identified the most effective use of blood transfusion after burn injury, which will cut the mean transfusion volume in half, saving millions of dollars and decreasing utilization of a valuable resource, blood.

- **Smoke Inhalation** – developing earlier and more accurate diagnosis of smoke inhalation injuries.

- **Accelerated Diagnosis of Infection** – utilizing modern technology (polymerase chain reaction) to accelerate diagnosis of infection from the traditional 3-5 days to less than 12 hours. Early identification and treatment of infection decreases morbidity and mortality.

- **Dietary Regimens** – determining whether glutamine can improve outcomes.

- **Sepsis** – determining the effect of hemofiltration or renal replacement therapy on sepsis outcomes.

- **Cardiac Complications** – studying the effect of drugs to decrease cardiac work (propranolol).

- **Physical and Psychological Outcomes** – identifying factors most likely to improve physical and psychological outcomes in the severely burned.

- **Hypertrophic Scar Prevention** – invested in several research projects focused on developing novel treatment options for preventing scar contractures, including investigation of novel methodologies for remodeling hypertrophic burn scars using stem cells combined with laser therapy.
• **Burn Care Standardization Checklist** – developed of a new checklist model to improve burn patient care. Preliminary reviews of medical practices show clear differences in how different types of clinicians review patient information and subsequently prioritize treatment. Thus, a new paradigm that relies heavily upon this checklist model, called the phases of illness paradigm, is slated to provide a benefit to targeted therapies.

• **Rehabilitation Phase Physiology** – investigating the effects of a quantifiable exercise program in patients with acute burn injuries with the goals of decreasing both intensive care unit and hospitalization stays and improving overall physical performance. Treatments targeted towards returning burn survivors to duty have been evaluated, including the effects of different treatments on return to work and outcomes. The importance of physical and occupational therapy on strength function, and outcomes have been delineated and the efficacy of exercise programs in outcomes evaluated. The improvement in functional outcomes afforded by these initiatives will increase readiness by providing evidence-based methods that will return soldiers to active duty in a timelier fashion.

• **Accelerated Wound Healing** – conducting a randomized controlled pilot study of hyperbaric oxygen therapy as a possible treatment for deep partial thickness burns.
Future MBRP Projects Needed to Improve Readiness

Despite the great research progress achieved over the past several years, there remains much work to be done to improve military burn care. The ABA has identified several key areas that could improve current readiness:

- Inhalation injury remains a key driver of morbidity and mortality and much more work needs to be done in this area, including optimizing diagnosis of inhalation injury and determining the appropriate timing and methodology of tracheostomy.
- Infection remains a constant priority in burns. Current forward military combat environments, which are removed from definitive medical care, are at particular risk, as sterility is often not possible. Portable methods for rapid diagnosis and treatment of infection are needed.
- Analysis of the metabolic changes after burn injury to identify optimal nutritional support for continuing recovery and return to duty.
- Optimizing wound healing, which is a major component of all traumatic injuries but of burns, in particular, is essential. Development of innovative treatments in initial wound care and subsequent scar management would enable more rapid healing and return to the workforce.
- Optimizing physical function after burn injury, beginning at injury onset and continuing through the rehabilitative phase, is needed to return the soldier to duty.
- Pain is ubiquitous in burn injury. Optimizing pain management decreases the incidence of post-traumatic stress disorder and allows earlier return to duty as well as improvements in quality of life.

An ABA-Specific Proposal – Advanced Burn Life Support Training for the Battlefield

In addition to these research topics, the ABA is uniquely positioned to implement an initiative that would improve military readiness in the future. For many years, the ABA has offered courses in Advanced Burn Life Support (“ABLS”) that provides knowledge for immediate care of burn patients up to the first 24-hours post injury. The ABA’s ABLS programs support emergency preparedness, mass casualty incidents focusing on triage, burn survivability, prioritizing patient transport and patient treatment.

As currently structured, the ABLS course is not mobile and does not address prolonged field care. Funding for development of a mobile educational platform that can inform both prior to and during deployment would improve readiness for burn injury. Moreover, given the remote nature of deployments, the impact of prolonged transport time on injury outcomes is needed. Finally, refinements in resuscitative efforts to are needed to minimize load while optimizing outcomes for both burn and burn/trauma injuries.