

TABLE 4-6 Examples of High-Priority Trauma Research Needs

Topic Area	Research Priorities
Prevention and epidemiology	<ul style="list-style-type: none"> • Develop data-driven strategies for mitigating morbidity and mortality due to potentially preventable injury. • Determine the epidemiology of preventable deaths after injury in the United States (adults and children).
Resuscitation	<ul style="list-style-type: none"> • Develop and clinically evaluate the efficacy and safety of dried or frozen blood products. • Evaluate the efficacy and safety of new devices and drugs for controlling life-threatening extremity, junctional, and truncal hemorrhage. • Determine whether measuring prehospital shock and coagulopathy would improve outcomes in the prehospital environment. • Develop safe and effective oxygen carriers. • Determine whether whole blood resuscitation is clinically superior to component therapy. • Determine the safety of low-titer Group O whole blood as a universal donor. • Determine the clinical and cost-effectiveness of pathogen reduction technology for blood products. • Develop methodology, training, and equipment to improve the ability of far-forward medical personnel to transfuse whole blood and blood products. • Determine how various endpoints of resuscitation affect clinical outcomes in patients with traumatic brain injury, hemorrhagic shock, or both. • Develop fail-safe methods for ensuring establishment of a casualty's airway. • Determine the efficacy and safety of permissive hypotensive strategies with blood product resuscitation and for prolonged prehospital transport times.
Prehospital care	<ul style="list-style-type: none"> • Develop predictive prehospital algorithms for early identification of prehospital and hospital life-saving interventions. • Fund the addition of prehospital and hospital blood product data to existing trauma registries. • Develop methods for and implement accurate automated meshing of prehospital trauma care, hospital, autopsy, fire, police, and rehabilitation data registries.
Burn care	<ul style="list-style-type: none"> • Develop novel methods for rapid skin replacement, minimizing scar formation.
Pain management	<ul style="list-style-type: none"> • Develop and test battlefield/prehospital analgesia techniques. • Develop strategies for optimizing perioperative pain management.

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TABLE 4-6 Continued

Topic Area	Research Priorities
Traumatic Brain Injury	<ul style="list-style-type: none"> • Develop new and innovative approaches for the classification of traumatic brain injury and its severity. • Determine the optimal methods of airway management and ventilation strategies for patients with acute traumatic brain injury. • Develop individualized strategies for treating the various manifestations of moderate and severe blunt and penetrating traumatic brain injury. • Develop therapeutics to improve outcomes of mild, moderate, and severe traumatic brain injury. • Develop animal and computer models for traumatic brain injury, especially those brain injuries resulting from blast injuries. • Identify biomarkers to identify mild traumatic brain injury and assays to discriminate between mild traumatic brain injury and posttraumatic stress disorder. • Evaluate effective traumatic brain injury treatments in the context of comorbidities (pain, amputation, hearing loss, and behavioral health disorders). • Determine the effectiveness of complementary and alternative medicines as part of an integrative health approach model for traumatic brain injury.
Spine	<ul style="list-style-type: none"> • Determine the optimal methods of spinal immobilization on the battlefield. • Determine whether stem-cell therapy results in improved outcomes after spinal cord injury and whether this is dependent on the injury type. • Determine whether early mobilization after surgical spinal column stabilization improves patient outcomes following spinal cord injury.
Critical care	<ul style="list-style-type: none"> • Develop and evaluate methods for rapidly diagnosing and treating patients with sepsis. • Develop, test, and optimize training in methods for transporting patients with pulmonary failure from the prehospital setting to definitive care.
Nursing	<ul style="list-style-type: none"> • Evaluate the staffing mix, nursing education, and certification models that yield best outcomes of trauma care. • Study interventions in the acute care setting that can be deployed by front-line providers to help mitigate the onset of depressive symptoms and posttraumatic stress.

TABLE 4-6 Continued

Topic Area	Research Priorities
Orthopedics	<ul style="list-style-type: none"> • Develop best practices for controlling junctional and pelvic fracture bleeding. • Develop methods for quantifying total tissue injury volume and the activation and recovery of inflammatory response. • Develop improved strategies for diagnosing, preventing, and treating deep-wound infections associated with extremity trauma. • Develop more effective strategies for the diagnosis and treatment of compartment syndrome. • Investigate improved strategies for reconstruction of major bone defects, nerve repair, and quantification of cartilage damage and later arthritis. • Develop new strategies for preventing contracture, heterotopic bone formation, and posttraumatic arthritis. • Develop a better understanding of the long-term physical health effects of major limb trauma, including the impact on obesity, cardiovascular disease, posttraumatic arthritis, and osteoporosis. • Develop evidence to support the dose, timing, frequency, duration, and intensity of physical therapy following major limb trauma. • As new regenerative medicine therapies are developed for treating major limb injuries, identify rehabilitation strategies for optimizing recovery following these therapies. • Develop strategies for optimizing the function, durability, and use of prosthetic and orthotic devices.
Rehabilitation	<ul style="list-style-type: none"> • Develop and evaluate data-driven recommendations and guidelines on strategies for optimizing return to preinjury functional levels after injury. • Evaluate cognitive-behavioral rehabilitation strategies for decreasing pain and fear of movement and increasing self-efficacy in patients following surgery for their injuries.
Systems research	<ul style="list-style-type: none"> • Determine the optimal number of trauma centers per population unit. • Determine optimal methods for transitioning proven clinical modalities into routine clinical practice.

SOURCES: The development of this list was informed by preexisting research priority lists, including but not limited to Butler et al., 2015; CDC, NIH, DoD, and VA Leadership Panel, 2013; Helmick et al., 2012; Kotwal et al., 2013a; NCIPC, 2005; NHTSA, 2001; Sauer et al., 2014; Sayre et al., 2005; van Middendorp et al., 2016.