Moderators' Summary: Outcomes Data Driving Technological Advances (Session I)

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Major limb trauma sustained in combat results in significant long-term disability.[1] Opportunity exists to integrate the experience accumulated by hundreds of military orthopaedic surgeons during a decade of conflict in Iraq and Afghanistan with the scientific knowledge held by industry in order to reduce the burden of the often devastating spinal and extremity injuries sustained by the warfighter. Collaboration between healthcare providers who manage explosive high-energy injuries and agencies such as the Defense Advanced Research Projects Agency could prove to be beneficial in protecting persons who are exposed to such injuries.

The body armor currently worn by soldiers, sailors, marines, and airmen in the Middle East and Southwest Asia has saved innumerable lives. This armor consists of a helmet as well as chest and back protectors. However, the extremities remain vulnerable to blast injury, resulting in a disproportionate number of leg and arm injuries and amputations sustained during Operation Iraqi Freedom and Operation Enduring Freedom.[2,3] There is a recognized need for improved groin and perineal protection, as well.

An operational personnel protective system must provide adequate protection while allowing sufficient mobility. This balance between weight (ie, load) and maneuverability in challenging mountainous terrain, confined urban spaces, and blisteringly hot temperatures must be considered and analyzed if an effective exoskeleton personnel protective system is to be fielded. Some munitions are so massive as to produce injuries that are not survivable. Therefore, the financial cost of developing and deploying personnel protective systems must be weighed against the progressively less measurable benefit returned by wearing them.

Potential solutions to the problem of level of protection versus mobility include the development of modular components that can be added or removed depending on the climate, terrain, threat, and mission. The capability to transition rapidly between levels of protection could reduce the warrior's load while increasing survivability in the face of multiple ballistic hazards. With modular components, commanders could modify the exoskeleton body armor based on multiple variables. However, the development and fielding of an effective exoskeleton body armor system is difficult and remains elusive. Anthropometric modeling, that is, the use of blast-test dummies, may prove to be useful in determining current deficiencies.

The US Department of Defense (DoD) recognizes the need to improve management of extremity injuries and to continue to work toward injury prevention. As a result, the DoD Office of Health Affairs has established the Defense Medical Research and Development Program as a core recurring program in the DoD annual budget. Six Joint Program Committees were established to pri-

oritize and manage medical research, including a Combat Casualty Care committee.[4] Fiscal year 2010 research awards were made in the areas of coagulopathy and blood products, diagnosis and treatment of brain injury, prehospital care, advanced monitoring, en-route care, combat dentistry, extremity trauma, burns, forward surgical care, and photomedicine.[5-7] The DoD has specifically targeted surgical/intensive critical care and extremity trauma/wound care as principal areas for increased funding in the future.

References

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