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Hemorrhage Control Research on Today's Battlefield: Lessons Applied

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The goal of the US military's Combat Casualty Care Research Program (CCCRP) is to reduce the mortality and morbidity resulting from injuries on the battlefield through the development of new life-saving strategies, new surgical techniques, biological and mechanical products, and the timely use of telemedicine technologies. One of the program areas in CCCRP, Advanced Capabilities for Combat Medics Research, includes basic and applied research to discover and develop new knowledge and devices that enhance combat medical personnel capabilities for triage, diagnosis, and decision-making relative to combat casualty management. Military casualties may wait for hours before definitive health care can be provided, initial treatment and subsequent evacuation occur in austere environments characterized by limited supplies and limited diagnostic and life-support equipment, and provision of acute and critical care is labor intensive and must frequently be provided by nonphysician medical personnel. Thus, the primary challenge for combat casualty care research is to overcome these limitations by providing biologics, pharmaceuticals, and devices that enhance the capability of first responders to effectively treat casualties as close to the geographic location and time of injury as possible.

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Almost 50% of current combat fatalities in Iraq and Afghanistan before evacuation and up to 80% of civilian trauma fatalities within the United States are attributed to uncontrolled hemorrhage. Data from the Vietnam conflict also suggested that exsanguination from extremity wounds accounted for more than half of the potentially preventable deaths in that conflict. It is hypothesized that some of these deaths may have been prevented by the prompt application of a tourniquet or hemostatic agent. Thus, hemostasis research and the development of an effective method for treatment of uncontrolled hemorrhage from combat wounds has become a major priority in combat casualty care research programs.

The US military continues to support the development and refinement of a dry, ready to use, hemostatic agent suitable for treating combat hemorrhage. Many of the agents and devices used for hemorrhage control have unique advantages and disadvantages and may be more suitable for different levels of care depending on the environment and situation. The ideal hemostatic agent for combat trauma should be inexpensive, simple to apply, durable, possess minimal risk, require little training to use, be effective against severe bleeding that would otherwise lead to exsanguination, and must be able to sustain hemostasis for at least several hours to permit safe evacuation of casualties to definitive care centers. The current literature on these products is controversial, with efficacy demonstrated under some circumstances but not others. Recommendations for the use of these and other products will depend on the above factors. Mission and training requirements will also dictate the use of these products by the military and other civilian organizations.