*Learning to Care for Those in Harm's Way*

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**Researchers identify model to predict successful wound healing**

**Bethesda, Md** -- Battlefield surgeons and civilian physicians could have a powerful new tool to help patients recover from traumatic injuries, including life-threatening wounds from explosions.

By studying blood and tissue samples from patients, a team of military and civilian researchers have identified a model to predict the chances for successful wound healing in individual patients. These predictions could help surgeons make critical, time-sensitive decisions, such as when to close a wound. Both premature and late closing can lead to serious complications for the patient.

The researchers' findings, "Lessons of War: Turning Data into Decisions," was published online July 17 2015 in the journal *E-Biomedicine* (http://dx.doi.org/10.1016/j.ebiom.2015.07.022).

"This study demonstrates that it is not merely the physical destructive nature related to the mechanism of injury in wounds, but the (body's) resulting inflammatory response, that dictates wound outcome," says the senior author, Navy Capt. (Dr.) Eric Elster, professor and chair of the Department of Surgery at the Uniformed Services University of the Health Sciences and the Walter Reed National Military Medical Center. "In this study, we have also determined that this response is similar between military and civilian patients, which is critically important because it allows us to translate advances in military patients into civilian patients and the converse as well."

Elster and a team from the USU Walter Reed Surgical Critical Care Initiative (www.sc2i.org) collected blood, tissue and serum samples from 73 patients who sustained 116 life-threatening combat wounds in Iraq or Afghanistan and analyzed biomarker data and clinical observation to predict the likelihood of wound failure. The samples were taken prior to and during each surgical debridement (removal of dead or contaminated tissue) of the wound.

"We've long suspected that young, previously healthy patients who had sustained blast injuries have difficulty regulating their immune system," Navy Cmdr. (Dr.) Jonathan Forsberg, first author on this study, says. "By characterizing patterns of inflammation using computer-intensive methods, we are now able to estimate the probability of surgical complications before they occur."

Because of body armor, improved tactical combat casualty care and a robust tertiary care system, many service members in Iraq and Afghanistan survived severe wounds that, in past wars, would have been fatal. But the severity of the injuries meant that "even highly experienced military surgeons had difficulty risk-stratifying their patients' wounds because the conventional manner of visually assessing wounds was inadequate," the authors wrote.

Using advanced computer analytic methods of the samples collected, the team was able to determine the presence of cytokines (proteins) that in turn could predict which patients would develop an inflammatory response that would lead to local wound failure. The result of such failure can include infection, amputation or death.

The result of the research is a decision-support tool to guide the timing of wound closure, although the paper noted that the process requires collection of numerous samples and advanced computer analysis, which would need to be carried out in a field hospital setting, not the front line of a battlefield.

In addition, a group of 18 critically injured civilian patients was evaluated to determine if similar inflammatory responses were observed. Preliminary findings were comparable, but the authors said that due to the small sample size, more patients would need to be studied.

If the study's results are further validated, "consistently applying this approach would improve surgical outcomes, allow trauma patients to spend less time in intensive care, and reduce health care costs," the authors concluded.

In addition to Elster and Forsberg, the authors were Drs. Benjamin Kyle Potter of USU and Walter Reed National Military Medical Center, Matthew Wagner of the Naval Medical Research Center, Andrew Vickers of Memorial Sloan-Kettering Cancer Center, Christopher Dente of Emory University, and Allan D. Kirk of Duke University Medical Center.

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