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Medical Risk in the Future Force Unit of Action

Results of the Army Medical Department Transformation Workshop IV

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Summary

This report documents the Army Medical Department’s (AMEDD) process of identifying and addressing medical issues related to the Army’s transformation to the Future Force. It describes the AMEDD Transformation Workshop (ATW) IV, conducted at the RAND Corporation Washington office on 10–13 February 2004, and includes an analysis and discussion of the workshop results. The purpose of this workshop was to continue the assessment, begun in ATWs I–III, of the medical risks associated with emerging Army operational concepts and the capacity of the AMEDD to mitigate these risks. The principal focus of ATW IV, however, was to begin the process of establishing data on the casualty demand that must be addressed by echelons above the Unit of Action (UA) Health Service Support (HSS) system. Thus, the principal purpose of ATW IV was to provide analytical support to the AMEDD to assist it in designing the HSS system above the UA level.

Background

The Army’s transformation to the Future Force not only posits dramatically different equipment, it also envisions radically new ways of fighting. One aspect of future Army operations that is of particular importance is the employment of widely dispersed units moving rapidly around the battlefield. These operational concepts potentially pose significant challenges for the units that support the combat elements. In 1998, the AMEDD began an analytical effort to gain insight into the challenges for HSS posed by emerging Army transformation concepts. Over the next few years, AMEDD conducted two games and several workshops to provide further insight into how it could best support the Army as it transformed.

AMEDD Transformation Workshop IV

In collaboration with the Center for AMEDD Strategic Studies, RAND designed, organized, facilitated, and provided analytic support to the fourth in a series of ATWs, conducted on 10–13 February 2004. The workshop was supported by two teams (A and B) of subject matter experts (SMEs), who examined the ability of an envisioned UA HSS structure to support Future Force combat operations. The AMEDD Center and School provided casualty data, which was derived from JANUS simulation results provided by the U.S. Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC). In the scenario that supported the simulation, a Future Combat Systems (FCS)-equipped Maneuver UA was engaged in
twelve hours of combat operations against a brigade-equivalent threat force. The dimensions of the engagement area were as large as 75 by 85 kilometers.

The results of this UA-level simulation were the most current available for ATW IV. How representative they are of what might occur in future operations is unknown, and this argues that the Army should conduct more simulations across different scenarios to validate and expand the utility of these outcomes for its force structuring and concept development efforts.

At the conclusion of the workshop, each SME team was asked to answer the following questions:

- What was the disposition of casualties (casualty outcomes) at the end of the scenario?
- What was the status of the HSS system at the end of the scenario?
- How many casualties require further evacuation and treatment at echelons above the UA?

ATW IV teams also focused on three principal issues:

- Where do first responders and combat medics fit in the overall future concept for combat casualty care, and what treatment capabilities (treatment technologies and skills) will medics require to support this concept?
- What theater military medical infrastructure is necessary to support future military medical operations across the spectrum of operations?
- What are the evacuation requirements to support military operations across the spectrum of operations?

Additionally, the teams assessed the implications of two further issues:

- What are the AMEDD’s platform (ground and aerial evacuation and treatment systems) requirements to support the transformed force, and on which of these platforms will telemedicine (and other technologies, e.g., en route care) be advantageous?
- What technologies would significantly improve force health protection (how much are they worth at the margin)?

Workshop Results

Response to Workshop Questions

Question 1: What was the disposition of casualties (casualty outcomes) at the end of the scenario?¹

The scenario resulted in 76 wounded-in-action (WIA) casualties during the approximately 12-hour battle. The estimates by the two workshop teams of casualty outcomes at the end of the 12-hour scenario are depicted in Figure S.1.

¹ It is important to note that only U.S. casualties were considered in this workshop. The scenario did not provide any data on civilian or enemy prisoner of war casualties, which would have increased the demand on the HSS system, both within the UA and at echelons above the UA.
NOTE: KIA = Killed in Action, DOW = Died of Wounds, RTD = Return to Duty, AE = Awaiting Evacuation within the UA, LL = Limb Loss.

It is important to note that the results shown in Figure S.1 do not indicate the final disposition of those casualties who are awaiting treatment or being held following treatment (e.g., for evacuation) at H+12. In the time beyond H+12, the percentage of Died of Wounds (DOW) casualties will either remain the same or increase. Casualties are considered to be DOW if they die after reaching a medical treatment facility (MTF); those who die before then are referred to as Killed in Action (KIA).

It is difficult to determine the final disposition of casualties because the capabilities of a future echelons-above-UA HSS system have yet to be determined. Specifically, it was assumed that casualties requiring evacuation from the UA medical company/forward surgical team (FST) were evacuated immediately upon that determination (casualties who had not yet arrived at the medical company/FST by the end of the simulation are classified as awaiting evacuation within the UA).2 In essence, this approach postulates an echelons-above-UA HSS system with infinite capacity. This assumption served both to support the goal of determining medical demand on echelons above the UA and also to unencumber UA assets. Had this assumption not been made, the medical company/FST would have quickly become overwhelmed, and determining demand for higher echelons would not have been possible. For this reason, the casualty outcomes in Figure S.1 represent only those casualties of the total population of 76 for whom an outcome is definitive. In other words, approximately two—

2 Technically, soldiers wounded or killed are known as casualties. They are referred to as patients once they have entered the medical system above the level of first responder (e.g., combat medic) care. For simplicity, we use the term casualty throughout this report.
thirds of the casualties had been determined to be ready for Unit of Employment (UE) evacuation. Their disposition will necessarily depend upon medical capabilities at echelons above the UA. Furthermore, all the casualties who are not returned to duty within the UA will eventually have to be cleared by a higher-echelon HSS system. ATW V will continue this line of analysis by assessing the results of a UE-level engagement and its resulting casualties.

**Question 2: What was the status of the HSS system at the end of the scenario?**

Earlier workshops in this series (ATWs I–III) focused on the capacity of an HSS system and included some assets not available in the current UA (e.g., combat support hospital (CSH)). This workshop was primarily designed to determine the medical demand on echelons above the UA for the workshop scenario; as discussed above, casualties requiring UE evacuation and treatment were assumed to receive it almost instantly. It is therefore difficult to determine the total demand on the UA because the actual backlog on the UA is dependent upon definite higher-echelon capabilities. It is, however, possible to describe the utilization of UA medical assets based on the UA HSS plan and doctrine. For example, an FST is doctrinally intended to stabilize patients for evacuation (the number of patients requiring such resuscitative surgery is generally low: 10 to 15 percent). Workshop teams were able to determine FST surgical requirements based on the nature of the casualties in the scenario. As the battle progressed, the number of needed surgeries increased. One team estimated that it exceeded its surgical capacity within approximately three hours and recovery cot capacity in approximately six hours.

In addition to surgical and post-operative capabilities, evacuation assets were generally committed to near their maximum capacity throughout the scenario. The combined mean time from wounding to surgery for both teams was 171 minutes (standard error 16.2, median 164 minutes). The mean times of the individual teams were not significantly different.

The period of time following injury within which a significant number of serious trauma casualties will die without surgical intervention is often referred to as the “golden hour.” In this scenario, delay time exceeded an hour in every case (14 and 15 FST surgeries for Teams A and B, respectively), with delay times from wounding to surgery ranging from 69 to 413 minutes. Finally, it is unclear whether additional casualties could have received treatment at the FST but were instead flagged for UE evacuation; the disposition of these casualties is unclear without knowledge of medical capabilities at echelons above the UA. In any event, UA surgical demand was already significant and probably would not have been able to accommodate this additional but unknown demand.

**Question 3: How many casualties require further evacuation and treatment at echelons above the UA?**

As already noted, a significant objective of this workshop was to estimate the medical demand that would need to be met by echelons above the UA for this scenario. Both teams estimated similar residual demands following casualty evacuation and treatment in the UA; for example, both performed a similar number of surgeries (14 and 15) at the FST, indicating similar decisions about which casualties should be treated in the UA versus higher echelons. Data from both teams was used to estimate the number, type, and severity of casualties requiring evacuation to, and treatment at, higher echelons and is shown in Figure S.2.
Figure 5.2
Casualties Requiring Evacuation and Treatment by the UE

NOTE: L = low, M = moderate, H = high wound severity. Team A estimated that 2 chest (H) casualties also have significant abdominal injury; both teams estimated that 2 face/neck (M) casualties also require treatment for significant eye injury. ICU patients are not exclusive of the other categories.

Issue Resolution

Issue 1: Where do first responders and combat medics fit in the overall future concept for combat casualty care, and what treatment capabilities (treatment technologies, level of supply, and skills) will medics require to support this concept?

The assumed proficiency of first responders, especially of combat lifesavers (CLS), and the availability of advanced technologies to control bleeding were judged to be absolutely essential. The reliance on CLS and advanced technologies was intended to address the principal characteristics of the Future Force concept that make HSS challenging: dispersed unit operations. These characteristics resulted in a significant time lapse between injury and care by a medic, if the medic was not collocated with the casualty at the time of wounding. This time lag is especially problematic for bleeding casualties who must be treated quickly. Some SMEs, however, were skeptical that such an advanced level of CLS proficiency could be achieved and maintained.

Issue 2: What theater military medical infrastructure is necessary to support future military medical operations across the spectrum of operations?

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3 First responder care includes self- and buddy-aid, combat lifesavers, and combat medics.
This workshop focused on establishing the UA casualty demand that would have to be addressed by the echelons-above-UA HSS system. Casualties were treated within the bounds of UA capabilities, and those who did not return to duty became a component of the demand for an above-UA HSS system. The estimates of demand resulting from this workshop will be useful in determining theater medical infrastructure requirements.

As in ATWs I–III, each team indicated that perfect situational awareness—based on advanced communications technologies—was a key capability because it enabled optimal allocation of medical assets. That is, knowing the location and severity of casualties in real time would allow for remote triage, resulting in the precise and appropriate allocation of both evacuation and treatment assets.

**Issue 3: What are the evacuation requirements to support military operations across the spectrum of operations?**

Wide unit dispersion made air evacuation essential to facilitate an efficient, timely casualty evacuation. To this end, each team used air evacuation at or near full capacity.

**Issue 4: What are the AMEDD’s platform (ground and aerial evacuation and treatment) requirements to support the transformed force, and on which of these platforms will telemedicine (and other technologies, e.g., en route care) be advantageous?**

As with issue 3 above, air evacuation platforms were critical in the effort to clear the battlefield of a widely dispersed UA engaged in rapid operations. These assets became increasingly important as the distance between point of wounding and the UA medical company/FST increased over the course of the engagement.

**Issue 5: What technologies would significantly improve force health protection (how much are they worth at the margin)?**

Although the impact of the medical technologies employed in the workshop was not addressed as an independent variable, team members noted that the Warfighter Physiological Status Monitor (WPSM) and advanced hemostatic agents were particularly valuable in combat casualty care. The WPSM provided casualty location and the capability for remote triage to support the regulation of heavily taxed medical assets across a dispersed battlespace. The advanced hemostatic agents, often administered by combat lifesavers, extended the time available to evacuate casualties to the required level of care. Without these two technologies, casualties’ outcomes would have been worse.