
Changes in Modern War That Affect Medical Operations

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Understanding the current Army Health System, the Force Protection Model, and their development over time gives one the knowledge of how and why certain practices, methods, and tools are used in modern military medicine. War has contributed to some of the most important medical advancements in history from surgical practices to infection control (Etienne, 2022). To reduce fatality rates, battlefield medicine needs to adapt not only in clinical practices but also in employed tactics to meet challenges presented in peer-to-peer conflict and large-scale combat operations (LSCO). By analyzing past and current battlefield conditions, organizations can adapt their tactics to meet these challenges. This proactive approach may result in the favorable condition of lower fatality rates compared to reactive measures that are implemented after lessons have been learned from casualties. To that end, it is critical that leaders and medical providers recognize the patterns emerging from recent conflicts to create new standards and practices in preparation for the next peer-to-peer war. This article will examine recent conflicts to support the hypothesis that advanced prolonged field care will be the new standard and new flexible and mobile support elements must be introduced to sustain the fighting force.

Background

The Second Nagorno-Karabakh War is considered the first near-peer war utilizing modern technology and tac-

tics by both sides. The conflict saw the smaller nation of Azerbaijan decimate the entrenched Armenian force in forty-four days. This was possible because preceding the war, Azerbaijan focused its defense expenditures on unmanned systems and aerial surveillance capabilities. Armenia focused on building fixed fortifications and developed a battle plan of heavy ground support to defend their positions without support by Unmanned Aircraft Systems (UAS). Armenian fighters were filmed surrendering with their hands in the air when they saw drones overhead. Armenians described the use of drones as unfair, saying they were unable to do anything except wait for impact when they heard the buzz of the drone (Antal, 2022). Their fixed fortifications proved fruitless against the surveillance and top attack capabilities of the Azerbaijani drones.

The Changing Nature of Warfare

At the 2022 Maneuver Warfighter Conference, John Antal gave a presentation on the changing nature of modern warfare based on the lessons learned from the Nagorno-Karabakh War (Antal, 2022). In the presentation, he identified seven battlefield disruptors that the United States must be prepared to contend with (see Figure 1). When applying these disruptors through the lens of medical sustainment, vulnerabilities are revealed that will stress the current sustainment model the Army Health System uses.

Figure 1. *Seven Battlefield Disruptors*

Factor	Impact
Transparent Battlespace	Inability to hide assets from advanced sensors
First Strike Advantage	Adversaries employing first strike will have initiative advantage
Tempo of War	Enemies will employ fast kill chains and exploit opportune targets
Top Attack	Loitering/smart munitions will take advantage of soft targets
Autonomous Systems	UAS kill systems drastically change cost expenditure to kill ratio
Kill Web	Interlinked systems shorten kill chains for maximum effectiveness
Battlespace Visualization	Data collection systems allow for real time analysis of battlespace

Pertinent to the Army Medical System are the transparent battlespace, tempo of war, autonomous systems, and battlespace visualization. The next near-peer war will most likely start with a first strike or escalation by an aggressor and not by the United States. Current United States defense policy focuses on force projection and deterrence but will not invade a sovereign nation or attack first unless there is a clear and imminent threat. A report by David Sacks (2022), a research fellow at the Council on Foreign Relations, supports Antal's position that adversaries will commit a first strike. In the report, Sacks (2022) emphasizes that China must attack quickly and maintain a fast operation tempo before the United States' reactionary force can respond and begin a stream of supplies to the country. At the opening of the Ukrainian conflict, Russia implemented first-strike operations after a troop build-up on the Ukrainian border under the initial guise of training missions. Russia used its initiative and momentum to thrust into Ukraine taking a quarter of the country in a short time. It was only after the initial thrust that undeveloped Russian logistics mixed with a strong Ukrainian counter-offense and foreign aid put Russia on the defensive. In keeping with U.S. policy, the 82nd Global Reaction Force was deployed to Poland as a standoff measure but did not engage with Russia and later returned.

It should not be ignored that Ukraine took advantage of loitering munitions, coordinated kill chains, and all the information the intelligence community could provide. This allowed a smaller force to counter a larger invading force whose numbers were negated by superior tactics, intelligence, and technology. It should also be noted that this was accomplished through LSCO and not insurgent tactics. Other nations are learning from Russian mistakes, most notably China, North Korea, and Iran. Strategic adversaries are taking note of how unmanned systems and intelligence are being utilized as well as the effectiveness of next-generation systems. Additionally, First World War trench and defensive tactics thought to be obsolete have proven to still be effective defensive measures that slow the pace of combat despite the aforementioned advantages. This means that in the next near-peer war, adversaries will use comparable systems, tactics, and countertactics based on expected strategies used by the United States and its allies. The next conflict will be defined by rapid strikes, initiative advantage, and total visibility of the battlefield.

The Ukrainian War is unique in terms of battlefield visualization. The internet has made the battle space completely visible with control of information almost impossible. Internet bloggers on both sides publicize troop movements while independent news sources have live maps of defensive positions, troop concentrations, and unit movements. For example, deepstatemap.live is a public resource created by interested parties that shows the daily progress of the Ukrainian front and the positions of Russian units, bases, and defenses. There are similar pro-Russian versions showing Ukraine's positions as well. The information stream that feeds these websites comes from partisans on both sides, soldiers posting videos, and publicly released information all coalesced into one resource. This

has led to Ukraine taking advantage of this information, along with joint intelligence data, to make targeted, high-impact strikes on key Russian positions. A notable strike was using the mapping data from a smartwatch to successfully target a Russian General on his daily run around his post. Similar attacks leveraging data and detailed signals intelligence will be directly relevant to the medical corps in the next war, regardless of whether the location is Taiwan, South Korea, or the European theater. It will not be possible to stop the information stream that will be produced (Maschmeyer et al., [in press](#)). This will result in high casualty rates as positions are exposed, and will force any high-value target like a field hospital to either remain mobile or be placed further than desired in the rear. According to the BBC, the current estimated Russian casualty count is around 200,000 (BBC, [2022](#)). Although significantly more competent in tactics, the United States should be prepared for a higher casualty rate in the next conflict than it has seen in previous conflicts like Afghanistan and Iraq. Night operations may become more difficult when adversaries employ comparable low-light technologies leading to higher casualty rates.

Collapse of the Golden Hour Model

The Golden Hour Model is the concept that if a critically injured patient receives definitive care within one hour, their chance of recovery is increased and mortality decreases (Okada et al., [2020](#)). During the Afghanistan and Iraq wars, the United States employed practices to take advantage of this concept to provide stabilizing and definitive treatment as close to injury points as possible through an established network of forward surgical teams, NATO Role II facilities, and centralized medical evacuation (MEDEVAC) locations. Specifically, these two conflicts saw extensive research emerge from the appropriate use and exploitation of rapid evacuation and stabilizing treatment close to the point of injury (Dobbins et al., [2020](#)). The exploitation of the Golden Hour Model was possible because the United States and its allies held a major technological advantage over its adversaries from 2001 to 2022. Their operations also included building activities that created fixed forward operating positions and complete air dominance. The strategy of fixed forward operating bases and establishing control of an area after engagement with minimal air denial threats created safe casualty collection points, in turn allowing slower rotary wing air assets to evacuate patients to stabilizing or definitive care (Dobbins et al., 2020).

A2AD is the New Reality

In a [2020](#) release, U.S. Air Force Chief of Staff Charles Brown stated that in the next peer-to-peer conflict, not only is air dominance not assured, air and ground assets will have to constantly fight to gain control of localized areas for limited periods of time. Control of airspace will be fluid as lines shift and mobile next-generation ground-based air denial assets are employed. Helicopters will not be able to operate within acceptable risk tolerance in an anti-access/area denial (A2AD) operational area. This risk

is further detailed by an earlier 2018 publication from NATO's Joint Air Power Competence Center (JAPCC). In their release, they said enemy SAM assets represent a serious risk to slower assets, particularly when employed as a layered defense system (Perkins, 2018).

Ukraine currently employs Army Tactical Missile System (ATACMS), High Mobility Artillery Rocket System (HIMARS), and First-Person View (FPV) drones to deal critical damage to Russian vertical take-off and landing (VTOL) platforms left in the open. Unless VTOL assets are under hard cover, leaving them in the open while within range of enemy medium and long-range assets poses a significant risk, even with interceptor assets. If a scatterable munition is not intercepted, Counter Rocket, Artillery, and Mortar (C-RAM) systems will not be able to destroy bomblets. Given that HIMARS has a generic, accurate range of 300 km, a MEDEVAC Blackhawk with a max speed of approximately 295 km/hour is vulnerable if staged on the ground within one hour travel time of the point of injury. Risk mitigation must then balance acceptable indirect fire (IDF) risk with increased flight times if assets are staged farther away. This leads to the conclusion that in the next near-peer war, evacuation times to definitive care locations will be much longer as units must wait until air assets can safely enter the area or slower ground transport assets are used for tactical evacuation.

The Need for Advanced Prolonged Field Care

In study examining casualty rates in recent conflicts from 2007 to 2015, it was found that in a sample of 16,202 military and civilian casualties, ninety percent died within four hours of injury (Shackelford et al., 2021). Within that total, 1,111 U.S. Service Members received prehospital care but died before getting to the next level of care. This report concluded that although standard Role I care was given, most of the casualties in this group required sustained transfusion resuscitation, advanced airways, or some form of ventilation support. These interventions are considered advanced and not currently part of tactical field care. If evacuation times are extended, patients will need prolonged field care (PFC) and these advanced care interventions must be employed to sustain them. The study's U.S. casualty statistic was generated over an eight-year period while fighting under-equipped and insurgent enemies. The next war will see much higher casualty levels at an increased pace.

Based on the conclusion from the previous section, it is reasonable to assume that frontline Role I providers will be caring for patients up to 72 hours post injury. Shackelford and colleague's (2021) case study showed that even those patients receiving prehospital care, but not definitive treatment, died within 72 hours because they did not receive an advanced intervention. For prolonged field care to be effective, providers at all levels need to be equipped and prepared to render interventions beyond basic combat lifesaver (CLS) and tactical field care levels. This is supported by research showing that PFC can be broken into phases, with a systematic approach applied in each phase

(Smith et al., 2021). As part of the maintenance phase, after injury mitigation has occurred, blood products, analgesics, oxygen, and continuous hemorrhage control will all be needed to maintain the patient. If providers are not equipped, trained, and prepared to provide this type of care during the maintenance phase, casualties will expire. Early transfusions during PFC after mitigating measures have been applied, along with additional clotting factors will increase patient survivability chances. However, the problem with this recommendation lies in the proper allocation of blood assets to frontline units in a way that keeps the blood safe to use and at a stable temperature over time. Because blood is a critical and limited resource, waste is not tolerable in high-demand scenarios.

Firsthand Account

This section's information is from a personal interview conducted by the author with a former Ukraine War Volunteer. For safety reasons, their identity is withheld. They are a former U.S. Army Medic who volunteered with the Ukraine International Legion, 1st Battalion, B-CO for nine months as a medical platoon leader. Because they are bilingual, they were able to serve on the front lines with the Ukraine Regular Infantry.

By this firsthand account, they estimated that 60% of the injuries seen were complex shrapnel injuries and 30% bullet-based. While in a trench, Russians would use military and commercial drones to identify Ukrainian positions quickly, followed by artillery assaults. This created many complex, noncompressible wounds. Because Russia mostly operated during the day, injured patients could only be evacuated safely at night. Daytime movement, including resupply of any type, was too dangerous unless the patient was so critical they were willing to make the run. They reported several patients expiring while waiting for nightfall as they had no blood products or tranexamic acid. Their front-line rotations were three days straight followed by a rest cycle. Whatever the medics had on them was all the supplies they had until they rotated off the front. This forced prioritization of which supplies to bring and who to treat. Triage from lack of supplies was prevalent.

Patients had to be hand-carried 4-6km from the trenches to casualty collection points (CCP) where a vehicle would be waiting at designated times to take patients to make-shift surgical teams 15 km or more away. Any vehicles, regardless of markings, were targeted. Any stationary object of interest identified during the day was attacked quickly by indirect fire. Moreover, because of minefields, friendly forces were forced to use known evac routes the enemy had intentionally created to focus fire when targets entered them. Because of this, vehicles could not be staged near the front nor maintain a constant presence at the CCP. The Role II facilities had to be set up inside destroyed buildings or completely outside artillery range. They reported that any tent was an immediate target. To further highlight the danger posed to medical units, it was noted that the Russians were able to identify medics by

their aid bags. If a drone spotted a medic or anyone rendering aid, they would be targeted quickly.

Outside direct combat, they noted several other important issues. High numbers of non-combat wounds from field sanitation issues to broken legs from trip hazards were seen. As they moved through destroyed villages and buildings, there was rubble debris everywhere. Because they mostly moved at night, there was little visibility which resulted in many fall onto an outstretched hand (FOOSH) injuries and tibia fractures. Varied degrees of traumatic brain injuries due to shelling on the front were prevalent as well. Finally, they reported some of the foreign fighters present continually broke OPSEC by posting themselves on Instagram and Tic-Tok with GEO locators.

This Soldier's experience in Ukraine supports every topic mentioned herein. A visible battlefield made resupply and evacuation difficult and restrictive. Stationary medical assets had to be placed further than desired as they were valued targets. Foreign fighters and partisans on both sides compromised positions. Shrapnel wounds created complex injury patterns that required immediate stabilization care. Evacuation times were increased while waiting for cover of night and limited vehicle availability due to safety concerns. Without doctors or battalion surgeons in close proximity, the Role I medic is the only provider available to casualties. The United States must learn these harsh lessons from our strategic partners and work to mitigate them before learning them themselves.

Preparation for Future Conflicts

Based on what has been discussed so far, there are three major takeaways that medical military planners must consider now to prepare for future wars: 1) a visible battlefield with precision weapons will produce more casualties; 2) contested airspace will prevent rapid evacuation of casualties; and 3) frontline providers must be trained and equipped to provide advanced levels of care in a prehospital environment. It is possible to bring these key points to light through understanding recent events and medical research in the past five years. It is therefore critical to recognize the patterns emerging in current conflicts to create the best predictions on how events in the future will unfold. This gives leaders the opportunity to plan for and mitigate the coming challenges. Continued reliance on established methods from insurgent-based wars with clear technological and manpower overmatch will result in higher casualty rates until adaptations are made.

Recommendations

The major recommendations that can address the coming challenges are an increase in training for frontline providers, an increase in available frontline Role I providers, establishing innovative methods of medical resupply, and changes to tactics, techniques, and procedures (TTPs) at an organizational level. Training must be the first line of effort addressed as soon as possible across all organizations to prepare providers for advanced prolonged field care. A re-examination of the individual critical task list (ICTL)

for medics, combat lifesavers, and other providers will be key to successful implementation. Transfusion therapy, advanced airways with ventilation support, and advanced pharmaceutical maintenance will be required to care for patients requiring Role I care longer than four hours (Smith et al., 2021). Medics must be prepared to activate walking blood bank procedures and provide medications pertinent to transfusions. They must also be prepared to conduct advanced pain management, infection control, and apply sedatives if they are treating patients for extended periods. In conjunction with this, units must be staffed appropriately to cover down when a medic must stay behind with wounded as ground units advance while awaiting evacuation. Patients with complex injuries will require more resources to sustain during prolonged field care.

Embracing New Technologies

Increasing the combat load of an individual medical provider with enough Class VIII medical supplies to cover multiple days of care for more than one patient is not practical. It is possible to increase supplies in a mounted unit if vehicles and space are appropriately allocated. It is also impractical to send whole blood products with units. The chance is too great for the loss of this valuable resource. Keeping blood cold mechanically without a dedicated power source is difficult and insulated carriers only last for eight hours. The civilian sector has commercial unmanned systems that can deliver cold products on demand to pinpoint locations. Companies like Zipline currently deliver blood products in Africa to clinics in need up to 100 miles away. The Army has only just started to test this in 2022 but is not ready for implementation (Lawrence, 2022). Utilizing unmanned delivery systems deployed from rear elements to deliver blood places the resource where it needs to be in a short period while reducing risk to pilots and large aircraft in A2AD areas.

Drones can also deliver nonperishable medical supplies. This will enable providers to sustain casualties without overloading units with medical supplies. It also is a solution to provide specialized equipment on demand. EUROSETS is currently testing the feasibility of delivering small extracorporeal membrane oxygenation (ECMO) that fits in a backpack via drones (EUROSETS, 2023). This type of support to a forward surgical team could mitigate death from severe pulmonary injuries. Using drones to deliver supplies in place of manned platforms will save lives and money. This is supported by field research on using legacy systems for battlefield medical resupply. In the research, it was shown that a complete speed bag (medical resupply backpack) can fit into a golden hour bag (blood delivery bag), and be placed on an intermediate-range, fixed-wing platform that can be launched and landed without a runway (Gaff, 2020).

Role II & III Changes

The current model of Role III field hospital may not be sustainable in future conflicts. The footprint a Role III generates is not discreet. Ideally, a 144-bed field hospital

must be able to set up or take down in 72 hours. Although the emergency section surgical sections can be set up within the first 4-8 hours, the support elements of the hospital take time to set up and tear down. If a Role III were identified by the enemy, it would be a prime target and would most likely be hit before it could be moved. In Fort Liberty at the 528th Field Hospital, Hospital Commander LTC Manning has tested proof-of-concept operations for rapid setup and tear down of a smaller hospital element. Instead of the 144 or even 32-bed setup, he tested a small footprint, ten-bed, surgical setup and was able to successfully jump the hospital three times in six days.

Implementing small-footprint, easily moveable stabilization-care units may be the way of the future. This is not the first time this concept has been used and is in line with previous Mobile Army Surgical Hospital (MASH) units. To keep providers and patients safe, large-footprint Role IIIs will have to be placed further in the rear than potentially desired. The forward surgical team model is a choice to maintain mobility however due to surgical provider manpower issues, it is not feasible to have many teams of valuable providers in close proximity to enemy fire. A balance needs to be found between mobility, proximity to the fight, and level of care to save the most potential patients without intolerable risk to providers.

Conclusions

The United States must be prepared for the next conflict. That conflict will be defined by contested airspace, a visible battlefield, and the need for advanced prolonged field care. This foresight is only possible by recognizing the patterns emerging from recent conflicts. A visible battlefield makes any stationary object of interest a potential target. Loitering munitions, long-range weapons, and artillery force stationary medical assets to be placed farther in the rear, increasing evacuation times. Medical assets must embrace the aspects of mobility and flexibility to avoid attacks and treat patients in dangerous situations. Complex injuries combined with increased evacuation times force Role I providers to engage in advanced prolonged field care. This field care requires advanced skills like transfusion therapy, advanced airways, and pharmaceutical maintenance. Role I providers must be trained to offer this care and be given the supplies to do so. TTPs must be adapted to meet these battlefield challenges before they become actualized on U.S. forces.

The solutions recommended are not definitive nor are they the only potential solutions. They are based on current technology and the recognition that TTPs must shift from practices developed in an insurgency to ones made for modern war. A tenant of the Army Health System is flexibility. Moving away from established methods that only work in specific conflicts will define the success or failure of the medical mission of the Army in conflicts to come.

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