Clearing the Battlefield of Wounded in Large-Scale Combat Operations

A Monograph

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14. ABSTRACT
As the Army shifts focus from limited-contingency operations to large-scale combat operations against a peer or near-peer competitor, one continuing theme is the increased lethality of future conflicts. This increase in potential casualties is in stark contrast to recent military experiences beginning with Operation Desert Shield/Storm in 1991. During Operation Iraqi Freedom and Operation Enduring Freedom, casualties were almost exclusively moved via air medical evacuation and commonly received hospital care within one hour. This monograph explores the question of what happens when that "golden-hour" standard is no longer feasible in future battlefields? In the worst month of Operation Iraqi Freedom, the US military suffered 1,432 casualties; future conflicts have the realistic potential of more than 3,600 casualties per day. The purpose of this monograph is to determine current evacuation capacity and shortfalls and identify options for operational level planners on the division and corps staff in the event of a significant mass casualty situation associated with large scale combat operations. Using the lens of theory, history, practice, and doctrine, this monograph looks at the historical foundations of modern evacuation principles from the Napoleonic Wars to present day. Additionally, there are two case studies: Evacuation operations during the Normandy Campaign and an assessment of current US Army evacuation capabilities. Divisions and corps must be ready to use all tools available from the Combat Aviation Brigade, Sustainment Brigade, and Medical Brigade to allow the Brigade Combat Teams to keep focus on winning the close fight.

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Abstract

Clearing the Battlefield of Wounded in Large-Scale Combat Operations, by MAJ Cale T. Hamilton, 61 pages.

As the Army shifts focus from limited-contingency operations to large-scale combat operations against a peer or near-peer competitor, one continuing theme is the increased lethality of future conflicts. This increase in potential casualties is in stark contrast to recent military experiences beginning with Operation Desert Shield/Storm in 1991. During Operation Iraqi Freedom and Operation Enduring Freedom, casualties were almost exclusively moved via air medical evacuation and commonly received hospital care within one hour. This monograph explores the question of what happens when that "golden-hour" standard is no longer feasible in future battlefields? In the worst month of Operation Iraqi Freedom, the US military suffered 1,432 casualties; future conflicts have the realistic potential of more than 3,600 casualties per day. The purpose of this monograph is to determine current evacuation capacity and shortfalls and identify options for operational level planners on the division and corps staff in the event of a significant mass casualty situation associated with large scale combat operations. Using the lens of theory, history, practice, and doctrine, this monograph looks at the historical foundations of modern evacuation principles from the Napoleonic Wars to present day. Additionally, there are two case studies: Evacuation operations during the Normandy Campaign and an assessment of current US Army evacuation capabilities. Divisions and corps must be ready to use all tools available from the Combat Aviation Brigade, Sustainment Brigade, and Medical Brigade to allow the Brigade Combat Teams to keep focus on winning the close fight.

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Acknowledgments

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Acronyms

ADP	Army Doctrine Publication
ATP	Army Techniques Publication
BCT	Brigade Combat Team
BSMC	Brigade Support Medical Company
CASEVAC	Casualty Evacuation
COSSAC	Chief of Staff to Supreme Allied Command
DNBI	Disease and Non-Battle Injury
EAB	Echelon-Above-Brigade (Typically referring to divisions or corps)
FM	Field Manual
HMMWV	High-Mobility, Multi-purpose, Wheeled Vehicle
JP	Joint Publication
LSCO	Large-Scale Combat Operations
LST	Landing Ship, Tank
MASCAL	Mass Casualty
MCTP	Mission Command Training Program
MEDEVAC	Medical Evacuation
MTV	Medium Tactical Vehicle
POI	Point-of-Injury

Definitions

Casualty Evacuation	CASEVAC: Casualty evacuation involves the unregulated movement of casualties using predesignated or opportune tactical or logistic aircraft and vehicles. These vehicles/rotary-wing aircraft are not staffed with medical personnel for en route care. (FM 4-02, Chapter 1)
Evacuation	For this monograph, if the term "evacuation" is used, it is a blanket term from both MEDEVAC (dedicated medical platform) and CASEVAC (non-medical movement) and refers to gross number of patients who must be moved using a combination of MEDEVAC and CASEVAC.
Mass Casualty	MASCAL: Mass casualty situations occur when the number of casualties exceeds the available medical capability to rapidly treat and evacuate them. (ATP 4-02.3, Appendix A)
Medical Evacuation	MEDEVAC: Medical evacuation refers to dedicated medical platforms staffed and equipped to provide en route medical care. Within the Army arena, medical evacuation is performed by dedicated, standardized medical evacuation platforms, with medical professionals who provide the timely, efficient movement and en route care of the wounded, injured, or ill persons from the point of injury wounding and/or other locations to MTFs. Medical evacuation is an AMEDD function that supports and is an integral part of the continuance of care. (FM 4-02, Chapter 1)
Role 1	First Responder/Point-of-Injury Care including self-aid and buddy aid, combat lifesavers, and medical personnel to provide stabilization prior to evacuation to the next echelon of care. Highest level is typically at a Battalion Aid Station (JP 4-02, Chapter 2)
Role 2	Includes everything found in Role 1 Care and adds advanced trauma management, emergency medical treatment, and may include damage control surgery if augmented with a Forward Resuscitative Surgical Team. Also includes pharmacy, laboratory, x-ray, and patient hold capacity. The Brigade Support Medical Company in Brigade Combat Teams and the Area Support Medical Company in Echelons Above Brigade provide Role 2 Care for the Army (JP 4-02, Chapter 2.)
Role 3	Theater Hospitalization: Expands support provided at Role 2 in an expeditionary hospital staffed and equipped to provide care to all categories of patients, to include resuscitation, initial wound surgery, and postoperative treatment. The 248-Bed Combat Support Hospital or the Field Hospital provide Role 3 Care for the Army (JP 4-02, Chapter 2).
Role 4	Care in US-based hospitals and robust overseas Medical Treatment Facilities. Role 4 care represents the most definitive medical care available within the medical care system. By nature, Role 4 care is out of the theater of operations. (JP 4-02, Chapter 2)

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Introduction

> Neither the proper kind nor the number of ambulances was in the Army at that time, but it was necessary, nevertheless, to devise such a system as would render most available, the materials upon the spot without waiting for the arrival of the additional number that had been asked for, only a portion of which ever came.
>
> —Major Jonathan Letterman, *Medical Director of the Army of the Potomac, 1862*

When the Army published Field Manual (FM) 3-0, *Operations* in 2017, strategic leaders aimed to shift the focus of military operations from crisis response and limited contingency operations to large-scale combat operations (LSCO). FM 3-0 considers LSCO against a peer or near-peer threat the most lethal form of war and the most significant threat to the readiness of the force.[1] In this form of conflict, casualty rates will considerably exceed those seen in recent military actions. During modern conflicts, including Iraq and Afghanistan, casualty evacuation procedures followed the "golden hour" policy. The golden hour was a Secretary of Defense policy dictating all critically injured service members must receive prehospital care within one hour of an incident.[2] The policy undoubtedly stressed the Military Health System by requiring the dispersion of limited medical capabilities across large geographic areas to meet the policy requirements. However, with relatively low casualty rates, proper placement of air evacuation platforms and forward surgical elements, and Allied air supremacy, the system generally worked and increased survivability rates.[3] Unfortunately, few of the conditions that allowed successful command and control of echelon-above-brigade medical assets in limited conflicts currently exist in a large-scale combat engagement.

The purpose of this study is to examine how the US Army can manage the increased evacuation requirements with the current force structure and resources. In 2016, the Chief-of-

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[1] Philip Belmont et al., "Disease and Nonbattle Injuries Sustained by a US Army Brigade Combat Team During Operation Iraqi Freedom," *Military Medicine* 175 (July 2010): 269.

[2] Russ Kotwal et al., "The Effect of a Golden Hour Policy on the Morbidity and Mortality of Combat Casualties," *Journal of the American Medical Association Surgery* 151, no. 1 (January 2016): 16.

[3] Ibid., 22.

Staff of the Army, General Mark Milley, stressed the importance of having an army ready to "fight tonight."[4] Current Chief-of-Staff of the Army General James McConville continued this emphasis by stating, "We must be ready to defeat any adversary, anywhere, whenever called upon, under any condition."[5] While there are many initiatives addressing evacuation within the Joint Capabilities Integration Development System, the Army's system for change management, organizational and materiel changes can take years to conceive, test, field, and implement. A military that needs to fight and win tonight must maximize the resources it currently possesses, not those in development. This monograph primarily focuses on patient evacuation from the Role 2 Brigade Support Medical Company (BSMC) to the Role 3 expeditionary hospitals. However, many of the recommendations scale down to the brigade combat team's internal capabilities within the brigade support battalion.

This monograph argues that there are insufficient dedicated ground and air medical evacuation platforms to meet the transportation demands of a division's casualties against a peer threat. The expectations of a 92 percent or higher survival rate that the military has operated under since before Operation Desert Storm are no longer realistic. Non-standard evacuation will be necessary to maintain tempo, operational reach, and reduce the inevitable loss of life.[6] Therefore, echelon-above-brigade planners must factor sustainment units and many of the additional aviation lift platforms from the general support aviation battalion into deliberate casualty evacuation planning, particularly during the *Dominate* phase of joint operational

[4] Association of the United States Army, "Milley: Readiness Wins, Deters Wars," *Association of the United States Army*, last modified May 23, 2016, accessed November 17, 2019, https://www.ausa.org/news/milley-readiness-wins-deters-wars.

[5] James McConville, "40th Chief of Staff of the Army Initial Message to the Army Team," *www.Army.Mil*, last modified August 12, 2019, accessed November 17, 2019, https://www.army.mil/article/225605/40th_chief_of_staff_of_the_army_initial_message_to_the_army_team.

[6] David Vergun, "Survival Rates Improving for Soldiers Wounded in Combat, Says Army Surgeon General," *www.Army.Mil*, accessed December 12, 2019, https://www.army.mil/article/173808/survival_rates_improving_for_soldiers_wounded_in_combat_says_army_surgeon_general.

planning.[7] This demand, at a minimum, implies that specific units should be expressly tasked, trained, and evaluated on their ability to perform mass casualty evacuation. Based on estimates jointly developed by the G1, Division Surgeon, and G4, planning could require a full dedicated reserve force of sustainment assets at the cost of reduced combat power or speed.

This study is significant to planners at the echelon-above-brigade level responsible for enabling brigade combat teams to win the close fight. Army doctrine states that it is the higher echelon's responsibility to evacuate the casualties of the lower echelon. Therefore, it is a brigade commander's responsibility to manage his or her wounded, ill, or injured back to the organic Role 2 Medical Treatment Facility. If additional care is required, it is the division or corps' responsibility to generate options to transport the casualties from subordinate brigade support areas to the Role 3 field hospitals and out of the theater. In recent conflicts, this could be handled by the division combat aviation brigade for air Medical Evacuation (MEDEVAC) operations and by the medical assets controlled by the senior medical command for everything else. In LSCO, the division will have to deliberately plan for internal and external non-medical resources to support the limited dedicated medical assets in theater.

Five research questions guide this study. The first question is: How has the military handled high-demand casualty evacuation operations in the past? The second question is: What is the maximum medical evacuation capacity the current medical force can support based on current inventory and doctrinal basis of allocation to a theater? The third question is: How many casualties are divisions or corps expecting during the initial phases of LSCO? The fourth question is: What non-medical units are available to the division to use for casualty evacuation, and what is their transport capacity? The final question is: What other options can division and corps planners generate to clear the battlefield of wounded, injured, or ill soldiers?

[7] US Department of the Army, Field Manual (FM) 3-0 (w/Change 1), *Operations* (Washington, DC: Government Printing Office, 2018), 1–12.

This study attempts to answer those questions with the following limitations. First, this study only uses unclassified documents, reports, and sources, which prevents the use of casualty estimates associated with current operations plans. Second, results from the last six corps Warfighter Exercises and previous LSCO historical data provide the casualty estimates used in the study but only include combat casualties, not those caused by Disease and Non-battle Injury (DNBI). Historically, DNBI causes far more hospitalizations than combat injury, including 75 percent of hospital admissions during the initial months of Operation Iraqi Freedom.[8] Next, there is no attempt to address serious concerns about treatment and surgical capacity, although treatment and evacuation are necessarily connected.[9] Finally, while civilian and allied partner casualties factor into real-world planning, this study only considers US military casualties requiring evacuation.

This monograph has six sections, starting with the introduction. Next is a literature review studying the history, theory, and doctrine of US casualty evacuation and how it applies to future operating environments. Following the literature review is a summary of the research methodology. The fourth section is a case study of the plan and execution of evacuation operations in Western Europe during World War II. Modern LSCO would face similar challenges but in a more lethal environment and potentially with a smaller force. A surprising amount of operational lessons learned by planners in this theater still apply to the military today. Section five is an analysis of the current capacity divisions and corps have to meet the demands of casualty evacuation using medical and non-standard vehicles. The final section is my recommendations and conclusions to improve readiness and meet the requirements of a "fight

[8] Patrick Sargent, "Evolving Mass Casualty Combat MEDEVAC," *Tactical Defense Media*, August 28, 2019, accessed December 10, 2019, https://tacticaldefensemedia.com/evolving-mass-casualty-combat-medevac/.

[9] Steve Sternberg, "A Crack in the Armor: Military Health System Isn't Ready for Battlefield Injuries," *US News & World Report*, accessed October 29, 2019, https://www.usnews.com/news/national-news/articles/2019-10-10/military-health-system-isnt-ready-for-battlefield-injuries.

tonight" mindset senior leaders are fostering in the military. While increased casualties are expected and inevitable in a LSCO fight, commanders and staffs at all levels must not allow this difficult fact diminish their responsibilities to ensure deliberate plans are in place to reduce or minimize unnecessary and preventable loss of life.

Literature Review

> Not evacuating our sick and wounded in LSCO is not an option. Failing to evacuate may cause us to lose today's battle—as the backlog of casualties/patients cause a cascade of medical and operational culmination on the battlefield. Failing to evacuate often enough—with its potential impact on Soldier morale and national will—may cause us to lose the next battle, the next campaign, the next contingency operation.
>
> —Major General Patrick D. Sargent, *Commander, Health Readiness Center of Excellence*

The purpose of this literature review is to establish a foundation of casualty evacuation principles through the lens of history, theory, practice, and doctrine. The first section will briefly look at past military leaders such as Napoleon's medical director, Baron Dominique-Jean Larrey, and Major Jonathan Letterman, the Medical Director of the Army of the Potomac in 1862. Nineteenth-century leaders like these men developed evacuation systems and doctrine still in use by modern armies at the time of writing this monograph. The next section provides an introduction to current evacuation doctrine including Field Manual 4-02, *The Army Health System*, Army Techniques Publication 4-02.3, *Medical Evacuation*, and Army Techniques Publication 4-25.12, *Casualty Evacuation* to determine their applicability to potential future conflicts. The literature review concludes with a summary of current assessments of potential challenges when conducting casualty evacuation in a more lethal battlefield. This summary includes an assessment of medical trends from recent Combat Training Center rotations and warfighters, concepts from current operational doctrine, and views from military leaders addressing the topic.

Over the expanse of the history of warfare, evacuation of the wounded is a relatively modern phenomenon. In ancient battle prior to the Enlightenment, casualty evacuation was a

rather simple affair. Combatants clashed at arm's length, engaged one another until someone was able to inflict a fatal blow, then moved on to the next target. When one side was routed or fled in mass, the engagement was over. There was no time to help the severely wounded because there was likely an enemy soldier with a sword, axe, or spear dripping with blood within a few feet of the wounded comrade.[10] Even if one could render aid, medical knowledge at the time was so rudimentary that aid caused more harm than good.[11] Therefore, casualty evacuation was simple; one either walked off the battlefield with superficial wounds or probably did not walk off at all. French artilleryman Colonel Ardent du Picq, an influential but lessor known theorist writing in the same period as Carl von Clausewitz and Baron Antoine Henri Jomini studied ancient combat extensively in his classic, *Etudes sur les combat: Combat antique et modern* (*Battle Studies: Ancient and Modern Battle)* posthumously published first in 1880 while gaining broader acceptance in the early 1900s.[12]

Battle Studies is mainly concerned with morale in combat, supported by du Picq's studies of ancient battles such as those in Greece, Rome, and campaigns conducted by legends such as Alexander and Hannibal. He noted that "In ancient combat, there was danger only at close quarters."[13] Du Picq then writes, "Whoever was that close knew he would be killed if he turned is back; because, as we have seen, the victors lost but few and the vanquished were exterminated."[14] Typically casualties remained low until one side's morale broke and they began to flee. This changed with the invention of ranged weapons and long-range fires, which increased lethality at a

[10] Richard A. Gabriel, *Between Flesh and Steel: A History of Military Medicine from the Middle Ages to the War in Afghanistan*, 1st ed. (Washington, DC: Potomac Books, 2013), 1.

[11] Ibid., 2.

[12] Michael Howard, "Chapter 18. Men Against Fire: The Doctrine of the Offensive in 1914," in *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, ed. Peter Paret, Gordon Alexander Craig, and Felix Gilbert, Princeton paperbacks (Princeton: Princeton University Press, 1986), 512–514.

[13] Ardent Du Picq, "Battle Studies: Ancient and Modern Battle," in *Roots of Strategy Book 2: 3 Military Classics*, trans. John Greely and Robert Cotton, 8th ed. (Mechanicsburg, PA: Stackpole Books, 1987), 123.

[14] Du Picq, "Battle Studies: Ancient and Modern Battle,"123.

distance in modern battle. This evolution, perhaps ironically, cost du Picq his life in the Battle of Metz in 1870 when a wayward artillery round fatally struck him.[15] To summarize, according to du Picq, in ancient combat, the strong, trained, and unified survive while the weak flee and die. In modern battle over vast distances with dispersed forces, strength and training do not carry the same value nor drastically increase the probability of success or at least survival.[16] These technological advances do not diminish the importance of morale, but it does change its nature. As war evolved to a state where "losses are as great for the victor as for the vanquished," building trust that soldiers will fight and maintain morale when away from direct supervision is more important than ever before.[17] One way to earn that trust is for soldiers to know that if wounded, considerable effort will be made to ensure they will not be left to die alone and afraid but that adequate medical care will be near in the point of injury. Colonel Ardent du Picq was one of the first theorists to study the effects of casualties and morale on individual and unit performance in battle. His time studying the Napoleonic campaigns as a student in the Saint-Cyr Military Academy in France from 1842-1844 was likely integral in the development of his ideas that still hold great value and relevance to current military theory and doctrine.

As with so many other elements of modern war, Napoleon and his Grand Armée laid much of the foundation for modern military medical practices. In August 1793, France enacted the *levée en masse*, mobilized all of her industry and resources, and conscripted 800,000 citizens to defend the Revolution.[18] While Napoleon personally had a mistrust for physicians, one of his senior medical officers, Baron Dominique-Jean Larrey transformed military medicine like never before. This was evident with several innovations to include the first use of ambulances on the

[15] Du Picq, "Battle Studies: Ancient and Modern Battle," 24.

[16] Ibid., 125-26.

[17] Ibid., 142.

[18] Michael Rapport, *The Napoleonic Wars: A Very Short Introduction*, 1st ed., Very short introductions 344 (Oxford: Oxford University Press, 2013), 56–57.

battlefield.[19] In Larrey's memoirs published in 1814, the reader gets a rare, in-depth account of one of Napoleon's most trusted leaders from the French Revolution through the fall at Waterloo. Larrey provides first-hand accounts of the conditions on the battlefield in over twenty-five campaigns and his rationale on a broad range of medical innovations. His emphasis on revamping evacuation started in Italy in 1794. In these battles, the armies were so large that the wounded were left where they lay for twenty-four to thirty-six hours until the roads cleared. The wounded were then moved one league back to the hospital to receive aid.[20] Modeled after the horse-drawn "flying-artillery," Larrey developed three divisions of "flying ambulances." Each division had 133 medical personnel assigned, to include surgeons, with twelve light and four heavy horse-drawn carriages.[21] The ambulances could follow the main attack and quickly treat or evacuate patients rearward without interfering with the main attack or resupply operations. Interestingly, Larrey was also the first to remove these capabilities from quartermaster control; a practice still used today.[22] The system itself ultimately failed in battles with extreme casualties and in disastrous campaigns such as Egypt in 1799 or Russia in 1812, where full wagons of wounded were abandoned during long retreats.[23] Regardless of their shortcomings, no other army had dedicated so much attention to medical care prior to Napoleon, even in spite of his mistrust. Larrey's innovations of evacuation using forward platforms that could match the speed of maneuver elements, triage principles of focusing assets on those who could be saved first, and battlefield medicine advances such as timing of amputations were later studied and adopted by

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[19] Bernard D. Rostker, "Providing for the Casualties of War: The American Experience Through World War II" (The RAND Corporation, 2013), 31–32.

[20] Dominique Jean Larrey, *Memoirs of Military Surgery, and Campaigns of the French Armies, on the Rhine, in Corsica, Catalonia, Egypt, and Syria; at Boulogne, Ulm, and Austerlitz; in Saxony, Prussia, Poland, Spain, and Austria*, trans. Richard Willmott Hall, Kindle Edition, vol. 1 (Miami: Joseph Cushing/University Press of Sergeant Hall, 1814), Location 1093.

[21] David Chandler and James Collins, eds., *The D-Day Encyclopedia* (New York: Simon & Schuster, 1994), 359.

[22] Gabriel, *Between Flesh and Steel*, 144.

[23] Ibid., 143.

the United States to address the heavy casualties experienced in the American Civil War four decades later.[24]

The final theorist instrumental to the formation of modern evacuation principles was Major John Letterman, a surgeon and the Medical Director of the Army of the Potomac during the American Civil War. When he assumed the position under General George McClellan in 1862, the Union Army had suffered significant losses in the Peninsular Campaign, and the medical support was "in shambles."[25] Upon arrival, Letterman received six directives from the Surgeon General, General William Hammond, to include a requirement to "arrange for the safe, effectual, comfortable, and speedy transportation of the sick and wounded."[26] Within the context of this study, his total revamping of the field ambulance system developed the concepts for evacuation still used in modern doctrine.[27] He got rid of the unreliable locals paid to perform casualty movement and received approval from General McClellan to form a unit of dedicated soldiers to train and deploy for the single purpose of locating and clearing the wounded from the battlefield and moving them to local or field expedient hospitals. Letterman added the concept of "control" to Larrey's initial evacuation ideas. "Control" is now one of the six Army Health System principles that means once a soldier is first treated by medical personnel, he or she will be tracked and monitored until reaching definitive care, wherever that may be in the system.[28] He also showed great foresight by linking the evacuation system to the rapidly developing rail and water networks. More than 225,000 casualties from both the Union and Confederate Armies were

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[24] Chetan Kharod, Brenna Shackelford, and Robert Mabry, "Chapter 39: Casualty Transport and Evacuation," in *Fundamentals of Military Medicine* (Fort Sam Houston, TX: Borden Institute, Office of the Surgeon General, 2019), 604–605.

[25] Robert J.T. Joy, "Jonathan Letterman," in *Builders of Trust: Biographical Profiles from the Medical Corps Coin* (Fort Detrick, MD: Borden Institute, Office of the Surgeon General, 2011), 38.

[26] Ibid., 39.

[27] Ibid.

[28] US Department of the Army, Field Manual (FM) 4-02, *Army Health System* (Washington, DC: Government Printing Office, 2013), 1–4.

transported by rail and another 150,000 by hospital ship to general hospitals during the final three years of the war.[29] Major Letterman's dedicated evacuation units were first used to great effect in the Battle of Antietam and earned Major Letterman the trust to make several more sweeping changes regarding military medicine.[30] His view that the medical force should always strive to "strengthen the hands of the Commanding General by keeping his Army in the most vigorous health, thus rendering it, in the highest degree…for fighting" remains especially true today in a transition back to LSCO.[31] If Larrey was the "father" of modern military medicine, then Major Letterman was his adopted American son.[32] His detailed evacuation planning starting forward at the point-of-injury and increasing capabilities rearward all the way to established civilian hospitals, a focus on prevention of injuries and getting soldiers back into combat after treatment, and providing care to both friendly and enemy forces has remained the model for most armies in modern war.[33]

Transitioning to the modern doctrine rooted in the ideas first used by leaders such as Larrey and Letterman, four documents apply in refocusing evacuation efforts in a more deadly fight. Using a top-down approach, the next section will first review Joint Publication (JP) 4-02, *Joint Health Services* to provide a big-picture of defining the Army's responsibility to the joint force. Next, Field Manual (FM) 4-02, *The Army Health System* will show how Army capabilities nest with joint requirements. Finally, Army Techniques Publication (ATP) 4-02.3, *Medical Evacuation* and ATP 4-25.12, *Casualty Evacuation* are summarized, providing insights into both major evacuation principles and baseline practices for army leaders and planners.

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[29] Gabriel, *Between Flesh and Steel*, 170–171.

[30] Dale Smith, "Chapter Two: A Heritage of Innovation," in *Out of the Crucible: How the US Military Transformed Combat Casualty Care in Iraq and Afghanistan* (Fort Sam Houston, TX: Borden Institute, Office of the Surgeon General, 2017), 5.

[31] Joy, "Jonathan Letterman," 35.

[32] Kharod, Shackelford, and Mabry, "Chapter 39: Casualty Transport and Evacuation," 605.

[33] Ibid., 606.

Starting with joint doctrine, JP 4-02, *Joint Health Services* defines each service's responsibility in the task of Patient Movement as well as some initial planning considerations. According to the document, the Army is primarily responsible for *intratheater* evacuation using ground or rotary-wing assets while the Air Force is responsible for *intertheater* evacuation out of the operating environment using fixed wing assets.[34] The joint pub also recognizes "management of a mass casualty situation is a complex task where success relies as much on well-practiced logistics and communications as it does on skilled medical treatment."[35] This implies that there needs to be coordination with both sustainment and maneuver planners for patient movement operations that exceed dedicated medical capabilities. A final term first defined in the joint publication is the theater evacuation policy. This is established by the Secretary of Defense with recommendations provided by the Joint Chiefs of Staff for every operating environment. The theater evacuation policy "establishes the maximum period of non-effectiveness (hospitalization and convalescence) that patients may be held within the theater for treatment" and would likely be very short in initial-entry operations adding pressure to dedicated medical evacuation resources to rapidly locate and clear the wounded.[36] Finally, JP 4-02 states "the decreased medical footprint and the increased patient movement requirements (during major operations) demand a more interdependent medical community, improved interagency and multinational partnerships, and joint solutions."[37] Therefore, casualty evacuation extends beyond the medical community in LSCO and requires detailed planning and rehearsals from several from a broad range of units and leaders.

[34] US Department of Defense, Joint Staff, Joint Publication (JP) 4-02 (w/Change 1), *Joint Health Services.* (Washington, DC: Government Printing Office, 2018), A-1-A-2.

[35] Ibid., VI–4.

[36] Ibid., VI–11.

[37] Ibid., A-2.

The principle Army medical doctrine is Field Manual (FM) 4-02, *Army Health System* which defines the Army Health System's role in both the *protection* and *sustainment* warfighting functions. FM 4-02 also defines the current mission command structure and provides an overview of the system of ten medical functional areas that synchronize diverse medical capabilities in theater.[38] Medical evacuation provides a vital linkage in maintaining continuity of care through the four roles of care, typically from the initial casualty collection point near the front line of troops to the corps support area and out of theater.[39] The doctrine defines the difference between Medical Evacuation (MEDEVAC), evacuation using dedicated medical platforms staffed and equipped to provide en route medical care, and Casualty Evacuation (CASEVAC); the unregulated movement of casualties using predesignated or opportune tactical or logistic aircraft and vehicles.[40] This differentiation is important to this study because these terms are often confused or used interchangeably, but much of this monograph is generating options for CASEVAC when dedicated MEDEVAC assets are overburdened in LSCO. Since CASEVAC is a function that is performed outside of the medical force structure, FM 4-02 does not provide much more information than a definition. Finally, the field manual discusses Medical Regulating, or the tracking of patient movement, which becomes exceptionally difficult in mass casualty scenarios using non-standard CASEVAC platforms and often does not start until a wounded Soldier arrives at the Role 2 medical treatment facility. It should be noted that the Army published FM 4-02 several years before the shift to LSCO, however now that FM 4-02's parent manual FM 4-0, *Sustainment* is updated, revisions to the supporting medical doctrine should follow shortly.

[38] US Army, FM 4-02, 1–11. The ten medical functional areas include: Medical Mission Command, Medical Treatment, Hospitalization, Medical Evacuation, Dental Services, Preventive Medicine, Combat Operational Stress Control, Veterinary Services, Medical Logistics, and Laboratory Services.

[39] Ibid., 8–1. See *Definitions* section for a description of each Role of Care.

[40] Ibid., 1–4 to 1–5.

Army Techniques Publication (ATP) 4-02.2, *Medical Evacuation* is the primary doctrine for Army MEDEVAC operations. This document establishes the MEDEVAC support protocol that requires "the higher role of medical care assets supporting forward and evacuating from the lower role or evacuation assets."[41] In theory, this keeps as much combat power focused forward as possible. By this protocol, the brigade combat team is responsible for transporting all casualties to its organic Role 2 Brigade Support Medical Company. The division or corps picks up evacuation responsibility from the Role 2 to the Role 3 hospital by using either the twenty-four ground ambulances from the Medical Company (Ground Ambulance) or the fifteen HH-60 Blackhawk MEDEVAC helicopters located in the Combat Aviation Brigade.[42] The doctrine identifies several planning factors in offense operations that include slow speeds due to damaged road networks, greater distances as the operation moves, and decreased capabilities at medical treatment facilities as they move with the offensive force.[43] These challenges, among many others, increase the likelihood of activating a valid CASEVAC plan to prevent unnecessary culmination or increased died-of-wounds rates, but the doctrine does a thorough job of addressing many of the challenges of LSCO regarding MEDEVAC.

The final Army doctrine reviewed covering evacuation operations is ATP 4-25.13, *Casualty Evacuation.* This non-medical manual is a collection of techniques and practices useful to all units conducting CASEVAC operations. Chapter 3 describes how to properly load and transport casualties in several common ground and rotary-wing platforms while urging planners to consider all available options such as civilian, joint, and coalition assets.[44] The configurations of the medium tactical vehicles and the Cargo Helicopter (CH)-47 Chinook are of particular

[41] US Department of the Army, Army Techniques Publication (ATP) 4-02.2, *Medical Evacuation* (Washington, DC: Government Printing Office, 2019), 2–9.

[42] Ibid., 2–12 to 2–13.

[43] Ibid., 2–17.

[44] US Department of the Army, Army Techniques Publication (ATP) 4-25.13, *Casualty Evacuation* (Washington, DC: Government Printing Office, 2013), 3–1 to 3–9.

importance because of their high loading capacity and availability within a division or corps to support the brigade combat teams. When planning for mass casualty situations, the doctrine states that "all available ground vehicles should be considered for augmenting medical evacuation assets in an emergency" and that vehicles and drivers should be identified early to support if needed.[45] One major shortcoming with the CASEVAC doctrine, however, is of the four platforms larger than HMMWVs with specific loading techniques, two are no longer utilized in large numbers by sustainment units.[46] Additionally, like much of the sustainment doctrine, ATP 4-25.13 was published several years before the doctrinal shift back to LSCO. Nevertheless, all units should train and be proficient on CASEVAC tactics, techniques, and procedures to reduce confusion during a mass casualty events where time has consistently shown to be the most important factor in saving soldiers' lives.[47]

Focusing on non-medical doctrine and writing, FM 3-0, *Operations* is the main driver to LSCO and articulates the doctrinal thinking on the risk associated with this type of fighting. The manual states "battlefields in large-scale combat operations have been more chaotic, intense, and highly destructive than those the Army has experienced in the past several decades."[48] It provides the example of Kasserine Pass, an opening battle in World War II where Allied soldiers had 1,333 casualties per day for the first three days of battle while warning that even more seasoned units should expect high casualty rates due to the inherent lethality of LSCO.[49] FM 3-0 provides a more recent example of an entire Ukrainian combat battalion being virtually destroyed in a matter of minutes from Russian long-range precision fires.[50] FM 3-0 resents challenges that directly

[45] US Army, ATP 4-25.13, 4–1.

[46] United States Army Combined Arms Support Command, "Sustainment Force Structure Book" (United States Army Combined Arms Support Command, September 2019). According to the publication, the M977 HEMMT has been phased out in recent MTOE updates.

[47] Kotwal et al., "Effect of a Golden Hour Policy," 22.

[48] US Army, FM 3-0 (w/Change 1), 1–2.

[49] Ibid.

[50] Ibid., 1–3.

relate to evacuation operations that include deploying in the initial stages of combat against a numerically superior enemy with anti-access and area denial capabilities such as robust air defense systems and long range artillery.[51] To defend against this, units will be far more dispersed, extending evacuation distances and much less reliant on air assets which will increase evacuation times and limit and already small pool of MEDEVAC capabilities. If FM 3-0 is correct, evacuation operations on this scale will be a challenge no one actively serving has experienced in their careers.

The recently published FM 4-0, *Sustainment* is the sustainment community's update addressing some of the LSCO challenges presented by FM 3-0. The manual states that in LSCO, a theater may experience 3,600 or more casualties per day.[52] To help support this demand, sustainment operations "will require greater precision in our distribution network" and a "flexible and adaptable sustainment structure" to meet mission requirements in an environment more susceptible to mass casualties.[53] FM 4-0 identifies the G4 or S4, the principle sustainment staff officer, responsible to coordinate the transportation support needed for CASEVAC.[54] The manual also says "Sustainment planners must be prepared to support ambulance exchange operations *on any asset* to reduce turnaround time of assets supporting medical evacuation."[55] To support this planning, operational medical regulating officers are placed in medical and sustainment brigades to coordinate and synchronize the limited MEDEVAC and non-standard CASEVAC assets.[56]

Unfortunately, while the manual states throughout that mass casualties must be included in the planning process, it places much of the burden on unit commanders despite stating earlier

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[51] US Army, FM 3-0 (w/Change 1), 1–3.

[52] US Department of the Army, Field Manual (FM) 4-0, *Sustainment Operations* (Washington, DC: Government Printing Office, 2019), 4–4.

[53] Ibid., 5–1.

[54] Ibid., 2–22.

[55] Ibid., 7–11. Emphasis added.

[56] Ibid., 5–8.

that CASEVAC is a G-4/S-4 responsibility.[57] Despite this inconsistency, FM 4-0 effectively identifies many of the LSCO evacuation challenges while appropriately spreading the burden for planning across the medical, sustainment, personnel, and aviation communities. However, it still leaves questions regarding who owns the mass CASEVAC responsibility out of the BCT area of operations that should be clarified in future updates. Perhaps this discrepancy is best summarized in The Center for Army Lessons Learned Newsletter 17-19, *Ten Fundamental BCT Skills Required to Win the First Fight.* In this 2017 publication, the author states, "At the (National Training Center), many sustainment rehearsals included leaders saying the right words, but never fully grasping what the words meant in terms of time, location, and method of resupply."[58] CASEVAC in sustainment planning is a complicated responsibility shared between the personnel, logistics, medical and aviation communities who each own competing demands over limited assets. This makes it difficult to justify statements that mass CASEVAC is simply a unit responsibility.

A final document with a more optimistic outlook on the grim nature of LSCO MEDEVAC is the article "Evolving Mass Casualty Combat MEDEVAC" by Major General Patrick Sargent. Major General Sargent is writing from a unique perspective as both the Commander of the Health Readiness Center of Excellence and a former MEDEVAC pilot in Operations Desert Shield / Desert Storm and the Global War on Terrorism.[59] In the article, Major General Sargent states that MEDEVAC, like virtually every other military function, will have to adapt to a more lethal future operating environment, but the most important change required is in

[57] US Army, FM 4-0, 5–8, 6–8, and 7-9. "Casualty evacuation is a unit level responsibility and must occur concurrently with operations."

[58] Brent Coryell, "Chapter 10: Sustainment in Decisive Action," in *Center for Army Lessons Learned Newsletter 17-19: Ten Fundamental BCT Skills Required to Win the First Fight* (Fort Leavenworth, KS: Center for Army Lessons Learned, 2017), 77.

[59] US Army Medical Center of Excellence, "Bio for Major General Patrick D. Sargent, Commanding General, U.S. Army Medical Center of Excellence," *U.S. Army Medical Center of Excellence*, last modified 2019, accessed January 26, 2020, https://www.cs.amedd.army.mil/Docs/sargent-bio.pdf?rev=3-2019.

one's mindset.[60] This change in mindset means the Army needs planners who grasp the dynamics of LSCO, sees opportunities and not just challenges, and refuses to "cede any advantage to an adversary that the adversary has not actually taken away" such as the use of air medevac near the front lines even without air superiority.[61] Finally, Major General Sargent rightfully places CASEVAC planning in the hands of operational level commanders when demand exceeds MEDEVAC resources, not just medical planners.[62] While writing specifically about MEDEVAC, what Major General Sargent proposes applies to CASEVAC operations as well. Consistent with ADP 4-02.2 but deviating from modern combat experience, Major General Sargent suggests air MEDEVAC should be saved for Priority I patients and ground MEDEVAC is primarily used for Priorities II through IV (see Table 1).[63] Perhaps a further shift in this mindset is necessary in LSCO that views MEDEVAC, both air and ground, as the primary method for all Priority I patients and CASEVAC for Priority II-IV. Nevertheless, this article serves as a sobering yet hopeful reminder that the conditions that led to so much success for the medical community in the last conflicts may not be present in the next one, but the people, assets, and pride remain. Now planners and commanders need to come together, like they have throughout American military history, to maximize limited assets to save as many wounded soldiers as possible.

[60] Patrick Sargent, "Evolving Mass Casualty Combat MEDEVAC," *Combat & Casualty Care*, no. Q3-Summer (2019): 4.

[61] Ibid., 7.

[62] Ibid., 6.

[63] Ibid.

Table 1. Table 2-1 from ATP 4-02.2 - Categories of Evacuation Precedent

Priority I—URGENT	Is assigned to emergency cases that should be evacuated as soon as possible and within a maximum of one hour in order to save life, limb, or eyesight and to prevent complications of serious illness and to avoid permanent disability.
Priority IA—URGENT-SURG	Is assigned to patients that should be evacuated as soon as possible and within a maximum of one hour who must receive far forward surgical intervention to save life, limb, or eyesight and stabilize for further evacuation.
Priority II—PRIORITY	Is assigned to sick and wounded personnel requiring prompt medical care. This precedence is used when the individual should be evacuated within four hours or if his medical condition could deteriorate to such a degree that he will become an URGENT precedence, or whose requirements for special treatment are not available locally, or who will suffer unnecessary pain or disability.
Priority III—ROUTINE	Is assigned to sick and wounded personnel requiring evacuation but whose condition is not expected to deteriorate significantly. The sick and wounded in this category should be evacuated within 24 hours.
Priority IV—CONVENIENCE	Is assigned to patients for whom evacuation by medical vehicle is a matter of medical convenience rather than necessity.

Source: US Department of the Army, Army Techniques Publication 4-02.2, *Medical Evacuation* (Washington, DC: Government Printing Office, 2019), 2-2.

In summary, this literature review established a foundation of casualty evacuation principles through the lens of history, theory, practice, and doctrine. French artilleryman Colonel Ardent du Picq is one of the first theorists to focus on the effects of battlefield casualties and their effect on unit morale. Napoleon's chief surgeon, Baron Dominique-Jean Larrey, developed the first known system of dedicated casualty evacuation. His principles set the foundation that Major Jonathan Letterman used to evacuate Union and Confederate soldiers in the US Civil War fifty years later. These principles of rearward evacuation by a variety of dedicated means through ever-increasing medical capabilities from the front line to fixed hospitals in the rear remain in effect today. Letterman's system remains central to current joint and army medical and sustainment doctrine used to support military operations. What is needed now is a change in mindset to effectively implement these principles in a more lethal battlefield with much higher potential for mass casualty situations at each echelon of care. Commanders and planners must be cautious about the dangers placed on servicemembers without becoming crippled by risk aversion of future potential conflicts.

Methodology

> There is no one thing that affects the morale of troops or has a greater effect for good morale of troops in operations than the knowledge of the fact that they will be properly cared for if wounded.
>
> —General John L. Dewitt, *Quartermaster General of the Army*
> Statement made during Colonel J.L. Snyder's presentation on amphibious evacuations in 1945

This monograph uses a structured case study approach to assess the US Army's ability to clear the battlefield of wounded in LSCO. There are two case studies in the project. The first case study is an analysis of the planning and execution of evacuation operations during the Normandy Campaign in 1944. The second case study is an assessment of the current structure available to the division and corps to conduct MEDEVAC and CASEVAC operations in LSCO. These two case studies will attempt to answer the five focused research questions raised in the introduction to provide future planners options to best support echelon-above-brigade maneuver and sustainment plans in a highly-lethal yet resource-constrained operating environment.

Beginning with the first case study, the Normandy Campaign presents a unique set of challenges for planners in a joint operating environment in offensive operations against a peer threat. While it may be problematic that the chosen campaign occurred more than seventy-five years ago, the actual principles of evacuation are essentially unchanged from that time. The challenges the planners had to address are also mostly the same issues planners are attempting to solve today. The campaign is a sound example of how to provide necessary evacuation support to a moving army during heavy fighting without an established medical base within walking distance. It also provides multiple dilemmas of providing support to numerous amphibious landings, concurrent airborne operations behind enemy lines, and an adversary who can effectively target air, land, and maritime domains simultaneously. Primary sources such as the initial medical planning order for Operation Overlord and multiple after-action reports compiled by the War Department will provide qualitative research for the case study. This qualitative

research will be supplemented by multiple historical books on the medical support to the Normandy Campaign by the Center for Military History and several other historians and authors. Initial casualty estimates, actual casualty reports, and evacuation records provide quantitative research for the study. The hypothesis for this case study is that the US military had to maximize non-standard evacuation platforms in the early portion of the campaign to account for an insufficient medical establishment during the invasion. This case study attempts to answer the first focused research question: How has the military handled high-demand casualty evacuation operations in the past?

The second case study examines the current evacuation capacity of the corps and division assets supporting the brigade combat teams. This case will look at the amount of dedicated air and ground MEDEVAC assets currently in the active and reserve force. It will then assess the viable CASEVAC platforms in the sustainment and aviation community that can support evacuation efforts. Finally, the study will look at various casualty estimates from recent combat training center rotations, division and corps warfighter exercises, and doctrinal casualty estimate planning factors to get an idea of what causality rates may be in LSCO. This case study aims to answer the remaining research questions. What is the maximum MEDEVAC capacity the current medical force can support based on existing inventory and the doctrinal allocation to a theater? How many casualties are divisions or corps expecting in the initial phases of LSCO? What non-medical units are available to the corps or division to use for CASEVAC, and what is their lift capacity? What other options can division and corps planners generate to clear the battlefield of wounded, injured, or ill soldiers?

Case Study 1: Evacuation Efforts in the Normandy Campaign

> On the far shore we planned for the early phasing-in of support service troops. By doing that, we got into trouble with the combat commanders. The combat commanders initially said, "All we want are doughboys ashore, 'trigger-squeezers'; we are not going to have any casualties."
>
> —Colonel J.L. Snyder, Medical Corps, *1945*

In 1942, the United States joined the Allies and began planning for an invasion of German-occupied France. Medical planners faced an incredible amount of challenges developing a concept of support on how to treat and evacuate the wounded. There were substantial questions about the composition and capabilities of the German defensive lines and reserves. The American forces were relatively untested and lacked doctrine for amphibious landing operations. Even the experience gained in the future Pacific campaigns was far different from Europe, making the two mostly incomparable. Casualties required an eighteen-hour transport through contested waters across the English Channel.[64] There would be no established military or civilian hospitals, evacuation assets, or secured airfields on the far side and limited lift platforms across the Channel. These factors meant maneuver and medical planners had to make difficult trade-off decisions on combat versus sustainment power. There was distinct land, maritime, air, and multinational elements, including massive airborne insertion operations deep behind enemy fortifications that leaders must consider, much of which was untested at this level. Finally, it was uncertain how much tolerance the American public would have for heavy casualties in Europe, when it was Japan's attack on Pearl Harbor that formally pulled the United States into the war. The ability for commanders and planners to generate options in such challenging and uncertain conditions was paramount for any hope for success for the invasion force into France.

[64] J.L. Snyder, "Medical Problems in Amphibious Operations, Including Evacuation on the Beaches of Normandy (Declassified)" (Washington, DC, August 4, 1945), 9.

The Normandy case study has three sections. The first section is an analysis of the planned medical support to landing operations and the establishment of the lodgment to include the value of doctrine in support of planning. Then, the study will assess what happened in comparison to the plan, any adjustments made, and what new challenges arose. The case study concludes with an assessment of lessons learned from the Normandy Campaign for modern operational planners regarding casualty evacuation.

Beginning with the initial medical plan, this section is separated into three subsections: the doctrinal foundation of the plan, a general review of the maneuver plan and how medical planners provided support, and an assessment of the evacuation platforms available. Securing a lodgment into German-occupied France by cross-channel assault created many challenges for Army planners. Planning for the amphibious assault started in April 1942.[65] At the time, there was little understanding of the German disposition of troops on the continent and only a broad plan of the simultaneous landing of five or six divisions along a more than 400 kilometer front from Pas-de-Calais to Cherbourg.[66] The doctrine on amphibious operations was in the process of development but included nothing on evacuation practices.[67] The evacuation field manual, Field Manual 8-35, *Transportation of the Sick and Wounded (21 February 1941)*, also offered little of value beyond techniques to modify certain vessels for casualty transport.[68] Finally, the failed Dieppe Raid would not occur until several months later, so there was very little historical data to begin planning for evacuation procedures and best-practices. Even lessons learned from the Pacific provided only limited value. The island-hopping campaigns included much smaller areas of operation, increased demand of sea evacuation, constant challenges with crossing reefs, and

[65] Graham Cosmos and Albert Cowdry, *Medical Service in the European Theater of Operations* (Washington, DC: Center of Military History, 1992), 149.

[66] Ibid.

[67] Ibid., 149–150.

[68] The War Department, Field Manual (FM) 8-35, *Transportation of the Sick and Wounded* (Washington, DC: Government Printing Office, 1941), 161.

much different beaches prevented the use of similar landing craft.[69] As with any operation, though, planning starts with incomplete information, and the sustainment planners began developing courses of action to support the combat. The planners' starting point was in doctrine.

The primary medical doctrine used in planning medical support for the invasion was Medical Field Manual 8-10, *Medical Service of Field Units* published in March 1942. FM 8-10 was a well-organized version of Major Letterman's system from the Civil War. Many of the general values held in 1942, in turn, match modern doctrine. However, this document had a far greater emphasis on evacuation than its modern equivalent, FM 4-02, *The Army Health System*. These include clear concepts of triage, rear echelon elements sending assets forward to evacuate the wounded, and arraying forces to render the "greatest service to the greatest number."[70] It describes the role of the medical service is to support operations by helping solve two major military problems. The first is the "Conservation of mobilized manpower" by ensuring only the "relatively fit" take the field, protection from health hazards known today as Force Health Protection, and prompt treatment to efficiently restore casualties into future combat replacements.[71] The second major military problem the medical service of 1942 must solve was "Prevention of adverse effects of unevacuated casualties upon combat efficiency." This problem directly addresses the effect mass casualty events have on combat unit mobility and the "depressing effect upon soldiers."[72] FM 8-10 states, "The evacuation, care, and treatment of sick and injured men and animals in all situations" as the Medical Department's primary mission.[73] The manual explicitly states that evacuation is both the most challenging and important task in all

[69] Snyder, "Medical Problems in Amphibious Operations," 10.

[70] The War Department, Medical Field Manual (FM) 8-10, *Medical Service of Field Units* (Washington, DC: Government Printing Office, 1942), 2.

[71] Ibid.

[72] Ibid., 2–3.

[73] Ibid., 3.

of the Medical Department, one that involves understanding from commanders at all levels.[74] Finally, the manual notes that combat organized evacuation must be present in combat in the instant contact is received and that the care of wounded is "as important then as it will ever be.[75]"

Clear doctrine helped organize CASEVAC. Army, Corps, and Division commanders were responsible for evacuation operations within their commands. This is accomplished through the advice of the senior surgeon on staff.[76] The Division Surgeon, in particular, was more than a senior medical officer on the special staff as seen today but was also the commander of the division medical unit assigned exclusively to the command. This unit typically included three battalions performing three different evacuation functions: Collecting, Ambulance, and Clearing (see Figure 1).[77] Collecting units were the tip of the evacuation spear and removed casualties from aid stations or directly from the field, usually through manual litter carries or assisting the walking wounded.[78] Collecting units often operated at or near the front lines, and multiple units were in the division area of operations. Each division or echelon then had one Clearing unit responsible for the final disposition of the wounded through sorting or triage.[79] Division surgeons were responsible for consolidating all of their wounded to their clearing stations, at which point the supporting armies provided evacuation assets further rearward. Ambulance units provided transportation between Collecting and Clearing units and between hospitals and are found in the medical regiments or within the collecting companies. The seeds of modern CASEVAC were planted in FM 8-10 when discussing options in the event the division is cut off from communications or army-level ambulances. In these events, division commanders have three

[74] Ibid., 6.

[75] The War Department, FM 8-10, 17.

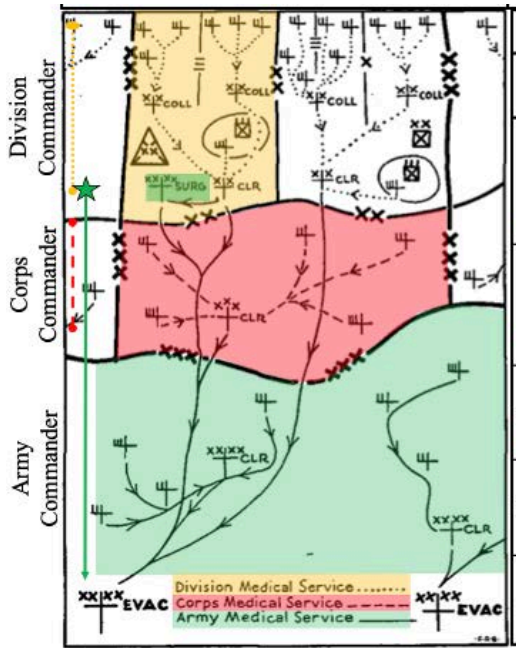
[76] Ibid., 9. "Commanders are responsible for the medical service of their commands. Whether the command be large or small, and whether the exercise of the functions of command be complex or simple, the commander must be the controlling head."

[77] Ibid., 27–31.

[78] Ibid., 61–62.

[79] Ibid., 98.

alternatives. First, they can evacuate their own casualties rearward with internal protection. Next, they can carry their casualties until restoring communication. Finally, they can abandon their casualties with supporting medical staff.[80]



Casualty Chain of Evacuation in World War II

WWII Echelon	Facility	Transportation Means	Responsibility
Echelon I	Aid Station / Unit Dispensary	Walking, manual transport or litter, ambulance or other vehicles	Unit medical personnel
Echelon II	Division Collecting Stations to Clearing Stations	Walking, manual transport or litter, ambulance or other vehicles	Medical Battalions, Squadrons or Regiments, Collecting, Ambulance and Clearing elements
Echelon III	Mobile Hospitals: Evacuation, Surgical, or Convalescent	Ambulance, Rail, Airplane	Army Medical Service or Independent Corps Medical Service
Echelon IV	General Hospitals, Hospital Centers, Station Hospitals	Rail, Water Transport, Airplane, Ambulance	Medical Service of the Theater of Operations
Echelon V	Hospitals in the Zone of the Interior (ZI)	Rail, Water Transport, Airplane, Ambulance	Medical Service of the General Headquarters or Zone of Interior

Figure 1: Chain of Evacuation within the Combat Zone. Color and command authority added by author. Chart on the left taken from The War Department, Medical Field Manual 8-10, *Medical Service of Field Units* (Washington, DC: Government Printing Office, 1942), 7; table on the right from Bernard Rostker, "Providing for the Casualties of War: The American Experience Through World War II" (The RAND Corporation, 2013), 194.

One other medical manual of note used during the initial planning of the invasion was FM 8-35, *Transportation of the Sick and Wounded.* This publication describes the means and methods of patient transportation in the field. FM 8-35 has chapters dedicated to transportation techniques using litters and various ground, air, rail, and water platforms. Each chapter includes both dedicated medical assets as well as modifications to non-medical platforms in emergencies relative to the respective mode.[81] The balance between medical and non-medical platforms mirrors the modern MEDEVAC/CASEVAC system without specific terminology. Even in its infancy, planners realized the advantages of air evacuation due to speed, comfort, and increased

[80] The War Department, FM 8-10, 106.

[81] The War Department, FM 8-35.

morale. However, this asset is not available without air superiority.[82] Figuring out how to get enough dedicated medical assets across the channel when the enemy would likely have air superiority and an unbroken defensive line was the central problem planners faced. FM 8-10 and FM 8-35 formed the doctrinal framework planners used to start addressing the operational problem.

Initially, operational and strategic planning occurred without medical planners. This exclusion created a disconnect between sustainment and combat planners, causing the development of nineteen separate plans to try and address multiple potential courses of action.[83] After multiple training exercises and reports from other theaters experiencing higher than expected casualties, medical planners became more integrated into the planning process.[84] Finding the right balance between combat and sustainment forces is often tricky, and it certainly was in planning for Normandy. Reducing combat power for support means commanders take the risk of having too little combat power to meet the objective and may increase casualties. Bringing too little support means as casualties mount, there is not enough dedicated personnel to take care of the wounded requiring maneuver forces to support the wounded. This pull from combat power also reduces the number of forces available to complete the objective, likely decreasing morale while causing more casualties and an increased rate of injured soldiers' dying of wounds. To strike the right balance, medical planners must know the maneuver plan and anticipate what assets they would need to provide adequate support.

The overall plan for Operation Overlord centered around seizing a lodgment near the French city Caen. The German defense was designed to deny access to the established ports,

[82] The War Department, FM 8-35, 137.

[83] Snyder, “Medical Problems in Amphibious Operations,” 1.

[84] Ibid., 1–2.

which the Germans deemed necessary for any build-up of Allied forces across the channel.[85] Therefore, the beaches near Caen were much less defended than the Pas de Calais to the east or Cherbourg to the west while allowing access to Allied ships and air support from across the channel.[86] The beaches near Caen were among the only beaches that could support the simultaneous landing of three divisions, while the deep area could also support parachute landing operations.[87] The original invasion planning staff known as the Chief of Staff to Supreme Allied Command (COSSAC) felt it was impossible to assess the size of the German forces with any accuracy, but expected no more than two infantry and one armored division on D-Day.[88] The German forces would increase by two divisions on D+1 and D+2 and up to nine divisions by D+8.[89] While there was not a significant naval threat, the German Air Force was of grave concern. Unless the fighter strength was reduced, the amphibious assault may not be possible. The uncertainty of enemy strengths, concern for the strength of German airpower, and long lines of communication across the channel made casualty estimations incredibly challenging to calculate correctly.

While the COSSAC staff could not adequately assess the enemy situation, there was a sound understanding of the Allied forces available. By 1 May 1944, the Allies expected between twenty-six and thirty divisions in the United Kingdom, including two airborne divisions and six airborne regiments.[90] There were significant transportation limitations, however. First, there was only enough aircraft to move two-thirds of a single division at one time. Next, there were limitations on landing craft and physical space along the beaches near Caen that would permit no

[85] The General Board, *Strategy of the Campaign in Western Europe: 1944-1945* (Washington, DC, 1945), 7.

[86] Ibid., 7–8.

[87] Ibid., 9.

[88] Ibid., 8.

[89] Ibid.

[90] Ibid., 10.

more than five divisions by D+2, eleven divisions by D+6, and one additional per day until D+24.[91] To support future air operations and potential air evacuation, it was expected that two airstrips, one at each beach, would be established by D+3, six airfields by D+6, and fourteen airfields by D+14. By the time Operation Neptune, the assault phase of Operation Overlord, was finalized on 1 February 1944, five total Allied divisions would require support along more than seventy kilometers of beach. Additionally, the 82d and 101st Airborne Divisions would jump behind enemy defenses on the far western flank while the 6th Division (UK) would jump into the east.[92] These two factors, coupled with the high probability for casualties, drove a very rigid Theater Evacuation Policy for the invasion force.

During the two years prior to D-Day, while Allied Forces waged campaigns in North Africa and Italy, the medical plan known as Annex 9 to Operations Plan Neptune was published and covered the general plan from D-Day to D+90.[93] As a reminder, the theater evacuation policy is the length of time units are responsible for holding patients before evacuating to the next higher echelon of care in order to preserve as much bed-space as possible in high-casualty engagements. In modern times, the Secretary of Defense sets the policy, but in WWII, local commanders determined the length.[94] Since each division had its organic medical regiment, those assets would be the first on the ground to support evacuation operations until a lodgment was secured. Planners did not expect to have functional hospitals established until D+19.[95] To support the gap in hospital coverage, commanders set an evacuation policy of "All", meaning every casualty required evacuation back to the United Kingdom until D+19.[96] At D+20, the policy would rise to

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[91] The General Board, *Strategy of the Campaign in Western Europe: 1944-1945*, 11.

[92] Ibid., 17.

[93] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, *Annex 9 to Communications Zone Plan: Communications Zone Medical Plan*, April 17, 1944.

[94] The War Department, FM 8-10, 180.

[95] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, *Communications Zone Medical Plan*, 12.

[96] Ibid.

seven days until D+40, fifteen days until D+60, and thirty days until D+90. Airborne units only would receive care from organic assets until a link-up occurred with ground forces seizing Utah Beach. An evacuation policy demanding immediate evacuation of casualties is exceptionally taxing, especially for a force immediately separated by the channel upon landing.

The number of days in the initial evacuation policy were set so low by senior commanders because of the extremely high casualties estimated by planners. Using Medical Field Manual 8-55, *Reference Data* as a starting point, it was expected that a division would receive up to 15 percent per day, of whom 30 percent would be killed and 70 percent would be wounded. Of the wounded, 50 percent were predicted to be "walking-wounded" while 50 percent would require litter transport.[97] That translates to more than 4,500 casualties requiring evacuation from just the Americans on D-Day and an average of more than 1,600 per day until hospitalization was established in France, referred to as the far-side of the English Channel during planning (See Figure 2).[98] Twenty-five 1,000-bed hospitals were planned to meet the casualty demand across the Communications Zone, but may not be available until D+19.[99] Meeting this demand required joint coordination between Army and Navy assets and creative phasing of equipment. Three chief evacuation problems that demanded special attention were patient tracking, water evacuation, and the property exchange replacing litters, blankets, and supplies for casualties moving rearward.[100]

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[97] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, *Communications Zone Medical Plan*, 16.

[98] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, "Inclosure 3 to Annex 9: Communications Zone Medical Plan - Casualty and Evacuation Estimate," April 17, 1944. "Inclosure" was the common spelling of the word "enclosure" in 1944.

[99] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, "Inclosure 1 to Annex 9: Communications Zone Medical Plan - Tentative Location of Fixed Com Z Medical Installations - D+90," March 27, 1944.

[100] Blanche Armfield, *Medical Department, United States Army: Organization and Administration in World War II* (Washington, DC: Office of the Surgeon General, 1963), 353.

FM 8-55, *Reference Data*
Doctrinal Planning Factors

Initial Daily Casualty Estimate			
	Percentage by Battle Day Type		
Type of Organization	"Light"	"Severe"	"Maximum"
Brigade/Regiment	2.5%	15%	35%
Division	1%	8%	12%
Corps	.5%	3%	5%
Army	.35%	1%	2.5%

Produced Estimate

Annex 9 - Medical Inclosure 3 - Evacuation Estimate (D-Day through D+18)

Evacuation Policy	Day	Casualties*	Evac to UK**	Cumulative Evac
All	D	4688	4551	4551
All	1	2515	2443	6994
All	2	2448	2380	9374
All	3	4781	4644	14018
All	4	1274	1243	15261
All	5	660	648	15909
All	6	737	724	16633
All	7	821	670	17303
All	8	888	1009	18312
All	9	948	1003	19315
All	10	999	1049	20364
All	11	1105	1222	21586
All	12	1154	1164	22750
All	13	1204	1194	23944
All	14	1263	1253	25197
All	15	1354	1344	26541
All	16	1444	1434	27975
All	17	1533	1522	29497
All	18	1624	1612	31109
Total	**19**	**31440**	***1637***	**31109**

*Casualties include both combat and disease/non-battle injury
** Total column is Average per Day

Figure 2: Initial Casualty Estimate During the Period of 100 percent Evacuation. Table created by author. Data on the left from The War Department, Medical Field Manual 8-55, *Reference Data* (Washington, DC: Government Printing Office, 1942), 47. Data on the right from Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, "Inclosure 3 to Annex 9: Evacuation Estimate," 1.

To meet the evacuation demands based on potential casualty estimates and available resources, planners established areas of responsibility regarding transportation and logistics on both sides of the channel for the Army and Navy (See Table 3). The four dedicated naval hospital ships were too risky to place so far to shore and could not meet the daily demand of up to 5,000 cross-channel evacuations. It was then decided to structurally convert 54 of the 103 Landing Ship, Tank (LST) transports into patient transports. The converted LSTs could carry 294 litters and an additional 150 walking wounded, although the daily planning factor was 75 litter and 75 ambulatory casualties.[101] Each had a team of Army and Navy doctors and medics who could provide en route care and even surgery for the eighteen-hour return trip.[102] The conversion

[101] Cosmos and Cowdry, *Medical Service in the European Theater of Operations*, 240–241.

[102] Snyder, "Medical Problems in Amphibious Operations," 9.

created an average daily evacuation capacity of 8,100 casualties and a maximum of nearly 24,000. Additionally, each LST carried a predetermined one-hundred fresh litters, 320 blankets, four splint sets, three dressing cases, and eight boxes of plasma to push to land forces until 300 total exchanges occurred.[103] These forced exchanges immediately put 30,000 litters and 96,000 blankets plus supplies on the far shore at nearly no cost to minimal cargo space.[104] The use of the LST did carry one significant risk worth noting. Due to its use of transporting combat troops to the far-side, the platform could not bear the Red Cross granting protection from the Geneva Convention.[105] Nevertheless, the LST conversion was a smart way of addressing two of the three major evacuation problems of mass water evacuation and transport of medical supplies into the theater. It would prove to be a primary workhorse for the initial invasion.

Table 2. Service Responsibilities on the Near- and Far-Side of the English Channel

	Service Specific Responsibilities on the Near- and Far-Side of the English Channel	
	Near-Side (UK)	**Far-Side (France)**
NAVY	* Conversion of All Landing Ship, Tank (LST) for casualty transport * Loading of litters, blankets, and supplies for equipment exchange on far-side * Liason with Army medical Planners regarding approriate	* Property Exchange of supplies while gathering casualties * Medical Care of all casulties received on far-side * Transportation of casualties when DUKWs are not available * Unloading of DUKWs, boats, or other crafts used to transport from shore to ship to LSTs * Delivery to designated near-side ports
ARMY	* Establishment and maintenance of holding facilities at ports to receive casualtes from returning LSTs * Unloading of all ships and craft and specificed docks * Provision of medical supplies to exchange supplies and equipment with returning LSTs * Emergency medical units at non-designated ports for casualties returning on unplanned or non-standard vessels * Liason with Navy for reception of near-side casualties	Medical services to all personnel landward of the highwater mark * Liason with Navy shore party for evacuation requirements * Provision of sufficent DUKWs for evacuation from shore-to-ship * Loading of DUKWs, craft, and boats used for water transport to LSTs * Loading of all evacuation vehicles on land * Transportation of DUKWs to LSTs, when feasible * Lateral movement of casualties between beaches
DUKW: Nomenclature for amphibious wheeled vehicle used by the Army; commonly referred to as "Ducks"		

Source: Created by the author. Information from Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, "Inclosure 4 to Annex 9: Communications Zone Medical Plan - Initial Evacuation of Casualties from Far to Near Shore: Army/Navy Responsibilities," March 27, 1944, 1–3.

[103] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, "Inclosure 4 to Annex 9: Communications Zone Medical Plan - Initial Evacuation of Casualties from Far to Near Shore: Army/Navy Responsibilities," March 27, 1944, 2–3.

[104] Cosmos and Cowdry, *Medical Service in the European Theater of Operations,* 241.

[105] Ibid., 246.

The plans for rail and air evacuation were more straightforward than the water evacuation challenge. Rail platforms were not expected until D+56, at which point the Navy would begin to transport hospital train cars across the channel at one car every five days to augment converted hospital cars.[106] Upon establishment of landing strips and airfields starting D+3, the Ninth Air Force assumed air evacuation operations. In a similar division of labor between the Army and Navy, the Air Force converted every troop-carrying aircraft into litter-bearing evacuation platforms without the protection of the Geneva Cross.[107] The Air Force would then provide en route care across the channel until transporting back to Army ground units at the near-side airfields. Air and rail evacuation usage would increase over time as more airfields formed, enemy anti-air was suppressed, more hospitals moved into theater, and theater evacuation policy increased in days.

In summary, divisional medical regiments through their collecting, clearing, and ambulance units provided ground evacuation and were responsible for operations above the high-water mark. The Navy provided water evacuation on four Navy hospital ships and LSTs augmented with Army doctors, medics, and supplies; providing cross-channel en route care. The Ninth Air Force would provide air evacuation using transport planes converted to carry casualties and would be available on approximately D+3. Rail transportation did not factor into the initial plan as hospital cars would not begin to phase in until after D+56. This case study will now shift focus to the outcomes from the actual invasion.

The result of years of planning, refinement, build-up, training, and anticipation was finally realized on June 6, 1944. By the time Operation Cobra commenced on July 26, completing the breakthrough of the German defensive line, the 770,000 total US forces in theater had

[106] Headquarters, Forward Echelon Communications Zone, European Theater of Operations, US Army, *Communications Zone Medical Plan*, 11.

[107] Ibid., 13–14.

sustained 73,000 casualties.[108] This 9.5 percent casualty rate created an average of 1,460 casualties per day for the US forces. By then, there were several established hospitals, landing fields for air MEDEVAC, ground ambulances to alleviate manual litter-bearers, and substantial supplies. On D-Day however, there would be exposed soldiers, no established medical footprint, an eighteen-hour ship ride to the nearest hospital, and many unknowns.

Operation Neptune began as Allied forces consisting primarily of American, British, and Canadian troops traveled across the English Channel on Navy ships. Simultaneously, thousands of American and British paratroopers prepared to land on the other side of the German defensive line known as the Atlantic Wall.[109] The paratroopers would be immediately cut off from cross-channel evacuation assets until link-up occurred with the 4th Infantry Division amphibious soldiers on Utah Beach. While exact casualty numbers remain difficult to determine due to extreme chaos, poor documentation, and significant mixing of units during both airborne and amphibious operations, the rough numbers are not far off from what planners initially forecasted. The D-Day casualties were lower than the original estimates. However, what the estimates did not account for were the stark differences in the resistance at Omaha and Utah beaches that were merely sixteen kilometers apart (see Table 3). It is difficult to find a better example of the importance of flexibility in medical planning for LSCO then when comparing these experiences.

At Utah Beach, the 23,000 4th Infantry Division soldiers achieved most of its objectives, including the critical link-up with the 101st Airborne Division while experiencing only 197 casualties, most of whom were either missing at sea or injured from clearing mines.[110] A combination of favorable landing conditions, concurrent airborne operations limiting German

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[108] W. Denis Whitaker, Shelagh Whitaker, and J. T. Copp, *Normandy: The Real Story: How Ordinary Allied Soldiers Defeated Hitler*, 1st ed. (New York: Presidio Press/Ballantine Books, 2004), 18.

[109] Gordon Harrison, *Cross-Channel Attack* (Washington, DC: Center of Military History, 1951), 131–144.

[110] Will Fowler, *D-Day: The First 24 Hours* (London, UK: Amber Books Ltd, 2019), 123.

counter-attack, and recent flooding left the defenses bare.[111] Six miles to the east at Pointe du Hoc, conditions were far worse. Two-hundred twenty-five rangers from the 2nd Ranger Battalion were among the hardest hit of all D-Day forces and lost nearly 60 percent of their men attempting to destroy the enemy artillery capable of targeting both beaches.[112] Omaha Beach, with steep hills, 400 meters of sand during low-tide, limited ravines that canalized troops attempting to seize high-ground, and many natural obstacles made it defensible even by inexperienced soldiers.[113] Despite the unfavorable conditions, seizing Omaha was necessary to connect the American and Allied forces to the east and west.

Table 3. Estimated D-Day Casualties

	D-Day Casualties*					
Unit	**Location**	**Killed**	**Wounded**	**Missing**	**Total**	**Source**
V Corps/First Army:	Omaha Beach	349	597	64	1,568	1
1st Infantry Division:	Omaha Beach	107	740	411	1,346	1
29th Infantry Division:	Omaha Beach	321	710	231	1,272	1
82d Airborne Division:	Ste. Mère-Eglise	156	347	756	1,259	2
101st Airborne Division:	Carentan	182	557	501	1,240	3
US Navy/Coast Guard/Royal Navy (UK):	Omaha Beach	65	119	15	539	1
4th Infantry Division:	Utah Beach	41	96	60	197	4
Eighth Air Force:		10	0	0	10	1
D-Day Totals:	**Normandy**	**1,231**	**3,166**	**2,038**	**7,431**	
*	Not all totals match sum of KIA/WIA/Missing due to many units not differientating in unit reporting, particularly in V Corps/First Army					
Source 1:	Balkoski, *Omaha Beach,* 350-352.					
Source 2:	Harrison, *Cross-Channel Attack,* 300.					
Source 3:	Harrison, *Cross-Channel Attack,* 284.					
Source 4:	Fowler, *D-Day: The First 24-Hours,* 123.					

Sources: Table created by the author. Numbers come from multiple sources cited in the table.

[111] Harrison, *Cross-Channel Attack*, 300–304.

[112] Fowler, *D-Day*, 125–126.

[113] Stephen E. Ambrose, *D-Day, June 6, 1944: The Climactic Battle of World War II* (New York: Touchstone, 1995), 320–321.

The raw casualty numbers at Omaha Beach only tell part of the story. Of the approximately 34,000 US soldiers who landed at Omaha on D-Day, 4,186 or 12.2 percent were casualties. This rate was almost exactly what was estimated during planning, but many individual units received much higher casualty rates. The best estimates of the initial landing forces were nearly triple that number.[114] In perhaps the worst case, Company A from the 116th Infantry Regiment lost all but a few dozen men of more than 200 soldiers, and virtually every survivor was wounded in a matter of minutes.[115] One thirty-man assault-force from the company lost every single member to enemy machine-gun fire before a single soldier could exit the landing craft. Every subsequent landing had to fight through and over that carnage. Engineer units were severely attrited, often experiencing more than 80 percent casualties.[116] The only coverage available came from the regimental aid stations of just a few doctors and medics established at the bottom of bluffs where direct fire was at least limited (See Figure 3). Dragging and litter carry were the only means of evacuation. Aid stations were quickly overwhelmed, resulting in many of the wounded dying who in normal battlefield conditions may have lived.[117] Ultimately, Omaha Beach is a sobering example that when medical coverage is needed most, often in the initial invasion against a fortified defense, it is likely least available.

Figure 3: A "Regimental Aid Station" on Omaha Beach on D+1. A single provider may have more than eighty casualties at any given time. Graham Cosmos and Albert Cowdry, *Medical Service in the European Theater of Operations* (Washington, DC: Center of Military History, 1992), 209.

[114] Joseph Balkoski, *Omaha Beach: D-Day, June 6, 1944*, 1st ed. (Mechanicsburg, PA: Stackpole Books, 2004), 343.

[115] Ambrose, *D-Day, June 6, 1944*, 328.

[116] Balkoski, *Omaha Beach*, 351.

[117] Ibid., 329–331.

Despite the best intentions of the Army providers on the ground and the Naval personnel shuttling forces onto land, very few casualties were evacuated from Omaha Beach in the first forty-eight hours. It was simply too dangerous to move rearward back through enemy fire. It was not until D+2 that casualties from the far-side were evacuated at any meaningful rate (see Table 4). To achieve this level of evacuation, the decision to augment the hospital ships with converted LSTs manned with Army or Navy medical personnel proved decisive. Originally, it was planned that only half of the LSTs would be used for CASEVAC. However, the decision was made during exercises to convert them all, which allowed great flexibility while increasing simplicity when coordinating between land and sea forces.[118] Pre-invasion rehearsals made planners realize that there was no meaningful way to determine which LSTs could receive casualties when the fog of war hit. Through D+11, it was the LSTs, not the hospital ships that carried 80 percent of the casualties, often with patient loads exceeding 300 casualties. Remarkably, 95 of the 104 LSTs had conducted at least one casualty transport.[119] On average, each trip carried seventy-eight wounded.[120] The hospital ships simply could not get close enough and were not well suited to receive casualties offshore. Since the number of casualties on Omaha Beach would have "overwhelmed even ten times the actual number of medical personnel available," and it would have been virtually impossible to have a hospital with the invasion force, the LSTs were the best means to keep surgeons close to the fight.[121] LSTs would continue to be staffed by medical personnel, albeit far fewer in number, until October when French ports could potentially receive the hospital ships.[122]

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[118] Snyder, “Medical Problems in Amphibious Operations,” 6.

[119] Cosmos and Cowdry, *Medical* Service *in the European Theater of Operations,* 243.

[120] Ibid.

[121] Balkoski, *Omaha Beach,* 329.

[122] Cosmos and Cowdry, *Medical Service in the European Theater of Operations,* 258.

Table 4. Casualty Reception at Ports in the UK and Casualties Loaded onto an LST

Casualty Reception at Ports in UK June 1944			
Day	**Date**	**Portland**	**Southhampton**
D-Day	6-Jun	19	0
D+1	7-Jun	543	0
D+2	8-Jun	14	280
D+3	9-Jun	1,466	138
D+4	10-Jun	2,269	1,439
D+5	11-Jun	971	419
D+6	12-Jun	1,052	486
D+7	13-Jun	1,102	194
D+8	14-Jun	854	280
D+9	15-Jun	329	279
D+10	16-Jun	1,144	204
D+11	17-Jun	1	579
D+12	18-Jun	464	309
D+13	19-Jun	562	258
D+14	20-Jun	800	1
D+15	21-Jun	291	324
D+16	22-Jun	3	0
D+17	23-Jun	1	0
D+18	24-Jun	301	227
D+19	25-Jun	240	1
D+20	26-Jun	185	86
D+21	27-Jun	7	263
D+22	28-Jun	213	298
Total:		**12,831**	**6,065**
Average:		**558**	**264**

Sources: Data adapted from Graham Cosmos and Albert Cowdry, Medical Service in the European Theater of Operations (Washington, DC: Center of Military History, 1992), 247. Photo provided by André Sobocinski, "The Workhorse of Normandy: Remembering the Role of LSTs in Medical Evacuation," *The Sextant*, last modified May 21, 2019, accessed January 25, 2020, https://usnhistory.navylive.dodlive.mil/2019/05/21/the-workhorse-of-normandy-remembering-the-role-of-lsts-in-medical-evacuation/.

Ground evacuation was arguably harder to plan and execute than initially expected. Forward litter bearers and company aid men had one of the most dangerous jobs in the invasion, despite protection from the Geneva protocols.[123] The primary equipment provided to ease the burden for the frontline litter bearers was the Carrier, Field, Collapsible (Figure 4), which performed so poorly that the General Board recommended its removal from the inventory without replacement after the war.[124] Of the three primary vehicles used for transport on the frontlines, the Truck, 1/4 Ton, 4x4, with litter racks added was by far the top performer and most popular, despite not being an actual ambulance. Enclosed ambulances such as the M3A2 Half-track or the

[123] The General Board, *Evacuation of Human Casualties in the European Theater of Operations* (Washington, DC: United States Forces, European Theater, 1945), 1.

[124] Ibid., 2.

M-29 “Weasel” provided some cover to the wounded, but were loud, slow, and were easy to target; limiting their use for clearing casualties.[125] However, these two platforms did offer some usefulness further down the evacuation chain.

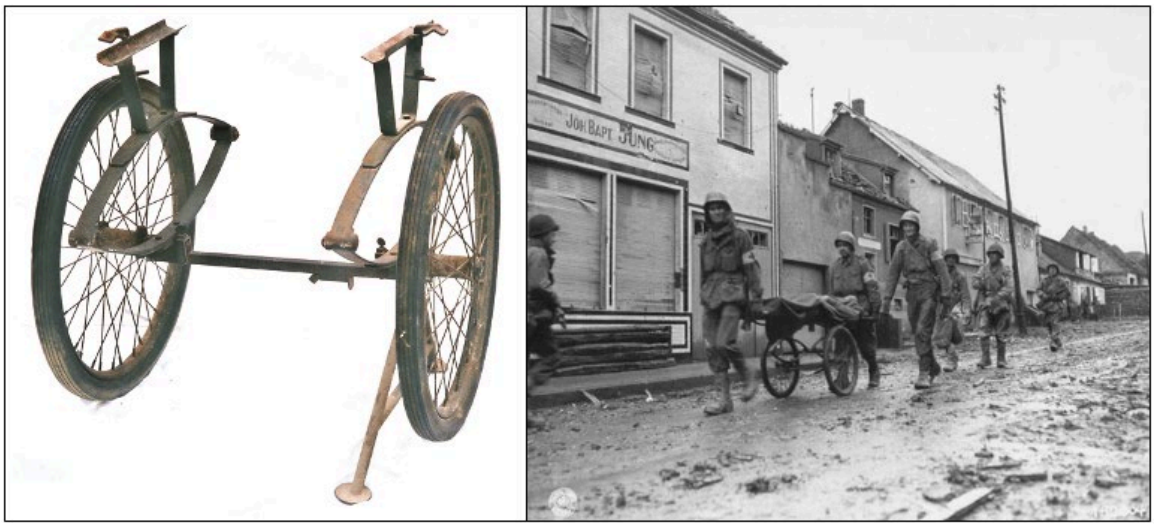

Figure 4: Carrier, Field, Collapsible. Photos from WW2 US Medical Research Centre, “WW2 US Army Litters,” n.d., accessed January 23, 2020, https://www.med-dept.com/articles/ww2-us-army-litters/.

Ground evacuation was most tenuous on D-Day. Airborne divisions had a particularly tricky challenge early on when both limited personnel and supplies scattered across the numerous drop zones. Wind and darkness isolated many of the company aid men from the units they built trust with during the train-up. However, medical personnel formed aid-stations based on need and units cleverly used captured enemy vehicles to move casualties back to assets located with 4th Infantry Division after link-up occurred.[126] Until the link-up occurred, the best the Airborne units could do was treat and hold, without evacuation.[127] On the beaches, the first waves relied solely on manual litter carries and drags. Two hours after the initial sea-borne assault, regimental medical battalions and collecting companies began to land and establish aid stations.[128]

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[125] The General Board, *Evacuation of Human Casualties in the European Theater of Operations*, 2–3.

[126] Ibid., 7–8.

[127] David Chandler and James Collins, eds., *The D-Day Encyclopedia* (New York, NY: Simon & Schuster, 1994), 356.

[128] Chandler and Collins, *The D-Day Encyclopedia*, 18.

Additional ground evacuation ambulances arrived in the theater between D+6 and D+12 to augment the evacuation hospitals and the few ambulances that arrived with the medical regiments in the division.[129] While there was an urgency to phase resources in quicker, the General Board found that "the arrival of clearing elements into the beachhead accomplishes no useful purpose unless the tactical situation permits efficient operations of the clearing element."[130] The landing at Utah Beach afforded quicker medical support where the ambulance units arrived and established a functional chain of evacuation by collecting the casualties and transporting them to the Naval aid stations and onto the DUKWs.[131] This level of support was not possible at Omaha Beach. The only option was to move casualties manually to the nearest cover or hasty foxhole until the tactical situation was more permissive. Making matters worse, Major Charles Tegtmeyer, the 16th Infantry Medical Detachment Commander on Omaha Beach, noted that the white brassard worn by medics made them targets to German snipers.[132] Planners also failed to disperse medical personnel among the many landing craft, so a single machine gun operator could kill or wound dozens of very limited aid men at a single point.[133] As evacuation and surgical hospitals phased in at D+5, well ahead of the original schedule of D+19, the concept of division collecting and clearing stations feeding to theater-level hospitals finally went into effect.[134]

Air evacuation occurred roughly on schedule, starting at D+4. Resources were limited early on with few airfields seized, however by the end of July, air evacuation on modified C-47 transports surpassed the Navy in patients moved across the channel.[135] Unfortunately, air

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[129] Cosmos and Cowdry, *Medical Service in the European Theater of Operations*, 169.

[130] The General Board, *Evacuation of Human Casualties in the European Theater of Operations*, 16.

[131] Cosmos and Cowdry, *Medical Service in the European Theater of Operations*, 206–208.

[132] Balkoski, *Omaha Beach*, 331.

[133] Ibid.

[134] Snyder, "Medical Problems in Amphibious Operations," 7.

[135] Cosmos and Cowdry, *Medical Service in the European Theater of Operations*, 256–257.

evacuation did carry some uncertainty, which required more elaborate holding capabilities near airfields to maintain patients if anything delayed the air movement.[136] Rail, on the other hand, remained non-viable in France during most of the Normandy Campaign until August 1944. Originally planned to arrive at D+56, rail was not used in the European Theater until the front was stabilized along the Siegfried Line.[137] However, railroads were extensively used in the UK where nearly 24,000 casualties were moved in by rail by the end of June.[138]

While casualties would remain high long past the initial invasion, large capacity hospitals arrived in theater to reduce the evacuation burden. For example, fighting in the bocage hedgerows caused more than 11,000 casualties, and the 29th Infantry Division rifle companies were composed of nearly 100 percent replacements by mid-July.[139] Throughout the campaign, the US military alone averaged 1,110 new casualties daily who required evacuation with surges far beyond that during major operations.[140] Over time, as hospitals continued to establish or relocate as maneuver forces moved east, the combination of air and sea evacuations across the channel streamlined. While the medical chain did not always perform smoothly, surgeons were able to treat 21 percent of the combat wounded within six hours and 68 percent within twelve hours.[141] This saved thousands of lives while increasing the return-to-duty rate for those injured in the theater. By the end of the Normandy Campaign in August, the dedicated hospital ships carried more of the burden than converted LSTs and routine air flights, each carrying the most severely

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[136] The General Board, *Evacuation of Human Casualties in the European Theater of Operations*, 24.

[137] Ibid., 27.

[138] Cosmos and Cowdry, *Medical Service in the European Theater of Operations*, 253–254.

[139] Whitaker, Whitaker, and Copp, *Normandy*, 69.

[140] Ibid., 18.

[141] Arthur Smith and Craig Llewellyn, "Tactical and Logistical Compromise in the Management of Combat Casualties: There Is No Free Lunch!," *Naval War College Review* 43, no. 1 (1990): 56. Medical planners at the time called the first six hours after wounding "The Golden Period," or the time before the onset of irreversible deterioration.

wounded, occurred daily.[142] Planners would adjust the theater evacuation policy as necessary to maintain adequate bed space, and constant communication occurred to spread cases to as many hospitals as possible.[143] The careful management of the theater evacuation policy allowed the force to manage limited evacuation assets and strained hospitals effectively at a scale never seen before in combat.

In conclusion, there are several lessons we can take from the medical planning of the Normandy Campaign. First, operational medical planners from the Army and Navy understood that their central role before establishing a firm medical footprint was the clearance of wounded from the division area of operations. Any delays would significantly reduce morale, mobility, and the survival or return-to-duty rates of casualties. Second, planners did not constrain themselves by using equipment as designed. Virtually every evacuation method had a non-medical, non-Geneva protected alternative that performed much of the heavy lifting. The 100 medically augmented LSTs were far more valuable than the four dedicated hospital ships. The modified 1/4-ton truck outperformed the two dedicated ground ambulance at the frontlines. There was no dedicated air evacuation, but planners were able to utilize converted troop carriers on return trips to move thousands of casualties. Rapid non-standard evacuation was critical to the success of combat and sustainment operations in the European theater. Finally, operational-level planners needed to find creative ways to get critical assets to isolated or dispersed forces. It was not possible to place a hospital on the shore during the initial landing, and an eighteen-hour trip across the channel without interventions was simply unacceptable. Placing hundreds of surgeons in the LSTs instead of having them wait to move with their hospitals was critical to reducing unnecessary loss of life. The Normandy Campaign is a valuable case study to show the importance of planning for the worst-case scenario without allowing risk aversion to delay the need to act decisively.

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[142] Whitaker, Whitaker, and Copp, *Normandy*, 44–45.

[143] Snyder, "Medical Problems in Amphibious Operations," 8.

Case Study 2: Current Evacuation Capabilities

> The timeliness of both treatment and evacuation of casualties is extremely important. Since the beneficial results of military surgery are found in correctly timed treatment – and not in temporary custodial care or mere introduction into an evacuation system – any delay in treatment of those with potentially salvageable wounds increases the risk of death. Delay in treatment, due to evacuation lag, is tantamount to denying care to those who could have survived with early surgery.

—Captain (Ret) Arthur Smith (US Navy) and Colonel (Ret) Craig Llewellyn (US Army), 1990

What happens when the “golden hour” becomes the “golden day"? Colonel Mike Davis, the Director of the Combat Casualty Care Research Program, recently posed this question to senior leaders during the IBCT Senior Mentor Symposium at Fort Bragg, North Carolina. In his briefing he concludes that while any change to a definition directly tied to the survivability of soldiers "should be approached with caution," there is little chance casualties can reach definitive care within one hour during LSCO.[144] While this is a clear shift from the “golden hour” period implemented in 2009 that led to incredible medical outcomes, it is even four times longer than the six-hour “golden period” planners strived to attain in the Normandy Campaign seventy-six years ago.[145] However, just as the leaders planning the France invasion had to overcome uncertainty and risk aversion against a highly lethal enemy, modern planners must do the same. Division and corps planners must generate options with all the available resources to clear casualties from the brigade combat teams in the close fight.

This monograph will now shift to the second case study, a review of the Army’s capacity to handle potential casualties in LSCO. This section will attempt to answer the final four research questions: How many casualties are divisions or corps expecting in the initial phases of LSCO? What is the maximum MEDEVAC capacity the current medical force can support based on existing inventory and the doctrinal allocation to a theater? What non-medical units are available

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[144] James Loffert, *IBCT Senior Mentorship Symposium (SMS) #44, Executive Summary* (Fort Bragg, NC: Infantry Warfighters’ Forum, January 30, 2020), 1.

[145] Kotwal et al., “Effect of a Golden Hour Policy,” 15–16.

to the corps or division to use for CASEVAC, and what is their lift capacity? What other options can division and corps planners generate to clear the battlefield of wounded, injured, or ill soldiers? It is necessary to begin with an assessment of the number of potential casualties requiring transport to answer the final three questions.

Casualty estimates are an inherently tricky business. In the best instances, rotating units reach out to the units they replace in order to validate assumptions for the local nature of combat and associated risk. When that option is not available, as is the case for most of the American military experience since 1775, planners then use a variety of tools and calculations using historic planning factors. Even these have limited utility and possess many shortfalls. Historic rates have some value, but in nearly every instance except for the Korean War and World War II, at least ten years and often several decades separate one conflict from the next. In that time, tactics, technology, and composition of the force likely changed drastically in response to lessons learned from the previous war. In the range of potential future scenarios, LSCO is only one option, though likely the most lethal. In LSCO, the lessons learned from the last twenty years in Iraq and Afghanistan will provide little value. The casualty rates received in the last forty-five years are the exception, not the rule of warfare (See Table 5). This is especially true in the case of Desert Shield/Desert Storm when Trevor Dupuy told the Senate Armed Services Committee that he predicted using models and simulations that the United States would suffer 10,000 casualties in the first ten days of combat.[146] Medical planners predicted similar numbers to Defense Secretary

[146] Shawn Woodford, "Assessing the 1990-1991 Gulf War Forecasts," *Mystics & Statistics*, May 18, 2016, accessed October 25, 2019, http://www.dupuyinstitute.org/blog/2016/05/17/assessing-the-1990-1991-gulf-war-forecasts/.

Cheney. The better than imagined results of the coalition's performance Desert Storm would be a poor model to base future LSCO on but can serve as a scenario that must be considered.

Table 5: Historic Killed and Wounded Rates During America's Wars.

Total Americans Killed and Wounded During Major Military Conflicts (1775-Present)							
War/Conflict	**Range**	**Wartime Service Members**	**Total Deaths**	**Battle Deaths**	**Non-Battle**	**Wounded**	**Wounded Rate**
American Revolution	1775-1783	217,000	4,435	4,435		6,188	2.85%
War of 1812	1812-1815	286,730	2,260	2,260		4,505	1.57%
Mexican War	1846-1848	78,718	13,283	1,733	11,550	4,152	5.27%
Civil War - Union	1861-1865	2,213,363	505,978	224,097	281,881	281,881	12.74%
Civil War - Confederate	1861-1865	1,050,000	133,821	74,524	59,297	*Unknown*	*Unknown*
Spanish-American War	1898-1902	306,760	2,446	385	2,061	1,662	0.54%
World War I	1917-1918	4,734,991	116,516	53,402	63,114	204,002	4.31%
World War II	1941-1945	16,112,566	405,399	291,557	113,842	670,846	4.16%
Korean War	1950-1953	1,789,000	36,574	33,739	2,835	103,284	5.77%
Vietnam War	1964-1975	3,403,000	58,220	47,434	10,786	153,303	4.50%
Desert Storm/Shield	1990-1991	694,550	383	148	235	467	0.07%
GWOT - Afghanistan	2001-2020	2,700,000	2,349	1,845	504	20,148	0.75%
GWOT - Iraq	2003-2017		4,418	3,481	937	31,994	1.18%
Total:	**1775-Present**	**33,586,678**	**1,286,082**	**739,040**	**547,042**	**1,482,432**	**4.41%**

Source: Table created by the author. Data adapted from the Department of Veteran's Affairs, *America's Wars Casualty Fact Sheet, May 2017* (Washington, DC: US Department of Veterans Affairs, 2017).

In an interview with the website *War on the Rocks* in 2017, the Army Chief of Staff General Mark Milley offered a sobering assessment of the potential future conflict. General Milley said the military must be "prepared for thousands, not dozens, of casualties" and "if you're stationary, you'll die."[147] General Milley's view is best summarized by his message "Think Iwo Jima, not the boardwalk stores at Kandahar airfield." This is consistent with FM 3-0 and 4-0's predictions of up to 3,600 per day.[148] The figures are also in line with recent corps and division-level projections in Warfighter Exercises run by the Mission Command Training Program (See Table 6). Finally, the recently published book *Large-Scale Combat Operations: The Division Fight* from the Combined Arms Center predicts future casualty rates recently to be more in line with the Battle of the Bulge, where more than 62,000 soldiers suffered wounds at a rate of 470

[147] David Barno and Nora Bensahel, "Three Things the Army Chief of Staff Wants You to Know," *War on the Rocks*, last modified May 23, 2017, accessed October 25, 2019, https://warontherocks.com/2017/05/three-things-the-army-chief-of-staff-wants-you-to-know/.

[148] US Army, FM 4-0, 4–4.

per day.[149] Contrast this data with our recent conflicts, and it is easy to understand General Milley's serious tone. The costliest year of Operation Iraqi Freedom was 2004 when US forces experienced 8,004 wounded and 848 total deaths. The worst month in that year was November, most notably during the Second Battle of Fallujah with 1,432 wounded and 137 killed in the theater.[150] This translates to a daily casualty rate of forty-eight wounded and five killed per day on the worst month of combat in Iraq or Afghanistan. There is simply no comparison to the potential scale of LSCO, which is orders of magnitude higher than what we have experienced in over twenty years of counter-insurgency warfare. Whether the daily casualty numbers are in the hundreds or several thousand is up to the interpretation of capabilities, simulations, and data. However, commanders and planners must prepare for several scenarios. Colonel Jennifer Caci, the Deputy Surgeon of the XVIII Airborne Corps, briefed commanders to expect all echelons to be in a constant state of Mass Casualty (MASCAL) in future conflicts, which will require a constant stream of evacuation.[151] This leads to the next section of the case study, an analysis of the division's current evacuation capacity.

Within the brigade combat teams, the ambulance squads assigned to the medical platoon in the headquarters company of each maneuver battalion perform dedicated MEDEVAC for the battalion. These ambulances doctrinally go forward to the casualty collection points near the front line of troops and return the wounded to the maneuver battalion aid stations. Then, each Role 2 Brigade Support Medical Company assigned to the Brigade Support Battalion has ten ambulances to evacuate casualties from the maneuver battalion aid stations and transport the wounded to the larger Role 2 aid station for triage and potential surgery. The brigade commander has overall

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[149] James Dunivan, "Chapter 14 - Living with the Dead: Casualties and Consequences in Large-Scale Combat Operations," in *Large-Scale Combat Operations: The Division Fight*, The Art of Tactics Series (Fort Leavenworth, KS: Army University Press, 2019), 197.

[150] Defense Casualty Analysis System, "US Military Casualties - Operation Iraqi Freedom (OIF) Casualty Summary by Month and Service," January 29, 2020, 1, accessed January 29, 2020, https://dcas.dmdc.osd.mil/dcas/pages/report_oif_month.xhtml.

[151] Loffert, *IBCT SMS #44, EXSUM*, 2.

responsibility for getting his or her casualties to this point in the evacuation chain. Then the corps or division commanders are responsible for transportation to the Role 3 hospitals. To perform this mission, commanders utilize the echelon above brigade (EAB) medical units supporting the area of operations.

Table 6. Mission Command Training Program (MCTP) Warfighter Casualty Rates

Recent Mission Command Training Program (MCTP) Warfighter Casualty Rates						
Rotation	Number of Divisions	KIA (25%)	WIA (Evac) (52.5%)	WIA (RTD) (22.5%)	Total Casualties	Average Daily Evac
19-1	3	15,500	32,550	13,950	62,000	4,069
19-2	3	13,000	27,300	11,700	52,000	3,413
19-3	3	10,500	22,050	9,450	42,000	2,756
19-4	2	10,500	22,050	9,450	42,000	2,756
19-5	2	9,750	20,475	8,775	39,000	2,559
20-1	3	24,534	32,201	17,021	73,756	4,025
20-3	3	14,336	20,731	24,342	59,409	2,591
Totals:		**14,017**	**25,337**	**13,527**	**52,881**	**3,167**

Acronyms:
KIA: Killed-in-Action
WIA: Wounded-in-Action
RTD: Return to Duty - Soldiers who did not require evacuation out of theater
Notes:
- Typically Warfighter Exercises are conducted over eight days of simulation in real time
- Percentages on top column are a percentage of casualties, not total force
- All 2019 Rotations use the generic KIA (25%), WIA - EVAC (52.5%), WIA - RTD (22.5%) rates to determine casualty break downs; All 2020 rotations were specified by MCTP

Source: Table created by author with data adapted from Matthew Fandre, "WFX 20-1 Casualty Roll-Up," October 9, 2019 and "WFX 20-3 Casualty Roll-Up," February 13, 2020.

There are three primary EAB units a commander can rely on for dedicated MEDEVAC (See Table 7). The only two MEDEVAC platforms in EAB are the M997 HMMWV Ground Ambulance and the HH-60 Blackhawk Air Ambulance. The M997s are found in the Medical Company Ground Ambulance or the Medical Company Area Support who provide general support to units in the Division or Corps Support Areas. They are assigned to medical brigades or battalions with a direct or general support relationship to maneuver commands. Each M997 can carry eight ambulatory patients, four litter patients, or a combination of the two and have one

enlisted medic in the back to maintain and monitor any previous medical interventions and provide en route care.[152] A division could expect to receive one half of a ground ambulance company in direct support providing a single-lift capacity of ninety-six ambulatory or forty-eight litter patients during a single lift if all vehicles are fully operational. With division support areas potentially hundreds of kilometers back from the front line of troops, it is likely that the ground ambulances can only make one trip per day taking more than ten hours to complete. There would be an additional eight M997s in the DSA from the Medical Company (Area Support), however these would be responsible for general support coverage to separate units in the DSA and carry risk if used to augment ground ambulance company assets long-term.[153]

Table 7. EAB Medical Evacuation Units and Capacity

Echelon Above Brigade MEDEVAC Units and Capacity						
			Capacity		Single Lift	
Unit Type	**Basis of Allocation**	**Evacuation Platforms**	**A**	**L**	**A**	**L**
Medical Company (Air Ambulance)	One per Combat Aviation Brigade within a Division	HH60 Blackhawk x 15	7	6	105	90
Medical Company (Ground Ambulance)	1/2 Per Committed Division; Two per Army Service Component Command	M997 HMMWV x 24	8	4	192	96
		Typical Division Single-Lift MEDEVAC Capacity:			149	93
Medical Company (Area Support)	One per 10,000 non-Brigade Combat Team troops in the BCT/Division/Corps/Theater Area	M997 HMMWV x 8	8	4	64	32
Notes: A - Ambulatory Patient L - Litter Patient - The ***Division Single-Lift Calculation*** is 1/2 of each capability listed above to account for crew rest/maintenance for aviation and the fact that a division only gets 1/2 of a ground ambulance company allocated doctrinally.						

Source: Table created by the author with information from US Department of the Army, Army Techniques Publication (ATP) 4-02.2, *Medical Evacuation* (Washington, DC: Government Printing Office, 2019), 3-5 to 3-7.

Air MEDEVAC is now provided entirely by the Medical Company (Air Ambulance) located in the General Support Aviation Battalion in the Division Combat Aviation Brigade. Each company has one Area Support and four Forward Support MEDEVAC Platoons with three HH60s each able to operate independently.[154] Each vehicle can carry up to seven ambulatory or

[152] US Army, ATP 4-02.2, 3–4.

[153] Ibid., 3–3.

[154] Ibid., 3–6.

six litter patients providing the division a single lift capacity of 105 ambulatory or ninety litter patients, however all fifteen would likely never be operating simultaneously due to mandatory crew rest cycles. Air ambulance companies have performed the vast majority of MEDEVAC missions during OIF/OEF, often at the point-of-injury (POI) since the Defense Secretary set the "golden hour" policy in 2009. The results of the golden hour policy and careful placement of MEDEVAC platoons throughout Afghanistan led to a reduction from one-hundred minutes to forty-two minutes in average evacuation time for an urgent casualty to a hospital.[155] However, with increased enemy anti-air capabilities in a future peer-to-peer conflict, POI evacuation from an HH-60 is no longer feasible.[156] With air and ground MEDEVAC assets so limited in EAB units, the most immediate option operational planners can generate is to follow in the footsteps of their World War II forebearers and lean heavily on available CASEVAC assets.

In the best case, dedicated MEDEVAC resources fall far short of the most conservative estimates for LSCO casualties. CASEVAC exists to fill this shortfall. A primary challenge in CASEVAC planning is executing operations in a coordinated manner when almost any vehicle is an option in dire enough circumstances.[157] Fortunately for operational planners, there are only a few units in the Division Support that provide support to mass casualty events on the necessary scale (See Table 8). For air CASEVAC, the Combat Aviation Brigade has three suitable units: The Heavy Lift Company, the Assault Helicopter Battalion, and the Combat Aviation Company.[158] The thirty-eight additional UH-60A "Blackhawks" in the Combat Aviation Brigade provide a very similar lift capacity to the standard HH60 MEDEVAC variant but lacks the on-board medical support. They also require little additional training due to flight likely traveling to

[155] William Howard, *2009-2010 Doctrinal & Regulatory MEDEVAC Summary*, Information Paper, April 20, 2010, 3.

[156] Barno and Bensahel, "Three Things the Army Chief of Staff Wants You to Know."

[157] US Army, ATP 4-25.13, 3–1.

[158] US Department of the Army, Field Manual (FM) 3-04, *Army Aviation* (Washington, DC: Government Printing Office, 2015), 2–8 to 2–11.

and from the pre-coordinated points of the BCT Role 2 Aid Station to established combat support hospitals and field hospitals in the Division or Corps Support Areas. The Heavy Lift Company with twelve CH-47 "Chinooks" is incredibly useful due to its increased speed, capacity, and the ability to augment with advanced medical providers relatively quickly from the Medical Brigade. In Afghanistan, the United Kingdom used CH-47's to carry small trauma teams called "Medical Emergency Response Teams" to manage severe casualties en route to hospitals. These teams performed complex airway management and blood transfusions during travel and saved many lives.[159] Using additional aviation assets is not without risk to the overall maneuver plan, but in high-casualty situations it may be necessary, and often these units can simply stop by the Role 2's on their return trips during missions. Additionally, increase air CASEVAC may not be possible in densely urban environments where suitable landing zones are limited. Finally, there is potential that adverse weather will restrict the use of air platforms at inopportune times. Regardless of the shortfalls, there is likely no quicker way to clear the BCT of heavy casualties then through the air in a highly dispersed and lethal battlefield.

[159] Robert Mabry, “Chapter Thirteen: MEDEVAC Lessons From the Iraq and Afghan Wars,” in *Out of the Crucible: How the US Military Transformed Combat Casualty Care in Iraq and Afghanistan* (Fort Sam Houston, TX: Office of the Surgeon General, 2017), 123.

Table 8. Echelon Above Brigade High-Payoff CASEVAC Units

	Echelon Above Brigade High-Payoff CASEVAC Units							
					Capacity		Single Lift	
	Unit Type	Parent Unit	Basis of Allocation	Evacuation Platforms	A	L	A	L
Air CASEVAC	Heavy Lift Company	Combat Aviation Brigade	One per Combat Aviation Brigade within a Division	CH-47 "Chinook" x 12	31	24	372	288
	Assault Helicopter Battalion	Combat Aviation Brigade	One per Combat Aviation Brigade within a Division	UH-60A "Blackhawk" x 30	14	6	420	180
	Command Aviation Company	Combat Aviation Brigade	One per Combat Aviation Brigade within a Division	UH-60A "Blackhawk" x 8	14	6	112	48
				Combat Aviation Brigade Total:			**904**	**516**
Ground CASEVAC	Composite Truck Company (Light)	Sustainment Brigade	One per IBCT or SBCT; One per Corps	MTV x 40	14	8	560	320
	Light-Medium Truck Company	Sustainment Brigade	One per SUS BDE in Theater Army	MTV x 50	14	8	700	400
				M1088A2/M871 Trailer x 10	50	16	500	160
	Composite Truck Company (Heavy)	Sustainment Brigade	One per Division with an Armored BCT	MTV x 20	14	8	280	160
	Medium Truck Company (Cargo)	Sustainment Brigade	As required	M1088A2/M871 Trailer x 60	50	16	3000	960
	Medium Truck Company (Linehaul)	Sustainment Brigade	As required	M1088A2/M871 Trailer x 60	50	16	3000	960
				Sustainment Brigade Total:			**8040**	**2960**

Notes: A - Ambulatory Patient
L - Litter Patient
MTV - Medium Tactical Vehicle
The M188A2s trucks tow the M871 Trailers, but cannot carry and casualties

Sources: Table created by the author using three doctrinal sources listed in the table. Data provided by US Department of the Army, Army Techniques Publication 4-25.13, *Casualty Evacuation* (Washington, DC: Government Printing Office, 2013), 3-4 to 3-6; Field Manual 3-04, *Army Aviation*, (Washington, DC: Government Printing Office, 2015); and Army Techniques Publication 4-11, *Army Motor Transport Operations* (Washington, DC: Government Printing Office, 2013).

Ground CASEVAC is slightly more complex if only because Sustainment Brigades can vary significantly in composition based on modularity and predicted requirements. Additionally, Sustainment Brigade Commanders do not control these units in garrison as they are assigned from a mix of Active, Reserve, and National Guard units.[160] To support CASEVAC, operational planners should look for five organizations on the task organization chart. Light-Medium Truck Companies, Composite Truck Companies (Light), and Composite Truck Company (Heavy) have a high quantity of Medium Tactical Vehicles that are ideal for quick loading and transportation of litter or ambulatory patients (See Figure 5). The Medium Truck Company (Cargo) or Medium

[160] US Department of the Army, Army Techniques Publication (ATP) 4-93, *Sustainment Brigade* (Washington, DC: Government Printing Office, 2016), 1–1.

Truck Company (Linehaul) are not as practical but could transport vast quantities of less critical casualties to allow frontline providers to focus only on the most severe cases. Every Sustainment Brigade deploys with some combination of these five units. Operational level planners need to task and conduct proper rehearsals. Additionally, to work correctly, each of these organizations needs to be supplied with large quantities of litters and blankets and factor these additional supplies into their load plans to pass to BCT Role 2's and receive casualties on return trips during supply runs. Medics from units throughout the Division or Corps Support Areas should be embedded into air and ground convoys to monitor interventions during movement halts while focusing attention to the most severe casualties. It is also important to remember that long driving distances and times are an inherent planning factor in LSCO just as an eighteen-hour journey across the English Channel was necessary in the Normandy medical plan. While there are many risks associated with ground CASEVAC on this scale and over these distances, commanders must weigh that risk against casualties continuing to mount closer to the frontlines, where Role 1 and 2 aid stations simply do not have personnel nor supplies to handle a perpetual state of MASCAL.

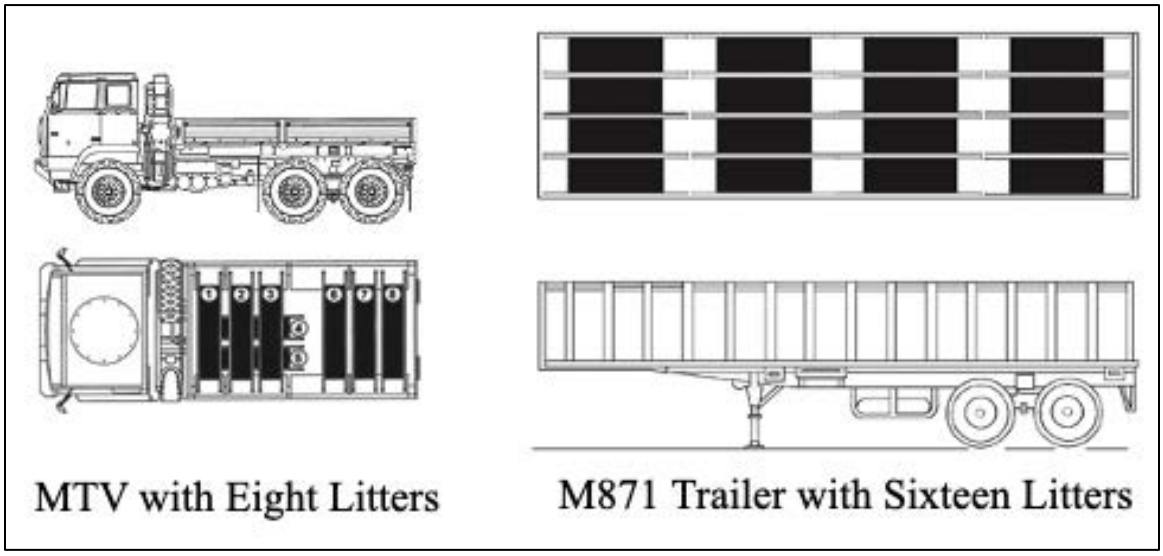

Figure 5: Loading the MTV or M871 Trailer for CASEVAC. Images from US Department of the Army, Army Techniques Publication 4-25.13, *Casualty Evacuation* (Washington, DC: Government Printing Office, 2013), 3-4 to 3-6.

Evacuation operations gain complexity when no one single organization owns a majority of the resources. The Medical Brigade owns all of the EAB ground MEDEVAC assets and is

responsible for the placement and control of theater hospitals however, it controls none of the medical resources within the BCTs nor any air assets. The Sustainment Brigade has a large number of ground CASEVAC platforms, but is not naturally tied to the EAB medical mission nor is it allocated abundant medical personnel to support major casualty movements. Finally, the Combat Aviation Brigade owns all of the air MEDEVAC and CASEVAC assets but few ground assets of value for evacuation at a LSCO scale. Additionally, the Combat Aviation Brigade possesses limited medical personnel outside of the MEDEVAC company and also creates several air space coordination challenges that arise with increased short-notice movement request. These coordination challenges are best managed and controlled by division and corps commanders and their staffs to synchronize the efforts of all three subordinate commands in a unified and rehearsed plan.

One additional option EAB planners should consider is the use of operational contract support to outsource some of the evacuation burdens. All major operations use significant contract support, and contractors have played a critical role in recent operations.[161] The Logistics Civil Augmentation Program provides sustainment support to a variety of mission-specific tasks, and there is no reason this cannot include evacuation operations under the proper conditions.[162] In 2017, US Transportation Command awarded contracts for air-lift support to isolated units in US Africa Command to included medical evacuation services.[163] In preparation for LSCO, the Financial Management Section (G-8) should determine the availability of any contracting support for evacuation operations.

In summary, evacuation is a complex system that stresses provider fatigue, driver fatigue, crew rest, medical supplies of both blood and materiel, equipment accountability, patient hold

[161] US Department of Defense, Joint Staff, Joint Publication (JP) 4-10, *Operational Contract Support* (Washington, DC: Government Printing Office, 2019), I–11.

[162] US Department of the Army, Army Techniques Publication (ATP) 4-92, *Contracting Support to Unified Land Operations* (Washington, DC: Government Printing Office, 2014), 1–15.

[163] US Joint Staff, JP 4-10, I–2.

capacity, soldier psychology, road congestion, and a maneuver unit's ability to continue to move forward. The division and corps have limited dedicated MEDEVAC assets available to clear the wounded from the BCTs and must be prepared to execute mass CASEVAC operations at any point in the operation. However, the organic Combat Aviation Brigade and supporting Sustainment Brigade have substantial resources to move casualties if properly tasked, supplied, and rehearsed. Additionally, operational contract support may provide additional resources without requiring the Army to create more niche evacuation units. Proper planning and preparation before heavy fighting occurs is critical to minimizing avoidable loss of life in an inherently dangerous business.

Findings and Conclusion

> Pay every attention to the sick and wounded. Sacrifice your baggage, everything for them. Let the wagons be devoted to their use, and if necessary, your own saddles. This was the course I pursued at Jean d'Acre. The officers will first relinquish their horses, then the sub-officers, and finally the men. Assemble the generals and the officers under your command, and make them sensible how necessary, in their circumstances, is humanity. The Romans bestowed civic crowns on those who preserved their citizens. I shall not be less grateful.[164]
>
> —Napoleon Bonaparte, *The History of Napoleon Bonaparte*

In the preface to the book *America's First Battles: 1776-1965*, editors Charles Heller and William Stofft conclude, "The record of America's ability to predict the nature of the next war (not to mention its causes, location, time, adversary or adversaries, and allies) has been universally dismal."[165] Later in the book, historian John Shy adds, "Won or lost, the first battle almost always guarantees that inexperience will be paid in blood."[166] While this has been true in

[164] John S.C. Abbott, *The History of Napoleon Bonaparte*, vol. II (New York, NY: Harper & Brothers Publishers, 1883), 287.

[165] Charles E. Heller and William A. Stofft, eds., *America's First Battles, 1776-1965*, Modern War Studies (Lawrence, Kan: University Press of Kansas, 1986), xii.

[166] John Shy, "Chapter 11: First Battles in Retrospect," in *America's First Battles, 1776-1965*, ed. Charles E. Heller and William A. Stofft, Modern War Studies (Lawrence, Kan: University Press of Kansas, 1986), 329.

every case with the exception to Desert Storm, this fact should not diminish the value of future planning. American futurist Peter Schwartz, a leading thinker on potential scenario prediction, says the point of scenario planning is not to find the most probable future but to "make strategic decisions that will be sound for all plausible futures."[167] This view applies very much in the military shift towards LSCO when limited-contingency operations and smaller engagements are still very likely in any scenario. The potential casualties in LSCO could be worse than the longest days in Operation Overlord or could end up like Operation Desert Storm when 10,000 casualties were predicted, but less than 200 occurred. To be prepared for the full range of scenarios the military could face in the future, there are several recommendations for operational and strategic planners.

First, doctrinally the timelines for each evacuation priority (See Table 1) need to be theater specific and based on conditions in the operating environment. The “golden hour” was a policy that saved many lives, and does not need abandoning entirely, but it also cannot be the expectation for all theaters or conflicts. Air Ambulances are typically reserved for Category I (Urgent) or IA (Urgent-Surgical) patients. This may need to be extended to the limited ground ambulances as well, while CASEVAC in severe MASCAL situations transports Categories II-IV. Proper expectation management will help maintain trust in the command's ability to take care of the wounded, injured, and ill without abandoning the lessons and success learned from the past two decades.

Next, the eight organizations identified as high pay-off CASEVAC units (See Table 8) should rehearse, practice, and validate CASEVAC operations with a large casualty load. Of the eight units, only the Heavy Lift Company and the Assault Helicopter Battalion have CASEVAC operations as a Mission Essential Task as part of their Combined Arms Training Strategy

[167] Peter Schwartz, *The Art of the Long View: Paths to Strategic Insight for Yourself and Your Company* (New York: Currency Doubleday, 1996), 2.

(CATS). CASEVAC should be added to at least the Composite Truck Company (Light and Heavy) and the Light-Medium Truck Company CATS if senior leaders truly believe LSCO is a realistic potential scenario. Medium Truck Companies (Cargo or Linehaul) also must train regularly on LSCO MASCAL situations, particularly those assigned to Division Sustainment Brigades. Since the Medium Truck Companies are not automatically assigned to Sustainment Brigades providing direct support to BCTs, in a LSCO conflict, at least one must be assigned to any division in order to support mass CASEVAC operations. All eight units need these collective skills validated before deployment by their higher headquarters and during Combat Training Center rotations when possible. In theater, the Combat Aviation Brigade and the Sustainment Brigade must be explicitly tasked to be prepared to conduct mass CASEVAC operations. To support the Combat Aviation and Sustainment Brigades, a detailed CASEVAC plan must be developed by medical, sustainment, aviation, and contracting planners on the division or corps staff. The orders cannot be generic if they are to be taken seriously.

Both of the previous recommendations can occur without any changes in force structure or any development of new units. The cost is minimal, requiring the inclusion of these tasks to existing events. They also support on-going initiatives such as the transition from combat support hospitals to more modular field hospitals and the expeditionary combat medic program designed to support prolonged field care in LSCO.[168] One long-term project worth exploring for the MEDEVAC force is the development of an unmanned ground ambulance for evacuation from the Role 2 to Role 3 hospitals. Several factors make ground MEDEVAC an ideal platform to test the potential for unmanned transport. First, the unmanned vehicle would be unarmed due to the Geneva Convention provisions, which also makes it less likely to be targeted by conventional forces. Second, EAB ambulances operate on straightforward routes, likely limited to main supply

[168] Meghann Myers, "Combat Medics Train to Keep the Wounded Alive beyond the 'Golden Hour,'" *Army Times*, last modified March 1, 2018, accessed February 26, 2020, https://www.armytimes.com/news/your-army/2018/03/01/combat-medics-train-to-keep-the-wounded-alive-beyond-the-golden-hour/.

routes between two known points. Next, the use of unmanned vehicles allows both medics on the ambulance team to manage casualties over potentially long travel times. Finally, the vehicles could immediately begin to move back towards the BCT Role 2 aid stations while the crew rests rather than stopping to allow the drivers and medics to sleep and recover. Unmanned vehicles would not likely drastically reduce the amount of CASEVAC necessary in LSCO and the amount of MEDEVAC vehicles available is still a limiting factor at this scale of casualties, but they would make the medics in the vehicles far more effective.

In the end, the words of Captain Smith and Colonel Llewellyn remain true that, "Only when the tactical situation becomes static for a reasonably long period of time is it possible to approach ideal medical planning and operational conditions. In the interim, difficult choices obviously must be made by the operational commander and his staff."[169] Operational commanders and staffs must address the potential for unprecedented casualties before the conflict if there is any hope of adequately managing them during it. Or, as Peter Schwartz would say, "No matter what future takes place, you are much more likely to be ready for it – and influential in it – if you have thought seriously about scenarios."[170] Leaders cannot allow themselves to be risk-averse in the face of potential harm, even when faced with fights as horrific as forecasted in LSCO. Simply stated, leaders must prepare for the reality of it.

[169] Smith and Llewellyn, "Tactical and Logistical Compromise in the Management of Combat Casualties: There Is No Free Lunch!," 60.

[170] Schwartz, *The Art of the Long View*, 2.

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