



U.S. Army Pfc. Anthony Concepcion, assigned to Dental Health Command Europe, reacts to contact while completing an Expert Field Medical Badge lane during Medical Readiness Command, Europe's 2025 Best Leader Competition at Grafenwoehr Training Area, Bavaria, Germany, March 18, 2025. (U.S. Army photo by Pfc. Brent Lee)

Resilient by Design

Reforming Medical Logistics to Support Global Operations

By Michael Ackman and Jon Fowler

In March 1942, the Japanese Empire seized Java, an island in the South Pacific located between Sumatra and Bali. In doing so, it eliminated 90 percent of the world's supply of quinine, the most

effective antimalarial drug in existence at the time.¹ In the years that followed, as the United States waged a counteroffensive, U.S. troops were ravaged by 572,950 cases of malaria.² General Douglas

MacArthur, hero of the U.S. Army during the war, was famously quoted as saying: “[T]his will be a long war if for every division I have facing the enemy I must count on a second division in the hospital with malaria and a third division convalescing from this debilitating disease.”³

More recently, when Hurricane Maria hit Puerto Rico in 2017, the result was severe disruption to the production

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of intravenous fluid from Baxter International, affecting more than 50 percent of U.S. hospitals.⁴ This also happened in 2024 when Hurricane Helene hit the Southeast United States, and again a Baxter International facility was flooded and forced to suspend production.⁵ Perhaps the most widely observed instance of medical supply shortages was during the COVID-19 pandemic, when medical personnel used homemade masks because of shortages of personal protective equipment. Shortages of other critical supplies, such as oxygen and ventilators, were far too common.

These lessons from history should serve as a cautionary tale about the risks associated with the global medical supply chain. What will happen to our Class VIII supplies (medical materiel) if we go to war tomorrow? As we plan for global military operations and shift our focus from counterinsurgency operations to large-scale combat operations, we need to ensure our medical supply chains are flexible, resilient, and adaptable. We simply cannot afford to be complacent in peacetime only to find ourselves in extremis during wartime execution.

Medical Challenges in Large-Scale Combat Operations

The war in Ukraine that started in February 2022 is now in its fifth year. The Center for Strategic and International Studies (CSIS) estimated that as of December 2025, the Ukrainian forces had sustained 500,000–600,000 casualties, including 100,000–140,000 deaths, and that the Russian forces had suffered nearly 1.2 million casualties, with 275,000–325,000 deaths. In its January 2026 report, CSIS stated, “Combined Russian and Ukrainian casualties may be as high as 1.8 million and could reach 2 million total casualties by the spring of 2026.”⁶

The gross number is staggering and is cause for concern. In a future fight with a peer competitor, the U.S. military’s ability to handle large numbers of battlefield casualties will be tested to the extreme. Our joint force is excellent and capable, but the major medical assets that we possess, such as our fleet’s hospital ships and the Army’s field hospitals, take time and resources to deploy and may not meet the demands for care that the enemy might impose in early phases of crisis or conflict. In addition, our major medical

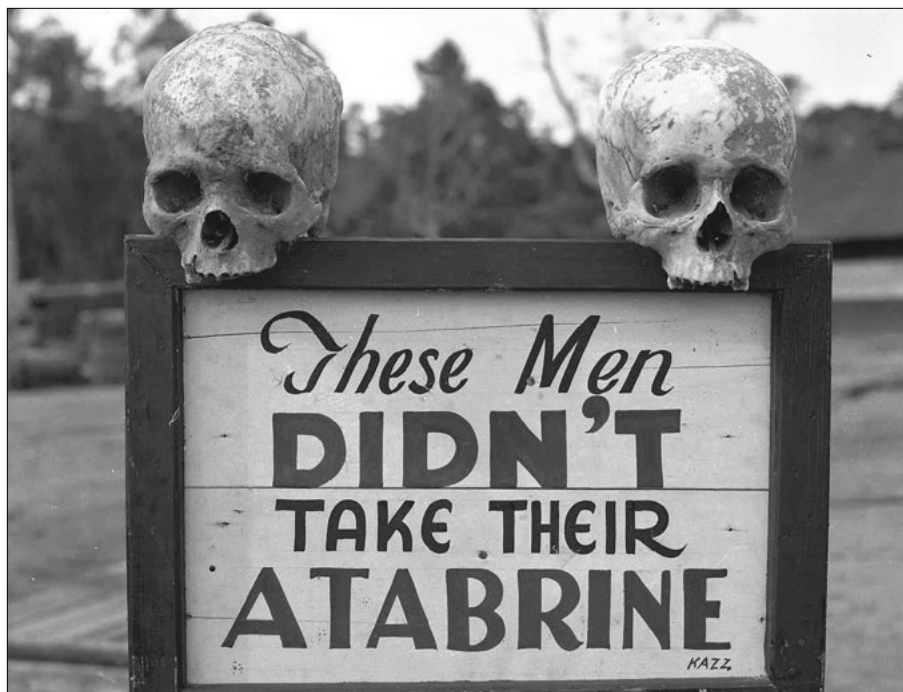
supply contingency contracts will require time to put into motion and move the materiel to the critical points where it is needed. This will introduce logistical sustainment risk that we must mitigate.

Complicating matters further, our ability to move patients in a future contested environment will upend our expectations for medical care that we have grown accustomed to over the last 20 years of counterinsurgency operations. Our greatest challenge is countering the threats represented by the People’s Republic of China in the Pacific. This may unfold in the U.S. Pacific Command (USPACOM) operating environment, which represents 52 percent of the Earth’s surface area and is home to 50 percent of the world’s population.⁷ This is a challenging maritime environment where the tyranny of time and distance will challenge our ability to provide rapid transport to achieve treatment during the “golden hour.” The time and distance problems, coupled with delays expected in a nonpermissive environment, will make it highly likely that we will be conducting prolonged casualty care at our forward-deployed medical units. The simple and terrible fact is this: the longer we delay patient movement, the higher the burn rate of our limited Class VIII (medical) consumables.

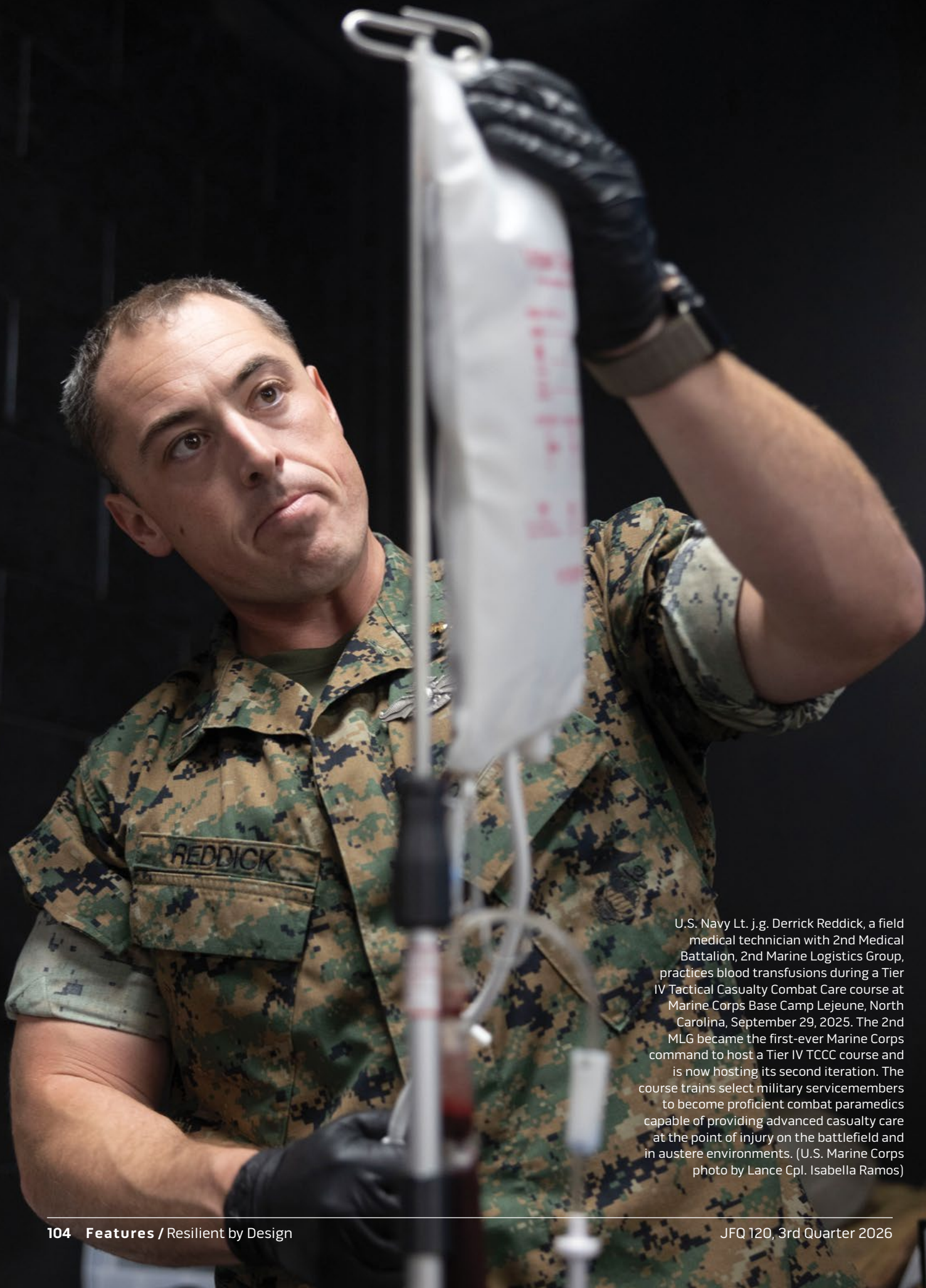
Adding to the complexity of battlefield trauma management, in the future operating environment we will also certainly encounter threats from diseases that have historically had tremendous operational impacts. Malaria, our age-old nemesis from our last war in the Pacific, persists today. The World Health Organization (WHO)’s malaria report in 2019 recorded more than 90 malaria-endemic countries, 228 million infections, and approximately 405,000 deaths.⁸ Dengue fever also remains a key threat that commonly afflicts our operating forces throughout the USPACOM area of operations.⁹

Medical Supplies: A Weak Link in the Supply Chain

Despite all of this, perhaps the largest threat to our ability to meet the demands of large-scale combat operations is the one



Atabrine advertisement in Guinea during World War 2. “These men didn’t take their Atabrine” sign promoting the anti-malaria drug, posted at the 363rd Station Hospital, Port Moresby, Papua New Guinea. 9Wikimedia Commons photo, Otis Historical Archives of National Museum of Health & Medicine [OTIS Archive 1]).



U.S. Navy Lt. j.g. Derrick Reddick, a field medical technician with 2nd Medical Battalion, 2nd Marine Logistics Group, practices blood transfusions during a Tier IV Tactical Casualty Combat Care course at Marine Corps Base Camp Lejeune, North Carolina, September 29, 2025. The 2nd MLG became the first-ever Marine Corps command to host a Tier IV TCCC course and is now hosting its second iteration. The course trains select military servicemembers to become proficient combat paramedics capable of providing advanced casualty care at the point of injury on the battlefield and in austere environments. (U.S. Marine Corps photo by Lance Cpl. Isabella Ramos)

we do not fully appreciate. There are many potential shortfalls of medical consumables that are only one catastrophe away from crippling the global supply. For instance, more than 90 percent of the latex used to manufacture sterile surgical gloves is produced in Malaysia.¹⁰ What would happen to the global supply if that area were hit by a sudden and devastating tsunami, earthquake, or volcanic eruption?

In 2018, in response to reported problems with the pharmaceutical supply chain the U.S. Food and Drug Administration (FDA) created an Agency Drug Shortages Task Force to identify the root causes of drug shortages. In its 2019 report, the FDA found that 70 to 80 percent of registered facilities that manufactured active pharmaceutical ingredients were located outside of the United States, with the largest suppliers being India and, distressingly, China.¹¹ A 2021 report from Duke University's Margolis Center for Health Policy sums up the risk of regional pharmaceuticals as follows: "Supply being concentrated in these areas makes certain supply risks more dire, including geopolitical conflicts. If the countries responsible for much of the U.S. drug supply were to restrict or halt exports, shortages would be inevitable."¹²

In an article titled "Treating Medicine as Ammunition," lead author Major General Paula Lodi—Commanding General of U.S. Army Medical Research and Development Command—and three other senior Army officers argue that we have a "prescription for concern." The authors specifically highlight risks in the pharmaceutical supply chain, stating that the Department of Defense—now the Department of War (DOW)—"maintains a disjointed and fragile supply chain and logistics system that does not ensure a posture of sustainable resilience internally, let alone with allied nations."¹³

Uncertainty is everywhere we turn. Russia is emboldened by its invasion of Ukraine. Unrest continues in the Middle East. China, perhaps the greatest looming threat, is growing its arsenal of ships, missiles, and aircraft and is constantly pushing to expand its influence. Given the challenges we will face from

our capable peer adversaries, we need real solutions to improve our access to global medical resources. The following are several actions we can pursue that would enable our combined and joint forces to operate more efficiently and would effectively mitigate our medical supply chain risks by promoting flexibility and resiliency.

Building a Resilient, Flexible Medical Supply Chain

We have established that medical materiel is essential in the next conflict, but we have a precarious supporting supply chain. One of the hardest problems is addressing the large percentage of active pharmaceutical manufacturing occurring in China, which supports the entire globe. This article will not seek to answer that question directly but will look at the issue of moving medical materiel to the point of conflict and maintaining sufficient stockage.

In a 2022 speech to a Washington think tank, Marine Corps Assistant Commandant General Eric M. Smith used the term *expeditionary foraging* to describe "contracting with local merchants and vendors to supply disaggregated forces with goods and services that cannot be supplied by sealift or stockpiled because of the need to preserve mobility."¹⁴ He emphasized that this is something that the U.S. military currently does in the Philippines to procure vehicles, food, or water for large exercises. While our logistics commands are needed to provide forward support, "[w]e can't build 'iron mountains' [of munitions and supplies] anymore."¹⁵ Although his talk was not focused on medical materiel, the same issues are present. The ability to procure from partner nations reduces our need to build "iron mountains."

Take a Page from the Defense Logistics Agency's Energy Playbook

The Defense Logistics Agency (DLA) has recognized the need for steady and predictable access to fuel resources globally. To meet the demands of the operational forces, DLA—through its

DLA Energy program—has been active in developing contracts that lay the foundation for rapid sourcing of bulk petroleum supplies worldwide. The DLA website describes the program as "the single source for drafting, negotiating, concluding, and amending international fuel agreements with foreign governments supporting worldwide [Department of War] operations."¹⁶

This active engagement has created a network of readily accessible fuel stores that can be quickly contracted to ensure we have the necessary access to Class III supplies (petroleum, oils, and lubricants) to support our deployed units. As we look at global sourcing for Class VIII supplies (medical materiel), we have an opportunity to develop similar support. To that end, DLA should direct a similar effort to identify international medical consumable distributors and establish a network of sourcing solutions for medical consumables as well.

Currently, all of DLA's medical readiness contracting is sourced from FDA-approved companies in the United States. If we suddenly found ourselves at war, DLA would activate Medical Contingency File contracts (joint time-phased contracts to remedy shortfalls in "go-to-war" medical materiel), which require that manufacturers and distributors use existing commercial inventories to support the critical go-to-war requirements. Although this access is wonderful, we may be inadvertently creating a distribution burden by being limited to domestic suppliers. Medical supplies will likely need to compete for lift with other wartime requirements, such as unit deployments and movement of fuel and munitions. Although this is an established process that should still be supported, we should expand the scope and reach of those contingency contracts to include foreign vendors and distributors that could also fill orders for similar supplies, particularly vendors that are already in or near our expected area of operations.

For other classes of supplies, our operating forces have normalized and experimented with the concept of expeditionary foraging.¹⁷ It is

commonplace for units to contract for local food and water (Class I supplies) while conducting operations and exercises. As mentioned earlier, contracts for bulk fuel (Class III supplies) are routinely activated to support exercise execution. Building materials (Class IV supplies) for rapid battlefield repair and construction are typically bought locally. However, medical consumables have some key differences that make this same management strategy more complex. Perishability, regulatory barriers, and patient safety issues all require additional safeguards. That said, although this makes the sourcing of foreign medical materiel more difficult, it does not make it unachievable, and we should still pursue this line of effort to ensure a diverse and flexible sourcing solution for medical materiel. Developing safe and reliable contingency contracting solutions for foreign Class VIII supplies (medical materiel) would provide valuable optionality that we could leverage to support large-scale combat operations.

Reduce Regulatory Barriers by Creating Operational Exceptions to Restrictions on Medical Procurement

Most units under DOW can legally expend operations and maintenance funding to procure only FDA-approved medical equipment and consumables. DLA, serving as the Medical Materiel Executive Agent for DOW, “will not purchase non-FDA approved products with Defense Working Capital Funds, appropriated funds, or any other government funds,” as stated in DODI 5101.15, *DOD Medical Materiel Management*.¹⁸ Furthermore, DODI 6200.20¹⁹ contains additional provisions that interpret the application of FDA rules to DOW’s Defense Force Health Protection Programs. Both policies impose severe restrictions on the ability of the operational forces to procure foreign medical consumables.

There is good reason for this. Medical care is inherently risky, and robust Federal laws and regulations that protect the quality of care for our Servicemembers

should remain a high priority. However, in austere environments and remote locations, we should expect that resources will be constrained and units may need to leverage local supply chains. Additionally, there are countries that have health care and medical regulating agencies that are on par with U.S. standards. The irony is that although we cannot purchase their medical supplies, nothing restricts us from routinely seeking treatment in their hospitals where our Servicemembers are treated with those same materials.

The WHO maintains a list of countries that have “stringent regulatory authorities” (SRAs), considered to be on par with FDA standards. While the WHO is transitioning to a new framework—WHO-Listed Authorities—the classic SRA definitions remain. In 2022, 36 countries were on the list of SRAs. Our ability to create reciprocal procurement authorities with these trusted allies is a key step in making our supply chains more resilient while reducing the logistical burdens associated with moving and sustaining medical materiel.

The good news is that we have already witnessed a situation where a competing global demand for medical materiel has led to exceptions from FDA procurement restrictions. The COVID-19 pandemic made the public aware of the FDA’s ability to issue emergency use authorizations and expedited the rapid distribution of vaccines. The bad news is that generally there is no ability for units on active deployment during steady-state operations to rehearse this procurement process, identify local vendors, make payment arrangements, and coordinate distribution. Simply put, we are not practicing how we expect to play the big game.

The reality of executing large-scale combat operations in a future contested environment will almost certainly result in logistical constraints that challenge our procurement and distribution of medical supplies. We must strike a balance between wartime readiness and steady-state risk reduction. To maximize the flexibility and optionality for unit commanders, we should consider two possible solutions.

First, we should create limited steady-state exemptions from Federal laws and regulations by establishing reciprocal agreements with countries that meet or exceed FDA standards. By providing this authority in peacetime, we can exercise and validate procurement strategies and conduct the detailed work that will enable this critical access during wartime. By expanding our ability to procure medical consumables with our strongest allies and partners—such as the United Kingdom, France, Germany, Japan, and Australia—we can help to promote resource-sharing for a critical class of supplies. This authority also allows us the ability to build the demand signal now. Because of the cost of holding materiel and concerns with shelf life, much of the world works on “just in time” inventory management. Our demand signal in war would represent an immediate demand that would likely far outstrip the supply of even our largest allies. Having the authority to procure and pre-position *now* would allow us to build demand to ensure that our partners’ supply chain can support us.

Second, we should deliberately “bake in” wartime emergency use authorities into our major wartime operational plans. In 2017, Congress took action by passing an amendment to section 564 of the Federal Food, Drug, and Cosmetics Act.²⁰ This amendment provides specific emergency use authorizations to support wartime operations. However, this authority requires the Secretary of Defense (now the Secretary of War) to formally submit a request to the Secretary of Health and Human Services to officially grant these exemptions. This could be a time-consuming process and may require extensive high-level coordination at a time when our attention may be focused on more pressing matters. The opportunity here lies in pre-coordinating this exemption authority between DOW and the Department of Homeland Security and tying it to the phasing plans for our major operations plans. As we receive indications and warnings of an impending crisis/conflict and our commanders begin to “run the playbook,” we can add this tool to our matrix of authorities and immediately take the handcuffs

off of our logistics managers to allow them to begin procuring from additional global sources of supply.

Support U.S. Efforts to Reduce Dependence on Foreign Pharmaceuticals

Our dependence on foreign medical consumables introduces a tremendous risk to our operational forces and to U.S. public health at large. DOW should encourage lawmakers in Congress and the executive branch to increase our medical supply chain resilience. The aforementioned 2021 report by Duke University's Margolis Center for Health Policy (titled *Supporting Resilient Drug Supply Chains in the United States: Challenges and Potential Solutions*) advocates

for several solutions to increase resilience, such as improving financial incentives (subsidies and tax incentives) for manufacturers, streamlining regulatory pathways to modernize production, and promoting supply chain transparency to enable stronger oversight and market competition.²¹

As manufacturers of medical consumables weigh profits versus losses, and as companies aggressively minimize their expensive on-hand inventories of supplies, the market has understandably lost its elasticity to respond rapidly to changing events. If we desire the ability to quickly respond to unforeseen events, we must make meaningful policy interventions that can increase our domestic supply chain resilience.

Invest in Pre-Positioned Medical Consumables Stocks

Unlike with other classes of supplies, the pre-staging of medical resources in foreign countries is relatively noncontroversial. This could be especially true if that resource were funded in collaboration with the Department of State. The same medical equipment and supplies that can be useful in supporting humanitarian assistance and disaster recovery can also have a dual purpose of serving the requirements for wartime casualty care. By conducting targeted global health engagements and investments in Class VIII supplies (medical materiel) in partnership with the Department of State, we may have an opportunity to invest in foreign pre-positioned stores. Imagine



A U.S. Navy Corpsman with Combat Logistics Battalion 8, Combat Logistics Regiment 2, 2nd Marine Logistics Group, provides medical treatment to a simulated casualty during the Technology Operational Experimentation Event 25.1 at Marine Corps Base Camp Lejeune, North Carolina, May 11, 2025. Office of Naval Research Global Experimentation and Analysis, partnered with Marine Corp Warfighting Lab, planned and executed the event focused on evaluating emerging technologies to enhance battlefield medical response, improve the speed and effectiveness of tactical combat casualty care, and increase survivability in austere environments. (U.S. Marine Corps photo by Cpl. Meshaq Hylton)

a scenario where a typhoon devastates the Northern Luzon area of the Philippines and local hospitals need medical supplies—simply have the Department of State open the warehouse and start issuing. Now imagine that war has broken out and U.S. forces in the same region are taking casualties from missile strikes; similarly, have DOW open the warehouse and start issuing.

Treatment of trauma requires rapid stabilization, surgery, and blood products. Treatment of diseases requires sustained treatment of infections, chronic care, vector-borne illness management, and prevention. Care of trauma and disease will likely strain our supply chains differently, and we expect to face both in the event that we are conducting large-scale combat operations in an austere, forward-deployed environment. As we shape our strategies for global pre-positioning networks, the key is being prepared for both and pre-staging these resources today—in peacetime—to build and strengthen a broadly resilient supply chain that meets the demands of tomorrow. In addition, we should also rehearse the deployment of stocks of global pre-positioning networks during joint and combined exercises with our allies and partners. This would allow us to rehearse distribution under pressure, provide an opportunity to maintain our inventory, and even leverage artificial intelligence and advanced analytics to support predictive logistics. Every pallet of Class VIII supplies (medical materiel) that we can successfully pre-stage forward gives us the opportunity to increase the speed of our medical capability response and results in a lift savings for U.S. Transportation Command at a time when it may need it most.

It should also be noted that we also may derive other benefits from increasing our response capability for humanitarian assistance and disaster recovery. This investment can also increase our future access and collaboration with our allies and partners. The trust and cultural understanding that are produced from this kind of preparedness and response can open doors

to future operational interactions and increase the likelihood of access, basing, and overflight authorizations when needed for crisis or conflict. Global health engagement and investment in Class VIII supplies is not the solution to all our problems, but supporting these efforts yields strategic value, which may be more important than the tactical logistical benefits.

Expand Establishment of Wartime Host Nation Support Programs

Those with experience in the Korean theater may have come across the Wartime Host Nation Support program, which is in effect “during armistice (peacetime), crisis, hostilities, or war.”²² Since the advent of the program in 1992, the Korean theater of war has had a robust policy for how U.S. forces can leverage local resources to support combined operations. This policy includes guidance for a broad range of support and services including communications, engineering, field services, mortuary affairs, ammunition storage, bulk petroleum, and of course Class VIII supplies (medical materiel) and access to hospital beds.

Looking globally, we are lacking Wartime Host Nation Support program agreements that clearly define support and services with our allies and partners. With regard specifically to hospital access, it is crucial to have a formal framework that defines how U.S. forces would access host-nation facilities in wartime. The Royal Darwin Hospital in Australia’s Northern Territory and St. Luke’s Medical Center in downtown Manila both serve as examples of major medical infrastructure that supports our joint forces in steady state. What is not clear is how those same facilities could be utilized in the event of war. Can we openly send our U.S. casualties to either of these facilities? What capacity can we plan to utilize? How can we streamline or standardize the process of obtaining clinical privileges for our medical staff so they can be part of an integrated care team? What about coordination of return to duty for those recovering, or medical evacuation for those needing to return to

the United States? These are the detailed planning questions that can be answered by establishing a formal Wartime Host Nation Support policy.

Prioritize Blood-Sharing Standardization with Partner Nations

For critically wounded patients, receiving blood or blood products is a critical factor in survivability. Blood and blood products are also among the most difficult items to manage from a supply chain perspective, as their shelf life can be measured in days and they are extremely temperature sensitive.²³ Realizing this, DOW has initiated blood-sharing agreements with several of our partners and allies.²⁴

Unscreened blood is obviously very risky and could result in adverse outcomes if there is type incompatibility or transmission of blood-borne pathogens (such as HIV or hepatitis). For this reason, we want to be sure that blood products we use are of the highest quality. To that end, DOW and the FDA are evaluating strategic partner nations’ quality assurance programs, including analysis of their blood transportation and the electric grid that supports storage. This is an important step toward providing alternate sourcing options for these critical Class VIII supplies (medical materiel) to ensure that they are available when needed most.

The advancements of blood-sharing agreements should be utilized as a blueprint for the other side of Class VIII—medical consumable supplies and equipment. If we can study the ability to use an invasive product like blood from our partner nations, we can do the same for less invasive products or potentially look at those countries’ equivalents of our FDA to gain a broader reciprocity between approving agencies. Opening this avenue will allow us to diversify our supply chain and begin to build demand in the partner nations in which we operate, either through routine use during bilateral exercises or via the pre-positioning of medical materiel. It is critical that we build out this process in peace so that these supplies are ready in a potential conflict.



U.S. Marine Corps Cpl. Timothy Dobson takes doxycycline, used to prevent malaria, once a day in accordance with a weekly dosage of mefloquine, also an antimalarial, April 23, 2011, in Toubakouta, Senegal. (U.S. Marine Corps photo by Lance Cpl. Timothy L. Solano)

Conclusion

History has shown us that medical supply chain risk is a real threat that can have a tremendous impact on our operational forces. Our combined and joint forces need to create and enable a Class VIII supply network in partnership with our allies and partners that provides commanders with optionality, flexibility, and resiliency.

Unfortunately, our current status quo is not positioning us to meet the demands of the future fight. Our government leaders in the executive and legislative branches must dedicate time and effort in steady state to increase the authorities, investments, and international agreements that will increase our ability to sustain our forces in the forward operating environment. Although there are promising signs on the horizon, such as our pending blood-sharing agreement

with the United Kingdom, Australia, and Canada, we are not moving at the speed of relevancy. There is simply too much at stake to continue admiring this problem; now is the time for action. The United States must do more to improve this situation now, while there is still time to act. JFQ

Notes

¹ Hunter D. Bechtold et al., "From World War II to COVID-19: A Historical Perspective on the American Medical Supply Chain," *Disaster Medicine and Public Health Preparedness* 16, no. 5 (2021): 1719–20, <https://doi.org/10.1017/dmp.2021.94>.

² Coreen M. Beaumier et al., "United States Military Tropical Medicine: Extraordinary Legacy, Uncertain Future," *PLOS Neglected Tropical Diseases* 7, no. 12 (2013): Table 1, <https://pmc.ncbi.nlm.nih.gov/articles/PMC3873258/>.

³ Quoted in Beaumier et al., "United States Military Tropical Medicine."

⁴ Bechtold et al., "From World War II to COVID-19," 1719–20.

⁵ Ana Faguy, "TV Fluid Supplies in U.S. Disrupted by Hurricane Helene," BBC, October 4, 2024, <https://www.bbc.com/news/articles/cz04nl32e7yo>.

⁶ Seth G. Jones and Riley McCabe, *Russia's Grinding War in Ukraine: Massive Losses and Tiny Gains for a Declining Power* (Washington, DC: Center for Strategic and International Studies, January 2026), <https://www.csis.org/analysis/russias-grinding-war-ukraine>.

⁷ "About U.S. PACOM," U.S. Pacific Command, accessed August 5, 2026, <https://www.pacom.mil/About-US-PACOM/>.

⁸ Eric Halsey, ed., *CDC Yellow Book 2026: Health Information for International Travel* (New York: Oxford University Press, 2025), <https://www.cdc.gov/yellow-book/hcp/travel-associated-infections-diseases/malaria.html>.

⁹ WHO, "Dengue: Global Situation," December 21, 2023, <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON498>; WHO, "Western Pacific: Latest Situation Reports [on Dengue]," accessed April 27, 2026, <https://www.who.int/westernpacific/wpro-emergencies/surveillance/dengue>.

¹⁰ "Gaps in the Global Medical Supply

Chain,” in *Impact of the Global Medical Supply Chain on SNS Operations and Communications: Proceedings of a Workshop* (Washington, DC: National Academies Press, 2018), <https://www.ncbi.nlm.nih.gov/books/NBK525655/>.

¹¹ *Drug Shortages: Root Causes and Potential Solutions* (Silver Spring, MD: U.S. Food and Drug Administration, 2019), <https://www.fda.gov/drugs/drug-shortages/report-drug-shortages-root-causes-and-potential-solutions>.

¹² Stephen Colvill et al., *Supporting Resilient Drug Supply Chains in the United States: Challenges and Potential Solutions* (Durham, NC: Duke University Margolis Institute of Health Policy, 2021), <https://healthpolicy.duke.edu/publications/supporting-resilient-drug-supply-chains-united-states>.

¹³ Paula C. Lodi et al., “Treating Medicine as Ammunition: Enhancing Medical Logistics for Large-Scale Combat Operations,” *Military Review*, July 2025, <https://www.armyupress.army.mil/Journals/Military-Review/Online-Exclusive/2025-OLE/Medicine-as-Ammunition/>.

¹⁴ Richard R. Burgess, “Marine Gen. Smith: ‘Expeditionary Foraging’ a Component of Light, Mobile Logistics,” *Seapower*, June 15, 2022, <https://seapowermagazine.org/marine-gen-smith-expeditionary-foraging-a-component-of-light-mobile-logistics/>.

¹⁵ Burgess, “Marine Gen. Smith,”

¹⁶ Defense Logistics Agency, “Bulk Petroleum Services,” accessed April 27, 2026, <https://www.dla.mil/Energy/Services/Bulk-Petroleum-Services/>.

¹⁷ Peter Thermos and Angel Maldonado, “21st Century Foraging,” *Marine Corps Gazette*, March 2021, <https://www.mca-marines.org/wp-content/uploads/50-21st-Century-Foraging.pdf>.

¹⁸ Department of Defense Instruction 5101.15, *DOD Medical Materiel Management* (Washington, DC: Department of Defense, 2023), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/510115p.pdf>.

¹⁹ Department of Defense Instruction 6200.02, *Application of Food and Drug Administration (FDA) Rules to Department of Defense Force Health Protection Programs* (Washington, DC: Department of Defense, 2008), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/620002p.pdf>.

²⁰ *An Act to Amend the Federal Food, Drug, and Cosmetic Act to Authorize Additional Emergency Uses for Medical Products to Reduce Deaths and Severity of Injuries Caused by Agents of War, and for Other Purposes*, Pub. L. No. 115-92 (2017), <https://www.congress.gov/115/plaws/publ92/PLAW-115publ92.pdf>.

²¹ Colvill et al., *Supporting Resilient Drug Supply Chains in the United States*.

²² United States Forces Korea Regulation 550-52, December 2, 2008, <https://www.usfk.mil/Portals/105/Documents/Publications/Regulations/USFK-Reg-550-52-Wartime-Host-Nation-Support.pdf>.

²³ “Blood Components,” American Red

Cross, accessed April 27, 2026, <https://www.redcrossblood.org/donate-blood/how-to-donate/types-of-blood-donations/blood-components.html>.

²⁴ Patty Nieberg, “Blood Brothers: In the Pacific, U.S. Medics May Soon Use Blood from Allies,” *Task & Purpose*, November 6, 2023, <https://taskandpurpose.com/history/blood-agreements-china-allies/>.