



ARROYO CENTER

Optimizing Army Medical Materiel Strategy

Adam C. Resnick, Kathryn Connor, Anna Jean Wirth, Eric DuBois

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Preface

This report documents research and analysis conducted as part of a project entitled *Optimized Medical Equipping*, sponsored by the U.S. Army Medical Research and Materiel Command. The purpose of the project was to update the current Army Medical Department equipping strategy to optimize medical readiness by most effectively equipping the operational medical force in support of global contingency missions in a limited resource environment.

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Summary

The U.S. Army equips a wide range of units with medical materiel when units are either preparing to deploy from a home station or when they arrive in theater. Units must have appropriate materiel to meet their missions, as well as access to sufficient materiel for training to support contingency and rotational operations. Providing this equipment can be complicated with a constrained fiscal environment and the short life cycles of medical items. The largest medical units by medical materiel requirements are medical companies, Forward Surgical Teams (FSTs), and Combat Support Hospitals (CSHs).

Medical companies are organic to brigades, where they are called brigade support medical companies (BSMCs), and reside in brigade support battalions. Medical companies are also organized as Area Support Medical Companies (ASMCs), which are similar in capability and designed to be stand-alone units that deploy with division or corps headquarters. Medical companies are manned with 70 soldiers (including materiel and soldiers to support primary and emergency medical care) and can collect and hold casualties.

FSTs are designed to be attached to other units, such as BSMCs, and are manned with 20 soldiers. FSTs include medical materiel to perform triage preoperative care, initial surgery, and postoperative nursing care.

As of 2016, when this research project was undertaken, the prominent Army hospital was a CSH, which was organized as either a corps or echelon-above-corps unit. Full CSHs can be assigned more than 600 soldiers, and they include a robust range of medical materiel to perform the services regularly available at inpatient treatment facilities.

There are three types of Army medical materiel. *Equipment* is materiel that will become obsolete before the end of its serviceable lifetime and will be replaced by a newer model. Medical equipment could include such items as defibrillators, oxygen generators, and X-ray apparatus. The Army budgets to procure new items on an ongoing basis. *Non-shelf-life* items generally do not require modernization and will not expire in less than ten years. Such items may include medical equipment repair tool kits, such medical tools as stethoscopes, and storage or furniture items. *Shelf-life* items must be replaced after a planned amount of time because they are no longer usable. Such items may include pharmaceuticals that must be used by a certain date to ensure potency.

The entirety of materiel fielded to a unit can be considered a *unit set* when describing its management. Such a set includes vehicles, weapons, and medical materiel. A *medical set* includes mostly medical items, with such exceptions as office supplies. Medical sets can encompass all collections of items that the Army technically refers to as *sets*, *kits*, and *outfits*. Shelf-life items can be managed separately from whole medical sets, in which case they are collectively referred to as a *shelf-life item set*, or *set of shelf-life items*.

Faced with budgetary constraints, the Army must decide how to best invest for readiness. It cannot afford to modernize all units with current medical equipment and to sustain all units with consumable medical items at all times. To help the Army consider how best to invest in medical materiel equipping, the U.S. Army Medical Materiel Agency (USAMMA) asked RAND Arroyo Center to survey medical materiel owned by the Army, procurement and fielding costs, alternative supply options, and the effect that alternative options would have on capabilities and risk. This report summarizes our analysis. Specifically, it considers the current Army medical materiel strategy, equipping costs, readiness levels, and recommendations for optimizing the Army medical materiel strategy.¹

Current Army Medical Materiel Strategy

The Army has undertaken several steps to apply available funds in a way that efficiently equips units with medical materiel. Chief among these steps has been the deferred procurement of CSHs.² In 2012, the eight Active Component CSHs in the contiguous United States (CONUS) turned in all medical materiel from their 164-bed companies to the Sierra Army Depot, keeping only materiel for their 84-bed companies. At the time, materiel for the 164-bed companies had not received any recent investments, and CSHs were considered unlikely to deploy with materiel for their 164-bed companies.

The Army also has deferred procurement of shelf-life items for many types of units. Specifically, items with a shelf life of less than 60 months are not fielded to Reserve Component (RC) units or hospitals, and items with a shelf life of less than or equal to 12 months are not fielded to any units in the Army. Prior to a deployment or rotation at a Combat Training Center, the Army assumes that units will procure items from Installation Medical Support Activities, the purchasing organizations associated with the medical treatment facility on an Army installation.

To mitigate the risk of deferring procurement of medical materiel across segments of the force structure, the Army has programs to centrally maintain materiel for deploying units' use. Unit sets, including nonmedical and medical materiel, are stored overseas (prepositioned for use in rapid-response missions) through the Army Pre-Positioned Stocks program. The USAMMA also centrally manages the Unit Deployment Program, which procures and sustains sets of shelf-life items for hospitals and echelon-above-brigade (EAB) medical units to use as their unit basic loads³ when they deploy.

¹ The Army medical materiel strategy includes practices adopted by units with approval from their commands, and policies from these sources: U.S. Army Medical Command, Director of Logistics, *Army Medicine Equipping Strategy*, Version 15, May 2011; and Army Publishing Directorate, *Army Medical Department Supply Information*, Fort Belvoir, Va.: U.S. Army, SB 8-75-S7, July 20, 2013.

² When procurement is deferred, materiel designated on units' equipping tables is not purchased. The implication of deferring procurement is that materiel would be purchased when units need to deploy.

³ *Unit basic loads* are items to support units, typically in their first three days of deployment. Headquarters, U.S. Department of the Army, *Army Pre-Positioned Operations*, Army Techniques Publication 3-35.1, Washington, D.C., October 2015.

Even with deferred procurement, the Army cannot deploy its full force structure in a short period. The time needed for hospitals, for which whole medical sets have been deferred, to deploy would be longer than the time to deploy for units, for which only shelf-life item procurement has been deferred.

Equipping Costs

To estimate equipping costs, we gathered data describing the units in the force structure, the bill of materials for units' medical sets, and the costs of items in sets. Equipping units with medical materiel is a costly requirement for the Army.

Hypothetically, if the Army were not deferring procurement, it would require an overall expenditure of \$2.3 billion to procure all the medical materiel needed across the force structure. The Army's current medical materiel strategy reduces this intended investment to \$1.7 billion. Deferred procurement of hospital sets, not including shelf-life items, accounts for more than half of this difference, while deferred procurement of shelf-life items in hospitals and RC units accounts for the remainder of this difference.

It is possible to estimate annual life cycle costs on the basis of medical material procurement costs, broken out into the component costs of equipment modernization and sustainment of shelf-life items. For the whole force structure, life cycle costs calculated from these two components would be \$347 million annually. Under the Army medical materiel strategy, the annual costs to modernize equipment and repurchase expiring shelf-life items are about \$222 million. This far exceeds the \$62 million annually that the USAMMA executed for equipment modernization in fiscal year (FY) 2014 and FY 2015, and the \$15 million annually that the USAMMA executed to sustain shelf-life items for centrally managed programs over this period. Although units spend an unknown amount of funds for shelf-life item sustainment, this amount is not likely to match what is needed because of other demands on units' training budgets. Brigade combat teams (BCTs) would need to spend nearly \$1 million per year to replace expiring medical shelf-life items in their medical companies. Based on conversations with Army experts and leaders, spending on medical supplies is more likely in the range of tens of thousands of dollars to replace first aid items consumed in training.

Annual costs to sustain shelf-life items vary by type of unit. Although deferred procurement helps units reduce their sustainment costs, many still face substantial costs. For example, although deferred procurement reduces annual shelf-life item sustainment costs by \$28 million for BCTs across the Army, such units have \$33 million in remaining costs to sustain shelf-life items.

In short, even with deferred procurement, the Army still faces a large annual cost to sustain medical materiel—a cost its current expenditures may not be covering.

Readiness

We estimate medical materiel readiness by examining percentage funding for equipment modernization and sustainment of shelf-life items by unit type.⁴ In FY 2014 and FY 2015, executed funding for equipment modernization as a percentage of that needed was 33 percent for BCTs, 36 percent for enablers supporting BCTs, 42 percent for hospitals, and 84 percent for EAB medical units.

Although executed funding is insufficient to modernize medical equipment for all units, the Army can optimize its funding to ensure that units on such plans as Time-Phased Force Deployment Data (plans for military operations) have access to modernized medical equipment for deployment.

Similarly, the Army can rely on a strategy of prepositioning equipment and shelf-life items to reduce deployment time lines. A unit with prepositioned equipment and shelf-life items either prepositioned or ready for immediate shipment from CONUS can deploy in 30 days. A unit with equipment and shelf-life items that are immediately accessible in CONUS can deploy in 60 days, while one with equipment immediately accessible in CONUS but needing to buy shelf-life items can deploy in 90 days. Units needing to buy both equipment and shelf-life items would need more than 120 days to deploy.

Altogether, our analyses suggest that, with prepositioned equipment and shelf-life items either prepositioned or available for immediate shipment from CONUS, the following number of units could deploy in 30 days:

- ten units with Role 3 capability (or approximately ten 84-bed CSHs)
- five FSTs
- five ASMCs
- nine BCTs.

The numbers increase with longer time lines permitting procurement and shipment of equipment; in 90 days, most FSTs and ASMCs should be able to deploy, as the Army has spent sufficient funds to modernize FSTs' and ASMCs' equipment but has not procured their shelf-life items. Time lines for most hospitals and BCTs to deploy would be longer, as funding for their equipment modernization is well below projected costs. Ensuring that more units have medical equipment so that they can deploy more rapidly would require the Army to invest more funds.

Recommendations

The Army can generate greater readiness by applying its current resources through modified programs and policies. The Army funds readiness preferentially through its current medical materiel strategy, deferring procurement of some large hospital sets and shelf-life items, and

⁴ Although medical equipment sets of a previous technological generation could be used to provide medical support, in practice, the Army would be likely to procure a new set for a deploying unit rather than let it deploy with outdated medical equipment. Therefore, we make the assumption that outdated unit sets are not ready.

applying funds to improve the medical equipping readiness of the force structure balance. Our analysis found that, by further adjusting its medical materiel strategy, the Army can make measurable improvements toward accomplishing its objectives of achieving sustainable readiness and generating units to support plans.

Equipment

Although the Army does not currently budget sufficient funds to modernize medical equipment for the entire force structure, it does budget sufficient funds to modernize one-third or more of the force structure. We recommend that the Army craft its medical materiel strategy to focus on making medical equipment available for those units that need to be combat-ready to deploy rapidly for a contingency operation.

Shelf-Life Items

The Army is reluctant to invest in items that could expire before they are used in a deployment or exercise. This is sensible, particularly given that many programs are competing for resources. Nevertheless, to achieve readiness, the Army organizes on-hand materiel so as to provide it to units needing to deploy rapidly.

The Army must budget \$92 million annually to support units in the medical materiel strategy with sufficient and up-to-date shelf-life items. This expense is substantially greater than the amount executed by the USAMMA in recent years for shelf-life item replacement. The USAMMA has spent \$15 million per year sustaining medical shelf-life items in centrally managed programs, which amounts to 16 percent of the medical materiel strategy requirement. An unknown additional amount was spent by units.

We recommend focusing available funds on shelf-life items to hedge against delays in deployment for those units that need to be combat-ready for rapid deployment for contingency operations, which may be implemented through programs centrally managed by an agency or headquarters. For any shelf-life items fielded to units, replacement costs should be budgeted within unit training funds to ensure that units have sufficient funds to maintain their expiring medical materiel.

Our research also found that the Army has low visibility for shelf-life items that are outside of centrally managed programs. We recommend that the Army either put into place a unit-level reporting system to monitor the status of shelf-life items or assign responsibility to an agency or headquarters for centralized storage and management of shelf-life items for units to improve visibility of all shelf-life items across the entire force. Such a system may help increase readiness and reduce risk.

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Abbreviations

AC	Active Component
APS	Army Pre-Positioned Stocks
ASMC	Area Support Medical Company
BCT	brigade combat team
BSMC	brigade support medical company
CONUS	contiguous United States
CSH	Combat Support Hospital
CTC	Combat Training Center
DLA	Defense Logistics Agency
EAB	echelon above brigade
EEHE	Early Entry Hospital Element
FORSCOM	U.S. Army Forces Command
FST	Forward Surgical Team
FY	fiscal year
LIN	line item number
MDEP	Management Decision Package
MEDCOM	U.S. Army Medical Command
MMRP	Medical Materiel Readiness Program
MRMC	U.S. Army Medical Research and Materiel Command
MUAG	Medical Unit Assemblage Group
NIIN	National Item Identification Number
OCONUS	outside the contiguous United States
OTSG	Office of the Surgeon General
RC	Reserve Component
RTS	Reserve Training Site
SIAD	Sierra Army Depot

SRC	Standard Requirement Code
TEWLS	Theater Enterprise-Wide Logistics System
UA	Unit Assemblage
UDP	Unit Deployment Program
UIC	Unit Identification Code
USAMMA	U.S. Army Medical Materiel Agency
USAR	U.S. Army Reserve

1. Introduction

The Army has stated that *readiness*, defined as the ability to fight and win our nation's wars, is its number one priority.¹ This report seeks to identify strategies that will optimize Army medical equipping readiness.

The Army equips units with medical materiel to support them when they deploy. Various units use medical equipment, including aid stations for combat units; medical platoons and companies; Forward Surgical Teams (FSTs); and Combat Support Hospitals (CSHs) and their augmenting units, such as pathology, infectious disease, and head and neck teams. These units must have the appropriate materiel to meet their missions, as well as access to sufficient materiel for training to support contingency and rotational operations. Providing this equipment could be complicated in a constrained fiscal environment. The largest medical units by medical materiel requirements are medical companies, FSTs, and CSHs.

Medical companies are organic to brigades, where they are called brigade support medical companies (BSMCs), and reside in brigade support battalions. Every brigade combat team (BCT) in the Army will have one BSMC in its force structure. Medical companies are organized as stand-alone units to support areas on the battlefield outside of brigades, such as near division or corps headquarters; these units are called area support medical companies (ASMCs). BSMCs and ASMCs have similar capabilities.

FSTs are designed to be attached to other units, such as BSMCs. FSTs lack the patient holding and ancillary capabilities of BSMCs, such as preventative medicine and mental health; and independent of attached FSTs, BSMCs can perform emergency medicine procedures, such as resuscitation, but not surgery. FSTs are manned with 20 soldiers and organized around four functions: administrative, triage/preoperative, initial surgery, and postoperative nursing care.²

Army hospitals are normally assigned at the corps level, where they support multiple brigades; they also can be assigned above the corps level (at the theater or joint task force level). Army hospitals are organized in several variants. In 2016, at the time this research project was undertaken, the prominent Army hospital was the CSH, which was organized as either a corps or echelon-above-corps unit. In 2017, the Army began to outfit hospital units with field hospital sets to reflect a more modular organization. The prototypical Army hospital is a corps CSH, which is organized with a headquarters element, 84-bed company, and 164-bed company. A full CSH can be assigned more than 600 soldiers.

Army medical capability is found in all components. In the Active Component (AC), there are instances of all medical units in the force structure. In the U.S. Army Reserve (USAR), there

¹ U.S. Army, Chief of Staff, "Army Readiness Guidance, Calendar Year 2016–2017," memorandum for all Army leaders, Washington, D.C., January 2016.

² Headquarters, U.S. Department of the Army, *Employment of Forward Surgical Teams*, Field Manual 4-02.25, Washington, D.C., March 2003.

are Army hospitals and many other medical support units, but no BCTs. In the Army National Guard, there are medical support units and BCTs, but no hospitals.

This report explores how the Army can optimize its medical materiel strategy. In this chapter, we discuss the types of units using medical materiel, the types of materiel they use, the life cycle costs for sustaining medical materiel, and the responsibility for sustaining it. In subsequent chapters, we explore the current Army medical materiel strategy, equipping costs for this materiel, and current levels of medical materiel readiness and options for improving readiness; and present recommendations for optimizing the Army medical materiel strategy.

Background

As noted, various units use Army medical materiel. This materiel varies widely by type and purpose, and accordingly has varying life cycle costs. We review the costs and responsibility for sustaining materiel in the following subsections.

Types of Units

Units across the force have medical capability, use medical materiel, and must be equipped with medical materiel to perform their missions. These units may be medical units or nonmedical units.³

For this research, we included all units in calculations of total force structure costs; in focused analysis and readiness calculations, we only included units requiring the largest amounts of medical materiel. Some units requiring large amounts of medical materiel are predictable, such as hospitals and echelon-above-brigade (EAB) medical units, which include FSTs and ASMCs. These units are supported by the Unit Deployment Program (UDP). More surprisingly, there is significant medical materiel in BCTs and units described as enablers. In this report, several categories of units are considered.

Hospitals

The largest medical unit in the Army force structure is the hospital. Most hospitals in the Army force structure are designed to be 248-bed CSHs. A CSH has two companies that can deploy individually and establish a treatment facility: an 84-bed company and a 164-bed company. A section of the 84-bed company also can deploy in a smaller package, as a 44-bed Early Entry Hospital Element (EEHE). The Army is currently redesigning its hospital units; future units will be organized as 32-bed field hospitals.

Hospital units differ in their surgical capacity, in their patient-holding capacity, and in the ancillary services they provide. As a result, they differ in their materiel and manpower

³ We distinguish medical and nonmedical units by using the Standard Requirement Code (SRC). Medical units are those whose first digits of the SRC, called the series, are 08; nonmedical units are those whose series is not 08. For more on the SRC, see Army Force Management School, *Structure and Manpower Allocation System (SAMAS) Code Book: Reference Handbook*, Fort Belvoir, Va., updated as of July 18, 2018.

requirements. However, all provide an inpatient surgical capability and will be aggregated in this report for analyses of costs and readiness. Hospitals are in both the Army AC and USAR.

EAB Medical Units

Medical units other than hospitals are often referred to as EAB medical units. When deployed, such units are under the command of an Army division or corps, which are echelons of command above brigades. Among the types of EAB medical units are FSTs, ASMCs, dental companies, and veterinary companies. In this report, specific analysis is performed on the EAB medical units that require the greatest amount of medical materiel: FSTs and ASMCs. EAB medical units are in all Army components.

BCTs

BCTs are the focal fighting unit of the Army. A BCT contains organic medical capability in its battalion aid stations, located in the Brigade Support Battalion, and first-responder capability in units across the brigade. BCTs are in the Army AC and Army National Guard.

Enablers

Units other than BCTs can be called enablers for their support of BCTs. Enablers may be combat units, such as aviation units, or they may be combat support units, such as engineers. These units also have first-responder capabilities and must be equipped with medical materiel to perform their missions. Enabler units are in all Army components.

Types of Materiel

Materiel is defined for Army management as equipment, durable, and expendable. We distinguish these by their sustainment characteristics, and therefore discuss *equipment*, *non-shelf-life* items, and *shelf-life* items, which match up closely though not precisely, to the Army materiel categories.

Equipment is materiel that will become obsolete before the end of its serviceable lifetime and will be replaced by a newer model. Medical equipment includes such items as defibrillators, oxygen generators, and X-ray apparatus. The Army budgets to procure new items are reviewed on an ongoing basis to keep unit equipment updated.

Non-shelf-life items are items that should not require modernization and will not expire in less than ten years. Such items include medical equipment repair tool kits, such medical tools as forceps and stethoscopes, and storage or furniture items.

Shelf-life items have materiel characteristics that require items to be replaced after a planned amount of time because they are no longer usable. Within the Office of the Surgeon General (OTSG), these items are called potency and dated items. Such items are often pharmaceuticals that must be used by a certain date to ensure potency. Plastic medical surgical items and bandages are among the common examples of medical materiel that have finite shelf lives after which they should be discarded.

Although these definitions can be applied to all classes of materiel, this report focuses on *medical materiel*, which is defined as class VIII materiel in military logistics.⁴ The entirety of materiel fielded to a unit can be considered a *unit set* in describing management of unit materiel. Such a set includes all types of items, including vehicles, weapons, and medical materiel. A *medical set* includes mostly class VIII medical items, with a few additional items, such as office supplies. Medical sets can encompass all collections of items that the Army technically refers to as *sets*, *kits*, and *outfits*. Shelf-life items can be managed separately from whole medical sets, in which case they can be collectively referred to as a *shelf-life item set*, or *set of shelf-life items*.

Medical Materiel Life Cycle Costs

To field medical materiel to units, the Army must first procure a medical set, which consists almost entirely of commercial items. Although there are materiel-handling and overhead costs associated with such procurement, the predominant cost for the commercial items that make up medical sets is the purchase price the Army must pay to item vendors. After procuring sets of medical materiel, the Army incurs costs to sustain sets and keep them ready for deploying units. There are maintenance, overhead, and administrative costs associated with sustaining units, but the predominant cost in sustaining units is the purchase price of new items. In this report, purchase costs are characterized by (1) modernization purchase costs to replace obsolete equipment, and (2) shelf-life purchase costs to replace expiring items. Although the Army also incurs sustainment costs for replacing expendable items as they are used, we exclude these from our analysis because they (along with maintenance, overhead, and administration) represent a lesser scale of costs for the items considered and including them would not affect the study's ultimate recommendations.⁵

Responsibility for Medical Materiel

The U.S. Army Medical Research and Materiel Command (MRMC) is the Army's medical materiel developer.⁶ The U.S. Army Medical Materiel Agency (USAMMA) is a subordinate command to MRMC; its mission is to equip and sustain the medical force. As such, it is the Surgeon General's executive agent for medical logistics.

Among its activities, the USAMMA procures medical materiel to be assembled into medical sets and fielded to units. The USAMMA is responsible for procuring medical materiel and sustaining medical materiel in Army Pre-Positioned Stocks (APS). The USAMMA is also

⁴ Classes of supply define commodities based on considerations for supply operations. Class VIII is medical materiel. An example of another class is class IX, repair parts. Headquarters, U.S. Department of the Army, *Sustainment*, Field Manual 4-0, Washington, D.C., April 2009.

⁵ Replacing expendable medical items as they are consumed is a small cost for units when not deployed, which is the set of costs considered in this research. In garrison, units may use a small amount of expendable medical materiel during training, but higher costs to purchase items will be borne by Army brick-and-mortar treatment facilities. When deployed, use of expendable medical items is a higher cost for units as they actively provide medical care.

⁶ MRMC, homepage, undated.

responsible for centrally managed medical materiel programs, including the UDP. This program procures and sustains sets of shelf-life items for hospitals and EAB medical units to use as their unit basic loads when they deploy.⁷

Each year, the USAMMA is budgeted money to procure and field modernized materiel to units and to procure and field new medical sets for newly formed units.

The responsibility for sustaining shelf-life items is distributed among several entities. The USAMMA is responsible for procuring shelf-life items to replace expiring materiel in APS and the UDP. AC Army units other than hospitals, however, are responsible for procuring shelf-life items to sustain units' basic loads of materiel. They must purchase these items using their unit training funds. Army hospital units and Reserve Component (RC) units also are responsible for sustaining some shelf-life items in their sets, but their burden to do so is greatly lessened because of deferred procurement strategies. Table 1.1 lists organizations responsible for modernizing medical equipment and sustaining shelf-life items, as well as funding sources for these.

Table 1.1. Responsibility for Materiel Summary

Activity	Responsibility	Funding Source
Unit set fielding and modernization	USAMMA	FL8D
Shelf-life items in unit sets at home station	UnitsAll	TRM, other unit funds
APS	USAMMA	FL8D, VWSI
UDP	USAMMA	HSUK

NOTE: FL8D, VWSI and HSUK are fiscal codes for Management Decision Package (MDEP), which represent portions of the Army's total resources (see U.S. Army, Army Financial Management and Comptroller, *Defense Finance and Accounting Services-Indianapolis Manual 37-100-16*, December 2015). TRM and other unit funds are resources allocated to be spent at units' discretion for training.

Medical Materiel and Readiness

Faced with budgetary constraints, the Army must decide how to best invest for readiness. It cannot afford to modernize all units to the same level or sustain all units in a combat-ready status at all times. Across the force, the Army seeks to achieve the highest possible levels of readiness while effectively managing risk.⁸ Optimizing its investment in medical equipping can help it do so.

Funding for medical materiel has decreased from its levels during overseas contingency operations in Iraq and Afghanistan when specific funds were available to procure new sets for units deploying and returning from deployment. Funds are not projected to increase from their current levels. Therefore, the Army should consider how it can use current levels of funding to generate the highest level of readiness in medical materiel.

⁷ Unit basic loads are items to support units, typically in their first three days of deployment. Headquarters, U.S. Department of the Army, *Army Pre-Positioned Operations*, Army Techniques Publication 3-35.1, October 2015.

⁸ U.S. Army, Chief of Staff, 2016.

Fiscal constraints have led units to make difficult decisions about how to spend their finite training funds. It can appear undesirable for units to spend these funds on sustaining shelf-life items that may expire or become unusable before a unit deploys. Units may instead wish to purchase class IX repair parts or other commodities they may consider more likely to be needed in training or to remain serviceable until deployment.

Medical materiel is unique among commodities in the extent to which it may not be used in training as it is in deployment. A maneuver unit whose core competency is generating combat power in land operations may focus its training on using its primary weapon systems and performing such tasks as moving as a unit and exercising command and control, which is associated more commonly with warfighting. In unit-level exercises, maneuver units may simulate medical capabilities only superficially, in a way that requires little medical equipment and only nominal use of consumable items.

BCTs would need to spend nearly \$1 million per year to replace expiring medical shelf-life items in their medical companies. Based on conversations with Army leaders and experts, their spending on medical supplies is more likely in the range of tens of thousands of dollars to replace first aid items consumed in training.

For these reasons, I Corps has directed BCTs in its command that they need not procure their unit basic load of medical materiel before rotation at a Combat Training Center (CTC).⁹ If a large portion of a BCT's medical shelf-life items expire, it would be very costly to replace them, and many of the items may remain unused during the exercise. I Corps also has asked U.S. Army Forces Command (FORSCOM) to standardize a package of medical materiel for BCTs to use when deploying for CTC rotations that would stay at the CTC location.¹⁰ Given these circumstances and fiscal constraints, many units are likely not sustaining their medical shelf-life items. This creates the risk that units may not be ready to deploy when they would appear otherwise in their unit status reports, which convey the overall mission readiness of units to their chains of command.¹¹ The primary risk to the readiness of units not sustaining their unit basic loads and the secondary risk to the readiness of the Army, which lacks visibility on which units are not sustaining their unit basic loads, raise a question of readiness across the entire force.

Looking to the Future

In a future threat environment that demands sustained readiness, the Army should consider how it can best invest in medical materiel. There are opportunities to change the priorities for

⁹ U.S. Army Forces Command, *Information Paper Class VIII Requirement for Combined Training Center Rotations*, April 2016.

¹⁰ I Corps, *Surgeon White Paper on Medical Equipment Set (MES) Fill Requirements for National Training Center/Joint Readiness Training Center Unit Rotations*, Joint Base Lewis-McChord, Washington, D.C., 2016.

¹¹ Headquarters, U.S. Department of the Army, *Army Unit Status Reporting and Force Registration—Consolidated Policies*, Army Regulation 220-1, Washington, D.C., May 2010. Many medical items, including all consumable and expendable items, are included in sets and are not stand-alone line items. Therefore, units are not required to report on their status.

existing funds so as to modernize units targeted for combat-ready status. The Army can change policies that determine how shelf-life medical items are managed to ensure that sets are available for units when they deploy and to require units to report readiness levels that include thorough information about their medical equipping. Indeed, the Army has already taken several steps to optimize its medical materiel strategy. We explore its current medical materiel strategy in Chapter 2.

2. Current Army Medical Materiel Strategy

The U.S. Army Medical Command (MEDCOM) has incorporated several coordinated efforts to generate a strategy that applies available funds in a way that efficiently equips units with medical materiel. The strategy uses multiple types of available funds to balance risk across the force and across missions. The strategy includes programs that defer procurement of materiel for units and mitigates the risk incurred by funding centrally managed programs.

In this chapter, we describe the programs in the Army medical materiel strategy and their effects on readiness and costs. This analysis includes materiel that is represented on units' tables of organization and equipment, or the materiel necessary to fully equip units. The Army sustains other medical items in centrally managed programs for use in contingencies. The USAMMA manages medical chemical, biological, radiological, and nuclear defense materiel. These items are stored in military warehouses until needed for a mission. Because these items are not tied to a specific unit or unit type, we do not include them in our equipping analysis.

Guidance

The Army medical materiel strategy is laid out most thoroughly in the Army Medicine Equipping Strategy.¹ This document describes the background behind the strategy and how the medical materiel programs align with Headquarters, Department of the Army equipping strategies. A 2013 Army supply bulletin provides details of strategy implementation.²

Deferred Procurement of CSHs

As the Army unit with the greatest medical capability and largest medical materiel cost, CSHs are the focus of several medical materiel programs. We review these in the following subsections.

FORSCOM CSH 164-Bed Companies

In 2012, FORSCOM directed the eight CSHs in the contiguous United States (CONUS) to turn in all the medical materiel from their 164-bed companies to Sierra Army Depot (SIAD), keeping only the materiel for their 84-bed companies.³ After the return of the materiel,

¹ U.S. Army Medical Command, Director of Logistics, *Army Medicine Equipping Strategy*, Version 15, May 2011.

² Army Publishing Directorate, *Army Medical Department Supply Information*, Fort Belvoir, Va.: U.S. Army, SB 8-75-S7, July 20, 2013.

³ U.S. Army Forces Command, U.S. Army Forces Command G-3 Central Tasking, *164-Bed Directive*, January 2012a; U.S. Army Forces Command, U.S. Army Forces Command G-3 Central Tasking, *Readiness Reporting Requirements for Combat Support Hospitals*, October 2012b.

FORSCOM CSHs were to report their readiness on the basis of their assigned missions. At that time, CSHs were considered unlikely to deploy with their 164-bed companies, as they had not done so in the previous ten years of overseas contingency operations. As a result, CSHs could report full unit readiness, although they did not possess sets for their 164-bed companies.

In the current Army medical materiel strategies, 164-bed company sets for FORSCOM CSHs are not part of the investment strategy. Accordingly, there are no life cycle costs associated with them.

USAR CSHs

There are 16 CSHs in the USAR. Under the auspices of the OTSG, the USAMMA modernized four USAR CSH sets to the current standard of equipping from 2007 to 2009. While they still bear the designation of specific USAR units, the CSH sets modernized in the Medical Materiel Readiness Program (MMRP) can be used by any deploying USAR unit. This means that only limited funds are needed to maintain unit equipping readiness. Readiness of the MMRP sets is reported to be high, as USAMMA assigns several staff members the dedicated responsibility for maintaining and inspecting the MMRP sets, and MMRP deployment of a hospital set successfully supported the 2010 deployment of the 31st CSH.

The USAMMA sustains four 248-bed CSH sets, stored at SIAD. This is the total investment in CSH sets for USAR units. The balance of 12 unit sets is not procured, so there are no life cycle costs associated with them.

Shelf-Life Items

The cost to procure and sustain shelf-life items across the force is tremendous. These items are part of the unit basic load for units across the force structure. Items in this category have planned durations for which they are serviceable, and these data are encoded in the master data file for the item as it is stored in the Army medical logistics data system.⁴

Shelf-life items must be continually purchased to ensure that a serviceable item is on hand as items expire. Units are responsible for monitoring the service life of items, sustaining the set of items fielded to them, and repurchasing items when they expire. The USAMMA sustains shelf-life items maintained as part of a central program.

To reduce costs to the Army and to its units, the Army medical materiel strategy defers procurement of a large portion of the shelf-life items required across the force structure. As the USAMMA fields medical sets to units, it manages the implementation of the deferred-procurement strategy. The USAMMA does not field items with less than 60 months (five years) of shelf life to RC units. These units do not have a major home-station training requirement, and

⁴ When a vendor supplies the Army with a shelf-life item, the item may arrive with greater or less than the planned shelf life remaining before its expiration date, although vendors should be disinclined by contract to send items with less than the stipulated shelf life and have incentives to manage their own inventory and not send items with greater than the stipulated shelf life. The Army enters the actual expiration date for the individual item into its inventory data system and selectively uses stock to ensure that items are used before they expire.

may go to a Reserve Training Site (RTS) for unit-level training. USAR units may store their medical sets at Reserve Concentration Sites. RC units may not be called to rapidly deploy, given the time required to activate their personnel.⁵ Therefore, deferring procurement of shelf-life items is a lesser risk for RC units than for AC units.

Hospitals are the largest unit of medical capability in the Army and require a larger amount of medical materiel than any other unit. They offer a good opportunity to implement deferred procurement for cost savings. In addition to the deferred procurement program of entire CSH sets, the Army has deferred procurement of items with shelf lives of less than 60 months for the 84-bed company sets fielded to FORSCOM CSHs.⁶

Lastly, the Army does not field medical items with shelf lives of less than or equal to 12 months to any unit in the force. Rather, it assumes that units will procure these items from their Installation Medical Support Activities (IMSAs)—the contracting and purchasing organization associated with the medical treatment facility on an Army installation—when needed for training or deployment. Using IMSAs to locally purchase medical materiel for maneuver units, which accounts for a small amount of work relative to the hospitals and clinics that IMSAs support, is a valuable example of leveraging institutional Army resources to support deploying units.

Items with shelf lives of less than 60 months (five years) are not fielded to RC units or to hospitals. Items with shelf lives of less than or equal to 12 months are not fielded to any units in the Army.

Table 2.1 summarizes shelf-life item management policies for the Army.

⁵ RC medical units are observed to deploy in less than 90 days but not less than 60 days. Results of this research show that the time to procure and field a full medical set to an RC unit would require more than 120 days. This would delay the RC unit, but not as much as it would delay an AC unit to deploy.

⁶ While the Army medical materiel strategy excludes fielding items with less than 60 month shelf-life to active component CSHs, some funds have been made available to sustain shelf-life items for the forward-deployed CSHs, the 212th CSH in Germany which has 84-bed capability, and the 121st CSH in Korea, which has 248-bed capability.

Table 2.1. Materiel Fielding for Shelf-Life Items

Unit Category	AC	RC	APS	UDP
Hospitals	≥60-month shelf-life items, no freezer, refrigerated, or controlled	No items fielded to RC units	No shelf-life items (with a few exceptions)	<60-month shelf-life items
EAB medical	>12-month shelf-life items, no freezer, refrigerated, or controlled	≥60-month shelf-life items, no freezer, refrigerated, or controlled	No shelf-life items	<60-month shelf-life items
BCTs and enablers (nonmedical)	>12-month shelf-life items, no freezer, refrigerated, or controlled	≥60-month shelf-life items, no freezer, refrigerated, or controlled	>12-month shelf-life items, no freezer, refrigerated, or controlled	N/A

NOTE: N/A = not applicable.

Risk Mitigation

When the Army defers procurement of medical materiel across segments of the force structure, it has programs for centrally maintaining sets for use by deploying units. This is a cost-effective way of ensuring that the first units to deploy have the materiel they need while not incurring the cost of maintaining sets for all Army units.

Whole unit sets are stored overseas, prepositioned for use in rapid-response missions, through the APS program. The USAMMA maintains the medical sets for these unit sets. Among the APS sets are combat units (such as BCTs and aviation units), sets for enablers (such as sustainment brigades), and sets for medical units (such as CSHs and FSTs).

To mitigate risk incurred by deferring procurement of CSH sets for USAR units, the USAMMA maintains four 248-bed CSH sets at SIAD through the MMRP. These four sets partially offset the 16 deferred CSH sets for USAR units, leaving a net decrease of 12 maintained sets.

To mitigate the risk to units lacking unit sets at home stations with which to train, the Army funds procurement of sets to be located at RTSs. These sites are designed for use by units in the USAR but also have been recommended for use by AC units.⁷

The force structure used in this report is shown in Table 2.2. Noted in the table is the deferred procurement of FORSCOM and USAR CSH sets. Two notable examples of EAB medical units are included: FSTs and ASMCS.

⁷ U.S. Army Medical Command, Director of Logistics, 2011.

Table 2.2. Force Structure Used in Research (Fiscal Year [FY] 2016)

Unit Type	Regular Army	Army National Guard	USAR	APS	Total Units (Excluding APS)
Hospital capability	19 (8 deferred)	—	32 (24 deferred)	14	51
FST	16	—	22	2	38
ASMC	14	40	5	2	59
BCT	33	26	—	5	59

NOTES: Hospital capability is calculated as the number of stand-alone capabilities that can be generated. While their capacities differ, for example, the units in the force structure were determined to generate the following numbers of hospital capabilities: 248-bed CSH = 2; 84-bed CSH = 1; 44-bed EEHE = 1; 32-bed field hospital = 1. Procurement of 168-bed companies for eight FORSCOM CSHs is deferred in Army medical materiel strategy. Their 84-bed companies are fielded. Also deferred is the procurement of 12 USAR 248-bed CSHs. Four USAR 248-bed CSH sets are centrally managed as part of the MMRP.

The USAMMA manages the UDP to supply shelf-life items to EAB medical units, although units are not sufficiently funded to sustain their shelf-life items. The basis for this program is to support units deploying in the first 31 days for three specific operational plans. In practice, the quantity of sets sustained for medical units is as low as 10 percent of the AC force structure for some units, and as high as 100 percent of the units in the AC force structure for other units. The UDP is not designed to support RC units.

There have been recent suggestions within the Army to further expand centrally managed programs for medical materiel. In a white paper, I Corps proposed that FORSCOM offer a centrally managed program to support units that have deferred medical materiel when they deploy for training rotations at CTCs.⁸

Summary

The Army has incurred risk by deferring procurement of medical materiel for its operational force. The Army cannot deploy its full force structure in a short period. The effect of deferring procurement propagates across all types of units, both medical and nonmedical, as shelf-life items are deferred for the entire RC. The time until all hospitals could deploy would be far greater than for units for which only shelf-life item procurement had been deferred, as the Army would need to procure, assemble, and field entire sets for companies in FORSCOM units and many whole units in the USAR.

The risk to defer procurement of medical materiel is prudently taken, as the Army cannot afford to fully equip all units, and deferred procurement offers significant cost savings. Nevertheless, the Army must understand the risk associated with deferred procurement

⁸ I Corps, 2016.

programs, and how changes in funding from currently budgeted levels would affect readiness even further.

In Chapter 3, we explore current equipping costs in more detail.

3. Equipping Costs

Equipping units with medical materiel is a costly requirement for the Army. Medical materiel is used by both medical and nonmedical units across the force. Medical units are equipped with advanced medical devices, similar to those commonly used in medical practice. Some nonmedical units have organic treatment facilities, such as the aid stations in BCTs. First-responder capabilities are distributed across the force; thousands of medical sets for ground ambulances and combat medical care are fielded to a wide variety of unit types.

Medical materiel also is procured and sustained in storage, through centrally managed programs, to issue to deploying units. Medical materiel is held in APS to equip medical and nonmedical units. The USAMMA manages the UDP to provide shelf-life items for deploying medical units.

Data for Estimating Costs

To estimate equipping costs, we gathered data describing the units in the force structure; the bills of materials for units' medical sets; and the costs of items in sets from the USAMMA Plans, Program Analysis and Evaluation Directorate, which were drawn from the Theater Enterprise-Wide Logistics System (TEWLS) data. Because the purchase price for medical items varies over time as vendors substitute like items, introduce new versions of items, and change prices on existing items, we sought to establish a cost basis for comparing items. We used the cost of line item numbers (LINs) as of May 2016 for equipment and March 2016 for sets, as provided by the USAMMA, for our analysis.

Analysis of Capitalization and Investments

We compiled materiel data from the TEWLS for all deployable units with medical materiel. The included units became the analytic baseline for force structure cost calculations. Because some units contain subordinate units, which could lead to double counting of materiel, we considered only parent units in our analysis. We identified parent units as those with "AA" in the last two positions of their Unit Identification Codes (UICs).

We sorted units to identify where costs lie in segments of the force structure. We sorted units by component: AC (component 1), Army National Guard (component 2), USAR (component 3), and APS (component 6, for Army logistics system use). Using the first two digits in the SRC, we distinguished units by their functional areas. Medical units, as noted earlier, are those whose first two digits in the SRC are 08. It is possible to distinguish units in other functional areas, but for the purposes of this study it was not illuminating to do so. We used unit titles in the data—such as "Combat Support Hospital. 248 bed"—to distinguish among medical units.

Unit sets are listed in the TEWLS by LINs. The bill of materials for a LIN is called a Unit Assemblage (UA), and the individual items in a UA are distinguished by National Item Identification Numbers (NIINs). Item costs are gathered in a database at the NIIN level. LINs can contain one NIIN or hundreds of NIINs. There are typically one to three substitutable NIINs associated with each equipment LIN, reflecting multiple generations of fielded equipment. Hundreds of NIINs may enumerate the equipment, durable items, and shelf-life items in a LIN for a set.

Codes in the TEWLS distinguish NIINs as equipment. The USAMMA uses a Medical Unit Assemblage Group (MUAG) code, with MUAG code C designating equipment items. We assumed all items designated as equipment by the MUAG code C to be equipment requiring modernization.

In calculations to determine the rate at which equipment must be modernized, we used a planning factor of six years for all equipment.¹ This might overestimate the extent of modernization needed: While highly technological items (such as X-ray apparatus) can be appropriately included in this category, items that may have a longer functional life between updates (such as isolation shelters) are also included. Nevertheless, a visual survey of items included by these equipment designations indicates that our assumptions are reasonable, with technological items contributing the most to the total set cost and being the most likely to require regular updating.

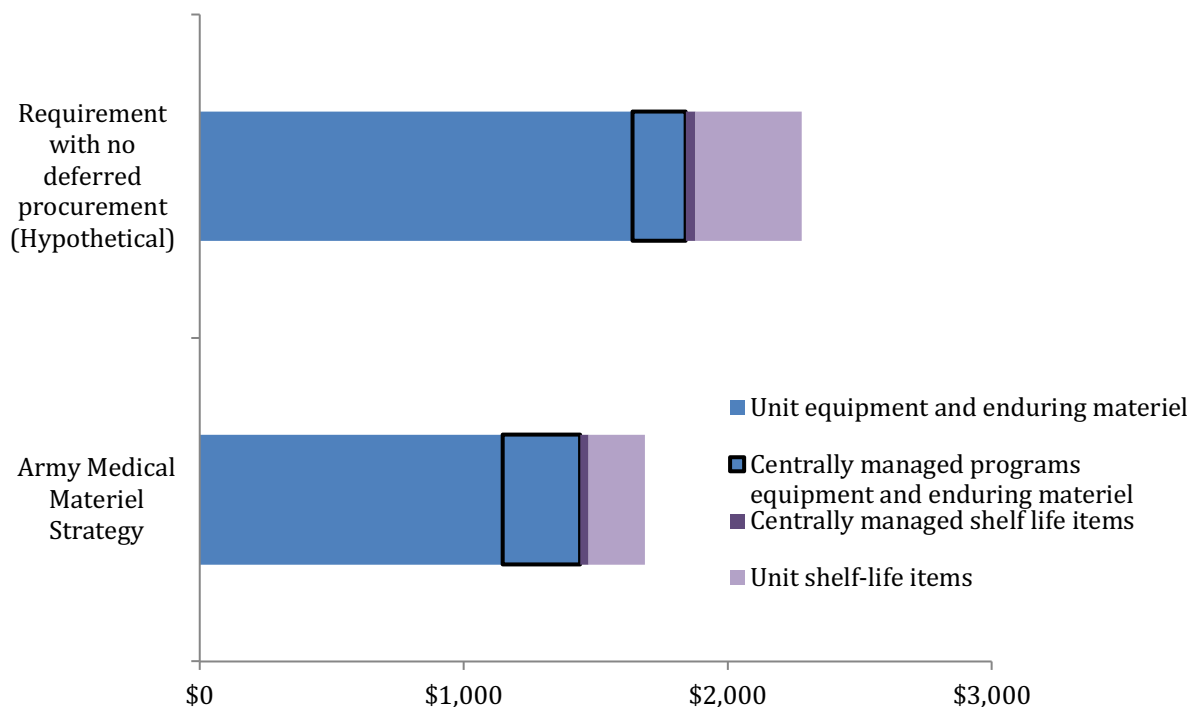
For a parallel determination to project the life cycle costs of sustaining shelf-life items, we used the shelf-life code in the TEWLS. We calculated the cost to purchase new shelf-life items when they expire by dividing the cost of the items by their shelf lives to determine an annual average sustainment cost. For example, an item that costs \$10 and has a three-year shelf life would incur a sustainment cost each year at \$10 divided by three, or \$3.33.

Costs of Force Structure and Army Medical Materiel Strategy

We compared costs for the entire force structure with the investment associated with the Army medical materiel strategy, which includes deferred procurement of hospital sets and shelf-life items. Figure 3.1 shows (in the top set of bars) the capital cost of procuring all the medical materiel required across the force structure, as given in the TEWLS data, to be \$2.3 billion. The Army medical materiel strategy described in Chapter 2 reduces this intended investment in medical materiel for equipping the entire force to \$1.7 billion, as shown in the bottom bars of Figure 3.1.

¹ The USAMMA historically planned to issue new medical sets to units every six years. While the USAMMA currently practices precision fielding rather than whole set replacement, six years remain an effective planning factor for the cost to modernize medical materiel. Discussions with item managers did not yield a better planning factor. While the calculated percentage modernization of unit medical materiel would change if the planning factor were assumed to be five, seven, or ten years, the percentage modernization funded over the past two FYs would remain less than 100 percent and the policy recommendations would not be affected.

Figure 3.1. Medical Materiel Capitalization and Investment (\$ millions)



NOTE: Equipment and enduring materiel includes all materiel except items with a shelf life. Unit shelf-life items and equipment and enduring materiel are those that are fielded to units. Centrally managed shelf-life items and equipment and enduring materiel are those held in APS, the MMRP, or the UDP. In the Army medical materiel strategy, the MMRP does not include shelf-life items and most APS for EAB medical units do not contain shelf-life items. Exclusion criteria for which shelf-life items are included in centrally managed programs and fielded to units are described in Table 2.1 in Chapter 2. The color formatting of the categories in Figure 3.1 correspond to related values in Figure 3.2.

The difference between the requirement without deferred procurement and the Army medical materiel strategy is \$593 million. Deferred procurement of hospital sets, not including shelf-life items, accounts for \$400 million of this difference. Deferred procurement of shelf-life items in hospitals and RC units across the force accounts for the remaining \$193 million of the difference.

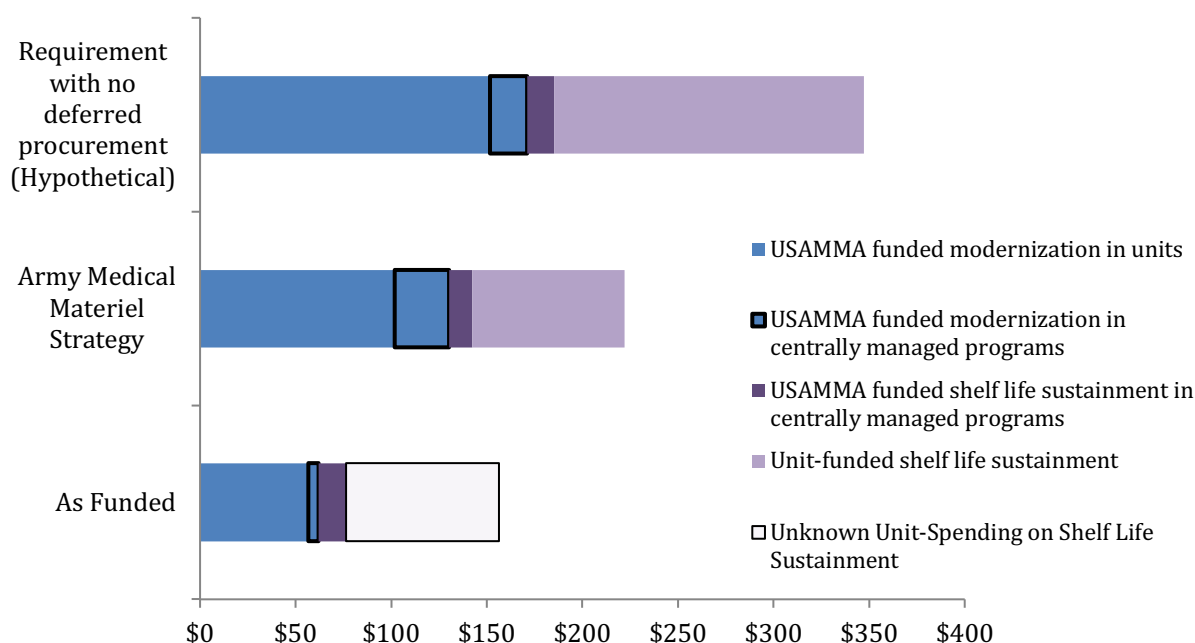
Analysis of Life Cycle Costs

USAMMA funds are used for medical equipment modernization because it is the Army organization responsible for procuring and fielding medical equipment to units. As noted earlier, the USAMMA also is responsible for sustaining sets of medical shelf-life items for such centrally managed programs as APS and UDP, while units are responsible for repurchasing items

fielded to them as they expire and ensuring that the materiel in sets is serviceable.² The funding sources required for each materiel type and recipient are summarized in Table 1.1 in Chapter 1.

Figure 3.2 shows the funds required to sustain medical sets with respect to both equipment modernization and shelf-life item replacement. The first set of bars shows the hypothetical quantity of funds required to support the force structure should all the items in medical sets be fielded to all units. This includes APS sets, which have UICs and are accounted for with tables of organization and equipment, as are units in the AC and RC. Altogether, it would require \$347 million annually to modernize equipment and repurchase expiring shelf-life items.

Figure 3.2. Annual Life Cycle Cost for Medical Materiel (\$ millions)



NOTE: Annualized life cycle costs for equipment and enduring materiel are calculated as their total procurement cost divided by six. For shelf-life items, sustainment costs are calculated assuming that items are replaced upon reaching their expiration date. We assume that items received by units and centrally managed programs have full shelf life remaining when they arrive. UDPs are assumed to include the balance of equipment NOT fielded to reserve component units as described in Table 2.1 in Chapter 2. APS that have shelf-life items are assumed to have all shelf-life items that would be fielded to an AC unit, as described in Table 2.1.

² This analysis focuses on the procurement costs of medical materiel. There are other life cycle costs associated with equipping Army units. Maintenance-intensive items must be repaired; units are responsible for repairing items fielded to them and the USAMMA is responsible for such items in centrally managed sets. There also are administrative costs associated with materiel programs across the supply chain. These include costs from materiel development to contracting and procurement, to fielding, storage, and the care of items. However, the sum of these costs is low relative to the ultimate cost of procuring medical materiel. While the implementation of any strategies must take these life cycle costs into account, the need to incur them will not affect the value of adopting medical materiel strategies or the outcome of our recommended courses of action.

The second set of bars in Figure 3.2 shows life cycle costs under the Army medical materiel strategy. The Army medical materiel strategy, as noted, defers procurement of unit sets for some hospitals and shelf-life items for large portions of the force. This reduces the annual life cycle cost for these items by \$125 million relative to the total force structure requirement, given that items that are not procured do not, of course, have life cycle costs. Remaining costs associated with the Army medical materiel strategy sum to \$222 million annually.

The “As Funded” data in Figure 3.2 show funds executed annually by the USAMMA for equipment modernization and sustainment of shelf-life items. These funds come from several MDEPs: HSUK (UDP), VWSI (APS), and FL8D (APS and FORSCOM). Because the USAMMA is responsible for procuring and fielding medical sets both to units and for centrally managed programs, we applied the life cycle costs depicted as USAMMA-funded modernization to the force structure for equipment in both unit sets and for centrally managed programs. The USAMMA executed approximately \$62 million annually for equipment modernization in FY 2014 and FY 2015.³

The USAMMA is responsible for sustaining shelf-life items in such centrally managed programs as APS and UDP. In FY 2014 and FY 2015, the USAMMA executed, on average, \$15 million annually for repurchasing these items. As can be seen by comparing the middle and bottom bars in Figure 3.2, executed funds are not sufficient to keep all equipment up-to-date in the Army medical materiel strategy. That the USAMMA is executing fewer funds than anticipated based on the projected life cycle costs to maintain the investment in the Army medical materiel strategy does not mean that there are unspent funds available. Rather, it means that the Army comptroller has allotted fewer funds to the USAMMA for these purposes than were programmed.

Finally, Figure 3.2 shows (in very light purple) a value for unknown unit spending on shelf-life item sustainment, which is equal to the entire requirement in the Army medical materiel strategy. All AC units besides hospitals are fielded some shelf-life items that pose a sustainment burden on unit funds. The Army does not have visibility into the amount units are spending toward this need because the status of such sets is not reportable in unit status reports or the Army maintenance data system. Thus, it is difficult to estimate the degree to which shelf-life items are kept up to date in the units holding those items. However, the cost to sustain these items—nearly \$80 million per year across the force structure—appears to be much greater than units would be able to afford given an estimate of their total funding for training.⁴ From this, we could conclude that units responsible for sustaining their medical shelf-life items may not be doing so, and that their equipping readiness may not be sufficient for rapid deployment without access to a centralized repository of shelf-life items, such as the UDP for EAB medical units.

³ Data were provided by the USAMMA.

⁴ While detailed unit training funding data were not available for this study, it is estimated to be of the same order of magnitude as medical materiel sustainment costs. Which is to say, nearly the entire training budget would need to be spent on purchasing medical shelf-life items in order to sustain them.

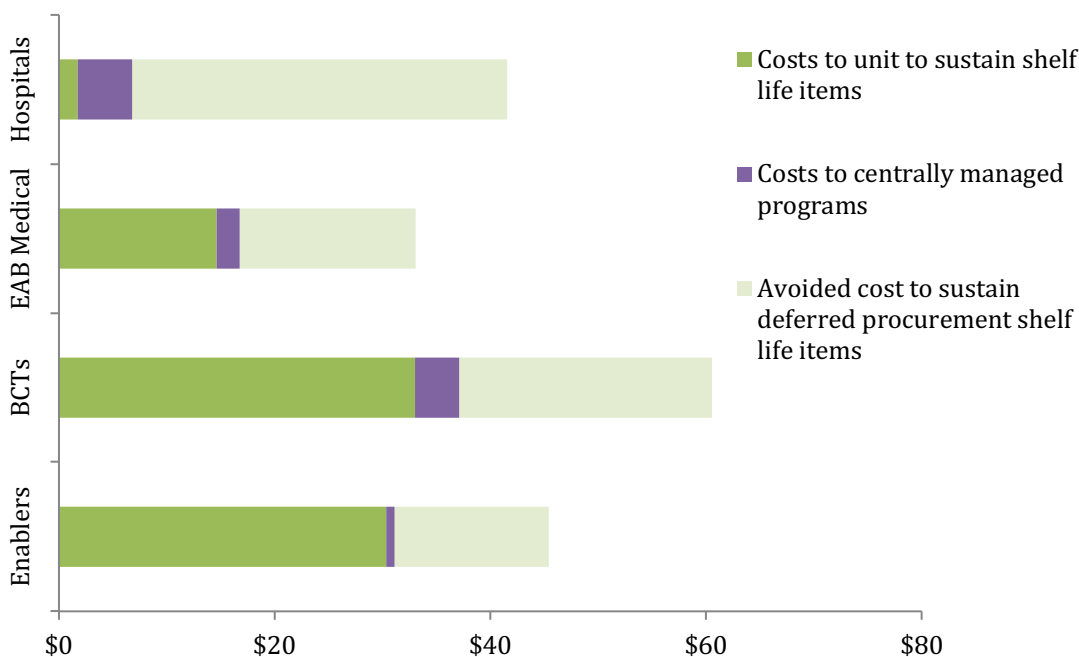
Units Responsible for Sustaining Shelf-Life Items

As medical materiel is fielded across the entire Army force structure, units of all types bear the responsibility for sustaining shelf-life items fielded to them. Under the Army medical materiel strategy, RC units are relieved of most of the burden to sustain shelf-life items because they are not fielded items with a shelf life of less than 60 months. The items that are fielded with a shelf life of more than 60 months are not numerous and do not expire often. AC units other than hospitals bear the full responsibility for sustaining shelf-life items fielded to them, which is all items with a shelf life of more than 12 months.

The Army observed the high cost to sustain shelf-life items for hospitals and acted to reduce associated costs. The Army medical materiel strategy defers procurement for hospitals of medical items with shelf lives of less than 60 months, avoiding \$30 million in annual sustainment costs.

As Figure 3.3 illustrates, the only remaining shelf-life item cost for hospital units is for those items with a shelf life greater than or equal to 60 months, as indicated by the dark green bar (this is about \$2 million). The UDP mitigates some of the risk incurred by deferring procurement of shelf-life items for hospitals at a cost of about \$5 million per year, as shown in the purple bar.

Figure 3.3. Annual Cost to Repurchase Shelf-Life Items (\$ millions) (Cost of Full Force Structure and Cost Under Army Medical Equipping Strategy)



NOTE: Costs to sustain shelf-life items under the Army medical equipping strategy include the two leftmost portions of the bars: costs to units (dark green) and costs to centrally managed programs (purple). Avoided cost is the delta between the full force structure costs and the Army medical equipping strategy costs, making the sum of the three sections of the bars in each row is the full force structure cost.

Similarly, EAB medical units, BCTs, and enablers all have lower shelf-life item sustainment costs as a result of the Army Medical Equipping Strategy, which defers procurement of shelf-life items for RC units. For EAB medical units, costs for sustaining shelf-life items decrease under the Army medical materiel strategy from approximately \$33 million to \$17 million. To mitigate risk, the UDP sustains shelf-life items for EAB medical units for \$2 million annually (excluding purchases for hospitals).

BCTs and enablers bear larger annual costs to sustain shelf-life items from unit training funds. While deferred procurement results in a reduction of annual sustainment costs of \$23 million for BCTs and \$14 million for enablers, the remaining annual sustainment costs are \$33 million for BCTs and \$30 million for enablers. These costs are not offset by such centralized programs as UDP, but some shelf-life items are kept at APS sites and purchased with APS funds. BCTs and enablers do not appear to be allotted sufficient training funds to sustain these items. Indeed, communication between I Corps and FORSCOM indicates that units are not sustaining medical shelf-life items and should not be expected to procure these items in advance of a CTC rotation.

Summary

The one-time overall cost to equip the entire Army objective force structure with medical materiel is \$2.3 billion. To decrease costs, the Army has deferred procurement of costly sets and items for units where it considers the resulting risk one that may reasonably be taken. Deferred procurement programs and such programs as centrally managed sets for deployment and centrally managed training sets to mitigate some resulting risks comprise the Army medical materiel strategy. This strategy reduces the total Army investment in medical materiel to a capitalized value of \$1.7 billion.

Even with this reduced investment, the Army still faces a large annual cost to sustain medical materiel through modernizing equipment and repurchasing shelf-life items as they expire. If fully funded, the annual cost to sustain the Army medical materiel strategy would be \$222 million. By comparison, the Army—through the USAMMA, as units are not funded for this burden—only executes \$62 million annually toward medical materiel sustainment. Spending fewer funds on medical materiel reduces readiness even below that envisioned in the Army medical materiel strategy. We discuss this in more detail in Chapter 4.

4. Readiness

The Army divides readiness into two levels: (1) strategic planning and (2) operational readiness for individual units.

Strategic planning focuses on the roles and responsibilities of commands and staff to ensure that the Army “provides sufficient, capable units to support the national military strategy.”¹ Army Regulation (AR) 525-30 highlights readiness tenets, leading indicators, and strategic levers for understanding and improving the availability of military resources.² This research focuses on the equipping readiness tenet rather than other readiness tenets, such as manning, training, or sustaining. Three leading indicators related to the equipping readiness tenet are discussed in Army guidance:

- critical materiel availability
- equipment-on-hand projections
- technology lag or deferred modernization.

Army guidance (AR 525-30) discusses strategic levers that allow the leadership to “mitigate strategic readiness shortfalls” identified by the leading indicators (Headquarters, U.S. Department of the Army, 2014). The levers that are most important to this research are adjusting the materiel management program and adjusting the modernization strategy for equipment.

Operational readiness is discussed in AR 220-1, which includes metrics that units must report to indicate their readiness to conduct missions and describes procedures and information technology involved in collecting this information.³ Current guidance defines how AC units, RC units, and organizations responsible for managing APS assess and report readiness.

Commanders provide assessments of (1) personnel, (2) equipment that is on-hand or available, (3) equipment readiness or serviceability, and (4) unit training level proficiency. These four areas allow commanders to assess core functions of their units and report on the four tiers of availability: C1, fully prepared;⁴ C2, prepared to perform “most core functions”;⁵ C3, able to “provide many, but not all, core functions”; and C4, needing additional resources or training to meet the requirement.⁶ Without the appropriate list of essential tasks and equipment, these C1 through C4 scores would provide limited insight into individual unit readiness. To improve the

¹ Headquarters, U.S. Department of the Army, *Army Strategic Readiness*, Army Regulation 525-30, Washington, D.C., June 2014.

² Headquarters, U.S. Department of the Army, 2014.

³ Headquarters, U.S. Department of the Army, 2010.

⁴ C1 is referred to as *objective* within the sustainable readiness model.

⁵ C2 is called *decisive action readiness* under the sustainable readiness model.

⁶ Headquarters, U.S. Department of the Army, 2010.

flexibility of assessments, commanders can subjectively upgrade or downgrade readiness reporting and provide their reasons for doing so within the readiness reporting system.

The level of readiness that this research explores bridges strategic and operational levels; it also focuses specifically on the levels of modernized equipment and shelf-life items that are either made available to units to deploy with or possessed by units.

Assessing Materiel Readiness

Army readiness is measured along a number of dimensions, including materiel readiness. Materiel readiness is measured by the portion of reportable items that is present and in serviceable condition at the unit. To be sure, there are other criteria that must be met by Army materiel in order for a unit to perform its mission: For example, materiel must be packaged and stored so that it can be accessed readily. In this research, we make the assumption that medical equipment is not serviceable unless it has been modernized within six years, and medical shelf-life items are not serviceable unless they are procured and managed as part of a centrally managed program. Also, we assume that if funds are spent as projected in this analysis, materiel will be serviceable through its usage life. Using these assumptions, we can assess how investment in equipment modernization and sustainment of shelf-life items contribute to readiness. By pairing data on these activities with the location of materiel, we can estimate time lines necessary for force generation.⁷

In this research, the time line for force generation is determined by whether the Army possesses materiel, whether materiel is modernized, and by the location of materiel necessary for the unit to deploy. In estimating this time line, we do not consider constraints in transportation capacity, aside from assuming that unit sets must be transported by sealift rather than airlift.

Because of the time involved in sealifting materiel to theaters outside the contiguous United States (OCONUS), any units deploying within the first 30 days of a mission either must be forward-deployed or rely on APS materiel. Shelf-life items—which often are smaller and lighter than bulky, heavy non-shelf-life items and equipment—may either be prepositioned OCONUS or located in CONUS. While it does take longer to deploy when using CONUS shelf-life items

⁷ First, measuring materiel readiness by presence and serviceability—not packaging or storing—is standard Army practice for all items, not just medical, so use of the assumption is expedient and consistent at this level of analysis. Second, it is an overly conservative projection to assume that all medical equipment presents zero readiness when it is past its useful life of six years. Some of the items could be expected to support the practice of medical care. On the other hand, a site visit by the research team to an Army medical unit found medical equipment missing parts, batteries, containers, and appearing to not have been used in training or inspected for an extended period of time. If this unit were to deploy, it would assuredly be issued a new medical set from a centrally managed program. Therefore, we need to assume that a medical materiel set indeed reaches zero readiness after a certain age. Lastly, it is reasonable to assume that medical materiel remains serviceable within its intended life span. As the organization currently responsible for centrally managed medical materiel programs, the USAMMA has shown that it maintains procured materiel in serviceable condition through inspections and experience. Sets from MMRP, UDP, and APS have been issued to deploying units and found to be serviceable when received and fielded.

rather than prepositioned items, as they may be airlifted to theater, the difference does not increase the time to deploy beyond 30 days.⁸

Within 60 days, materiel can be distributed by sealift from CONUS to most OCONUS regions, assuming that transport begins soon after a contingency is declared. This requires all materiel to be possessed by a unit or central program and kept up to date. While UDPs are designed to be given only to units deploying within the first 31 days,⁹ we envision that UDPs may be used to fill shelf-life item shortfalls for these additional units should more units be needed to deploy within 60 days, although doing so would incur risk in deploying units for other missions against which UDPs may have been aligned.

If units have access to modernized medical equipment, they should be able to deploy within 90 days. While on-hand components include medical sets and the balance of unit sets will have been sealifted to theater, we assume that newly procured shelf-life items can be airlifted to theater.¹⁰

Procuring entire new sets of medical materiel, rather than simply shelf-life items, is a time-consuming process requiring the Army to procure and the DLA to assemble millions of dollars in materiel. To our knowledge, such an undertaking has not occurred under time-critical circumstances for a modern unit. Therefore, it is difficult to determine precisely how long such a task might take—but we cannot assume with certainty that it can be completed within 120 days and state the time line to perform this activity as greater than 120 days.

A summary of deployment time lines and supporting materiel strategies is listed in Table 4.1.

Table 4.1. Time Lines for Units to Deploy OCONUS With Medical Materiel

Time Line to Deploy (Days)	Equipment	Shelf-Life Items
30	Prepositioned	CONUS (or prepositioned)
60	CONUS	CONUS
90	CONUS	Procure
>120	Procure	Procure

NOTE: *Prepositioned* indicates that equipment/shelf-life items are fielded to forward-deployed units or stored in APS sites. The prepositioned materiel must be in the same theater of deployment to support deployments in 30 days.

⁸ Airlift capacity is limited, so the Army may not transport heavy, bulky items by this mode in OCONUS operations. Transporting heavy items by surface (sea) is advantageous as the cost to transport materiel by surface is measured in cents per pound, rather than the dollars-per-pound cost of airlift.

⁹ Guidance for managing UDPs does indeed refer to units deploying in the first 31 days, which for programing purposes is equivalent in quantity to planning factors discussed in this report, which quantify units able to deploy to an OCONUS theater within 30 days. Army Publishing Directorate, 2013.

¹⁰ In this period, it is reasonable that items not on-hand can be procured, assembled, and distributed. However, there is risk associated with procuring items from suppliers and with assuming that the Defense Logistics Agency (DLA) or contractors have the capacity to assemble and distribute sets in a mission where many units may be deploying simultaneously.

Modernization

Medical sets can be described as ready if they contain equipment from the two most recent procurement cycles, which has historically amounted to a period of six years. While this will not be precisely correct for all medical equipment items, it is a reasonable assumption for assessing the currency of equipment in medical sets.¹¹

Using the planning factor of modernization every six years for medical equipment, we can assess the readiness of medical sets by the number of unit sets that can be modernized on a six-year cycle, given the amount of funding the Army invests in these sets. USAMMA data indicate that the Army spent approximately \$114 million, or \$57 million per year, procuring medical equipment for sets in FY 2014 and FY 2015.

We can calculate the average annual funds necessary to modernize medical sets by dividing the capitalized value of equipment by six. This value, when multiplied by the number of units planned to modernize, yields the quantity of funds that must be spent annually to modernize different types of units. Table 4.2 shows the amount of money that has been spent on modernization by unit type for FY 2014 and FY 2015 and the percentage of modernization that has been funded.

Table 4.2. Modernization of Medical Equipment, Average Over FY 2014–FY 2015 (\$ millions), and Amount Necessary for Army Medical Materiel Strategy

Unit Type	Executed/Investment Strategy (\$ millions)	Percentage of Funding for Modernization
Hospitals	\$8.2/\$19	42
EAB medical	\$28/\$33	84
BCTs	\$8/\$24	33
Enablers	\$13/\$35	36

NOTE: Executed spending was calculated from FL8D data. Investment strategy shown is for the Army medical materiel strategy and the value represents the required annual equipment modernization for all units in components 1, 2, and 3.

For example, Table 4.2 shows that the USAMMA spent \$8.2 million on average annually to procure medical equipment for hospital sets in FY 2014 and FY 2015—while we calculate that \$19 million would have been needed to keep sets fully modernized in accordance with the Army medical materiel strategy. In other words, only 42 percent of the funds needed for hospital modernization have been executed in recent years. Similarly, we can say that 84 percent of funds

¹¹ Six years is the planning factor that the USAMMA uses as an estimate of the time between modernization of medical equipment. The USAMMA is the Army organization responsible for the centrally managed programs that contain medical equipment, MMRP, and APS. The USAMMA budgets for future-year procurement of medical equipment to keep these sets modernized, and in this role has determined that a six-year cycle is the best estimate to make its budget planning accurate for projected future needed spending on equipment modernization.

required to modernize EAB medical units, 33 percent of funds required to modernize BCTs, and 36 percent of funds required to modernize enablers were spent over the same period.¹²

Shelf-Life Item Sustainment

Units appear unable to sustain items fielded to them with their training resources (see Figure 3.3 in Chapter 3). Able or not, units may be disinclined to spend their limited resources repurchasing expired shelf-life items, especially when their chain of command emphasizes other equipping priorities.¹³ Therefore, we assume that the only sets of shelf-life items that are available for deploying units are those in centrally managed programs, such as APS and UDP. The Army faces a corresponding challenge in assessing the medical materiel readiness of units. Uncertainty alone is a source of risk.

Between the analyses of equipment modernization and shelf-life item sustainment, it is possible to assess how many units and what portions of the force structure and of individual types of units are ready with respect to medical materiel.

Assessing Medical Materiel Readiness for Different Unit Types

Using a combination of the described methodology to assess medical materiel readiness with respect to equipment modernization and assumptions about the sustainment of shelf-life items given observable funds spent, we can project unit medical materiel readiness with respect to both of these components.

Based on recent historical funding for medical materiel (FY 2014 and FY 2015), it is possible to estimate medical materiel readiness for types of units, but it is difficult to determine the level of readiness for individual units.¹⁴ In aggregate, it was feasible to filter the data to determine funds spent on medical materiel for types of units of interest, such as hospitals and BCTs. All nonmedical units that were not BCTs were aggregated into a set of units called *enablers*.

Readiness Expressed as a Portion of Intended Investment

The level of readiness that the Army achieves is affected by the way it focuses its resources. For both equipment modernization and shelf-life item sustainment, the Army could spend available funds evenly across units, achieving partial modernization across the force, or it could focus resources on prioritized units to maximize the number of units that can be made fully ready to rapidly deploy with medical materiel.

¹² This funding is for unit materiel. APS is funded separately and was funded fully for modernization and sustainment in FY 2014 and FY 2015.

¹³ I Corps, 2016.

¹⁴ The data gathered for the project included spending by the USAMMA during FY 2014 and FY 2015. Over this period, only a fraction of units in the Army were fielded medical materiel, so no data were available to determine the level of medical materiel readiness of units. Also, no data were available to indicate funds spent by units on sustainment of shelf-life items. The only visible spending on shelf-life items was funds spent by the USAMMA for centrally managed programs, such as APS and UDP, in FY 2014 and FY 2015.

Equipment Modernization

The fielding of medical materiel to units, including equipment and non-shelf-life items, is performed solely by the USAMMA. The Department of the Army generates the list that prioritizes the units to receive medical materiel. The prioritization indicates that individual units and units of designated types should be fielded medical materiel with available funds. Through this process, units tasked with high-importance missions should be made medically ready to deploy, and other units should be deferred the fielding of medical materiel. As a result, medical equipment modernization is already prioritized by the Army, to an extent.

As the unit prioritization process performed by Headquarters, Department of the Army is not specific to medical materiel, there can be unintended consequences that result in suboptimal medical materiel readiness. For example, the availability of resources from centrally managed programs (such as APS) is not considered when prioritizing units. Therefore, it is possible that units of a certain type that are robustly supported with APS sets receive modernized equipment at a home station, while units that are not robustly supported with APS sets are not fielded modernized medical sets. By taking APS into account when allocating modernized medical materiel, the Army could avoid this consequence. Also, it appears that units undergoing transformation or reorganization are fielded full modernized medical sets regardless of their assigned missions. This occurs at the expense of fielding materiel to other units because the USAMMA is executed a finite amount of funds to spend fielding medical materiel, which is less than the amount required by the Army medical materiel strategy, with the result that, every year, units that are part of the strategy are not fielded the necessary materiel to keep up with the pace of equipment modernization.

If the Army were to perfectly prioritize the units to which it fields medical materiel each year, it could make ready to deploy a portion of the units equal to the portion of funds made available. For example, Table 4.2 shows that 42 percent of funds necessary to modernize equipment for hospitals was spent in FY 2014 through FY 2015. The readiness assessments in this research assume that the Army could keep 42 percent of hospital units ready to deploy with modernized equipment under a perfectly optimal fielding plan. Achieving this level of readiness requires full prioritization of spending on medical materiel.

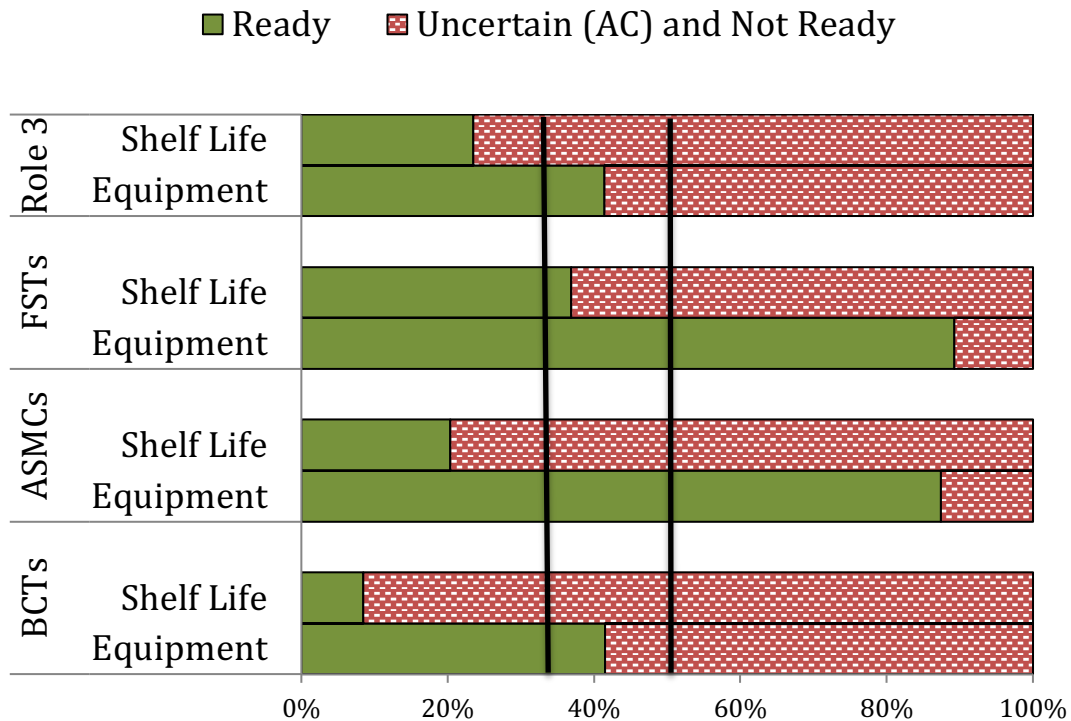
Shelf-Life Item Sustainment

In the data gathered for this research, only spending by the USAMMA on shelf-life item sustainment for centrally managed programs was visible. Unit spending on shelf-life items was not visible, as the data for this activity were not gathered. Therefore, the only sets of shelf-life items that were assumed to be ready were sets sustained by the USAMMA through centrally managed programs. Unit shelf-life item sets were assumed to be not ready.

Figure 4.1 shows a comparison of the medical materiel readiness for selected types of units. The percentage of the units in the medical materiel strategy that are estimated to be able to deploy with modernized equipment is shown, as is the percentage of units estimated to be able to

deploy rapidly with shelf-life items. Centrally managed programs, such as APS and UDP, constitute a large component of the materiel included in this estimate.

Figure 4.1. Achievable Readiness at Current Funding Levels, Relative to Total Numbers of AC and RC Units



NOTE: The percentage of units with ready equipment is calculated as

$$\frac{(\text{number of units able to be modernized with FY 2014–FY 2015 funds} + \text{number of sets in APS})}{(\text{total number of units})}$$

The percentage of units with ready shelf-life items is calculated as

$$\frac{(\text{number of UDPs} + \text{number of sets in APS})}{(\text{total number of unit medical sets in medical materiel strategy})}$$

This analysis assumes that materiel in APS and UDP is fully modernized and/or up to date and that any shelf-life items fielded to units in components 1, 2, and 3 are not up to date.

The percentages of AC and RC units estimated to be able to deploy with modernized medical equipment in Figure 4.1 include assumptions that APS sets are modernized and available. Therefore, the equipment readiness values for notable EAB medical units (FSTs and ASMCs), and BCTs in Figure 4.1 are somewhat greater than the percentage values in Table 4.2, which

count only unit sets.^{15,16} The percentage of units able to deploy with shelf-life items reflects the number of sets sustained in APS and UDP. For context, two black bars represent one-third and one-half of the total AC and RC units.

It is estimated that at least one-third of units are ready to deploy with modernized medical equipment, but a far smaller percentage of units are ready to deploy with medical shelf-life items.

Readiness to Meet Plans

Army readiness to meet plans can be assessed using data describing medical materiel readiness, medical set location, and logistics planning factors. Together, these data can help project how many units of a particular type the Army will be able to deploy under different time lines. Time lines for units to deploy will be measured in windows of 30, 60, and 90 days to match the way requirements for forces are stated in operations plans. Units that cannot be deployed in these time lines will be considered as requiring more than 120 days to deploy.¹⁷

An additional planning factor was included in estimating the number of units able to deploy within a time line. Empirical analysis of deployment time lines for RC units shows that BCTs have not deployed in less than 120 days. So even if medical sets were available for RC BCTs, the Army should not plan for these units to deploy in shorter time lines unless specific plans are in place. According to empirical data, medical units, which are smaller than BCTs, can deploy faster than BCTs, and do so in less than 90 days but not in less than 60 days. As a result, in our analysis of time lines to deploy, RC EAB medical units should not be projected to deploy in 60 or 30 days based on the time necessary to activate the units.

The estimated number of units able to deploy with medical materiel within time lines is included in Table 4.3. These estimates include the assumptions made determining the time lines in Table 4.2, with the addition of leveraging medical equipment sets in APS.¹⁸

¹⁵ The comparison between Role 3 readiness in Figure 4.1 and hospital readiness in Table 4.2 is more complicated. The reported 42-percent modernization of hospitals in Table 4.2 is calculated with only the Army medical materiel strategy number of units in the denominator, which excludes all deferred FORSCOM and USAR CSH sets. If the total number of units were included in the denominator, the \$8.2 million executed annually reported in Table 4.2 would yield only 11-percent readiness for hospitals. However, all APS sets for Role 3 units are funded for modernization. The calculation for Figure 4.1 assumes that these sets will be made available for deploying units, which raises the percentage of estimated equipment readiness for Role 3 units to 41 percent.

¹⁶ The percentage of funding for equipment modernization was calculated in aggregate for all nonhospital medical units. So the estimated percentage modernization in Figure 4.1 is the same for the two EAB medical units listed, FSTs and ASMCs. However, the number of sets of shelf-life items for each of these units in APS and UDP can be calculated individually as data are available.

¹⁷ For units that have full medical sets deferred for procurement, it will likely require more than 120 days for the Army to supply them with necessary materiel, as some equipment items require long time lines to procure. However, many items in medical sets (such as readily available equipment and shelf-life items) can be procured, assembled, and fielded in less than 90 days. Interview with USAMMA Set Production, May 2016.

¹⁸ The values in Table 4.3 reflect the estimated number of units that could deploy with modernized medical sets. This includes the estimated number of unit sets modernized with allotted funds (as in Table 4.2 and Figure 4.1) plus

Table 4.3. Cumulative Number of Possible Units for Deployment with Medical Materiel

Timeline Days	30	60	90	>120
Role 3 capability ^a	10	11	13	51
FST	5	15	32	38
ASMC	5	13	50	59
BCT	9	10	23	59

NOTE: The number of available units ready for deployment within each time line is calculated according to the time lines outlined in Table 4.1. Units must rely on UDPs or APS to deploy with shelf-life items in the first 30 or 60 days. The number of deployed units over time is expressed cumulatively.

^a Role 3 capability is calculated as the number of stand-alone capabilities that can be generated. While capacities differ, for example, the units in the force structure were determined to generate the following numbers of Role 3 capabilities: 248-bed CSH = 2; 84-bed CSH = 1; 44-bed EEHE = 1; 32-bed field hospital = 1.

We estimate that ten units with Role 3 capability (or, approximately, ten 84-bed CSHs¹⁹), five FSTs, five ASMCs, and nine BCTs (aggregate of combat aviation brigades, infantry, armored, and Stryker BCTs) could deploy to OCONUS locations within 30 days.

Within 60 days, one additional unit with Role 3 capability and one additional BCT could deploy with medical equipment, while the number of FSTs and ASMCs able to do so increased two to three times. Within 90 days, two more units with Role 3 capability could deploy, while the number of FSTs, ASMCs, and BCTs able to deploy more than doubles. After 120 days, all units in the force structure are able to deploy, although some of these units might have neither medical equipment nor medical shelf-life items, but instead must procure them from vendors before deployment.

Summary

In recent years, the Army has not expended what it must to ensure that all medical equipment is modernized. Rather, its expenditures for hospital, BCT, and enabler units are such that less than half of the equipment can be modernized, although enough to ensure that 84 percent of EAB medical units can have modernized equipment.

At the same time, if current resources are focused on units associated with Time-Phased Force Deployment Data, which are planned military operations, the funds can be used to ensure that increasing numbers of units with modernized equipment can deploy over time. Our analyses suggest that, with equipment and shelf-life items either prepositioned or available for immediate shipment from CONUS, ten units with Role 3 capability, five FSTs, five ASMCs, and nine BCTs

the number of prepositioned sets in APS and forward-deployed units. The values also reflect the number of sets of shelf-life items calculated to be ready in APS and UDP, and do not include unit sets.

¹⁹ Role 3 capability is calculated as the number of stand-alone capabilities that can be generated. While capacities differ, for example, the units in the force structure were determined to generate the following numbers of Role 3 capabilities: 248-bed CSH = 2; 84-bed CSH = 1; 44-bed EEHE = 1; 32-bed field hospital = 1.

can deploy within 30 days. The numbers increase with longer time lines permitting procurement and shipment of equipment; within 90 days, most FSTs and ASMCs are able to deploy, and all units with medical materiel are able to deploy after 120 days. Ensuring that more units with medical equipment can deploy more rapidly would require the Army to invest more in medical equipment.

Estimating the number of units able to deploy with medical materiel in this way is an approach not previously presented to Army leadership. The results can be used in conjunction with operational plans to show how the medical materiel readiness of the Army operates at a strategic level, whether the Army can deploy sufficient forces under required time lines, and the size of the surplus or deficit.

5. Recommendations

As resources for planning tighten, the medical logistics community must consider how to produce the best outcomes with available funds. Funding levels have decreased since the height of overseas contingency operations, when dedicated funds were available to equip units deploying and redeploying. If funding remains near current levels, many medical equipping requirements will not be addressed. However, the Army should consider alternative ways to spend its finite resources on medical materiel to maximize readiness. In this chapter, we calculate the costs of equipping a portion of the force and make recommendations for managing medical shelf-life items and equipment modernization to improve readiness.

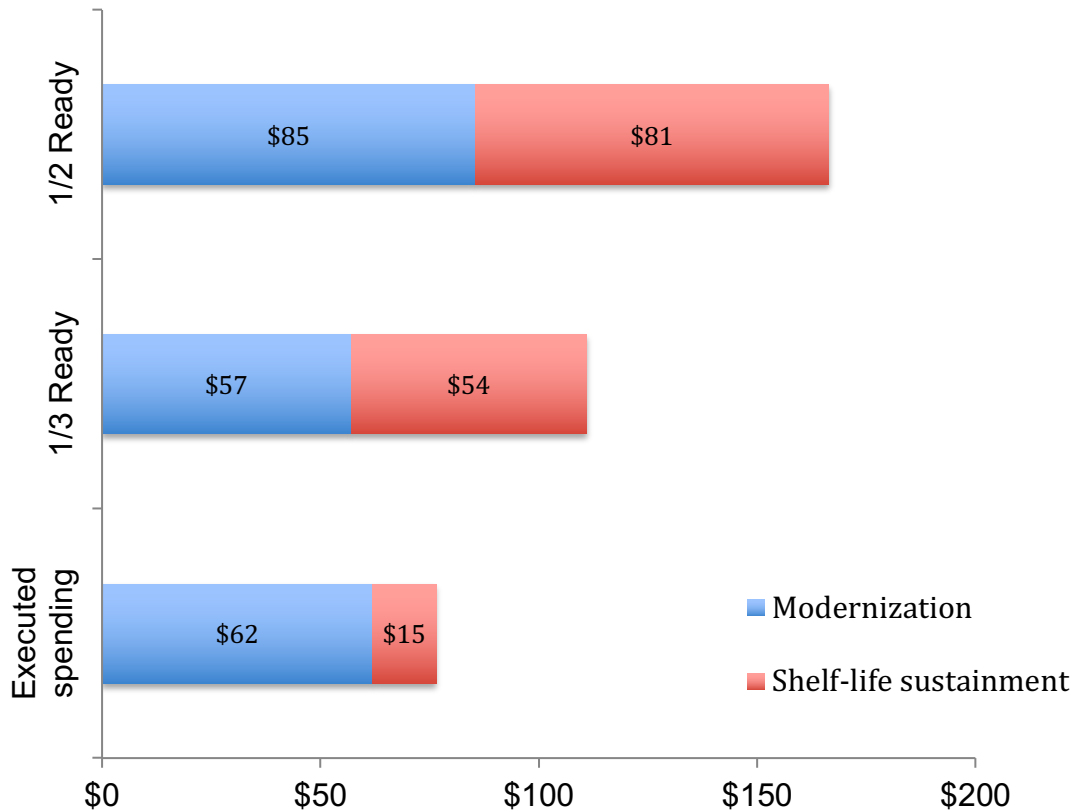
Costs to Keep Medical Materiel Ready for One-Third or One-Half of the Force

Chapter 3 outlined the annual costs associated with modernization and shelf-life item replacement of the force structure and of the Army Medical Equipping Strategy. Because the annual costs associated with keeping the force modernized and updated are substantially higher than the historical amount of funds available for those purposes, the Army should consider further prioritizing funds for units with the highest need to be deployment-ready.

To provide context on the recommendations for the Army to optimize medical materiel readiness, we assessed costs for keeping medical materiel ready for one-third or one-half of the force structure. We define a unit as being “ready” when it can deploy with fully modernized equipment and has all shelf-life items either on hand or in centrally managed storage. With these criteria for readiness, we estimate that a ready unit would be able to deploy with all of its required medical materiel from CONUS to an OCONUS location in 60 days.¹ Figure 5.1 shows the annual shelf-life upkeep and equipment modernization costs to equip one-third and one-half of the force, as well as actual average annual expenditure for these costs in FY 2014 and FY 2015. As shown, actual average expenditures do not suffice to keep even one-third of the force modernized.

¹ Most ready units could achieve this deployment time line, departing from their garrisons in CONUS. The number of units able to deploy in 30 days or less is restricted to the number of APS sets, in addition to current forward-deployed units.

Figure 5.1. Annual Modernization and Shelf-Life Sustainment Costs (\$ millions) to Equip One-Half and One-Third of the Full Force Structure, and Actual Expenditures



NOTE: Executed spending includes funds executed by the USAMMA.

Under current funding levels, the Army can sufficiently maintain modernized medical equipment in medical sets to make one-third of the force combat-ready or ready to deploy rapidly. However, the Army spends far too few funds sustaining medical shelf-life items to make one-half of the force ready.

Recommendations for Managing Medical Shelf-Life Items

The Army is reluctant to invest in items that could expire before they are used in a deployment or exercise. This is sensible, particularly given that many programs are competing for resources. Nevertheless, to achieve readiness, the Army could organize on-hand materiel so as to provide it to units needing to deploy rapidly. While the Army has the UDP in place to support medical units with shelf-life items when they deploy, no similar program exists for maneuver units. Current practice shows that the Army cannot rely on vendors to instantly supply the materiel necessary for deployments through standard procurement. The DLA has expressed

its concern that its contingency contracts will not deliver materiel in time lines necessary to support deploying units.²

The USAMMA continually procures shelf-life items for medical sets. Its orders are not governed by contracts with performance standards, but most of the items it orders are commonly used in general medical practice and are available from high-volume suppliers in sufficient time to supply units as they prepare to deploy. However, the USAMMA's set production branch reports that certain items take longer for vendors to supply, and thereby can delay by several months the assembly and fielding or distribution of a medical set. Such items tend to be supplied from low-volume suppliers or be delivered from the DLA or the U.S. General Services Administration, rather than directly from a vendor.

The DLA has indicated that its contingency contracts cover only about one-fourth of items in medical sets in APS and UDPs, which include medical sets for deploying maneuver and medical units.³ Thus, we assume that it will take at least as long to procure these items for deployment as it takes to procure them for set assembly—or even longer, should as-needed orders for medical items to support deploying units represent a surge in demand. Nevertheless, a surge in military demand would represent a small surge to vendors, as military consumption of medical materiel makes up only a small portion of the overall U.S. demand.⁴

Altogether, we identify two principle challenges with shelf-life items: First, some amount of shelf-life items must be on hand for rapidly deploying units. There are nontrivial annual costs to maintaining these items. Second, on-hand materiel must be monitored to ensure that it is not expired, and current responsibilities assigned to AC units to sustain medical shelf-life items do not provide visibility or monitoring of unit readiness.

Prioritizing Funds to Units with Identified Deployment Missions

As Figure 5.1 shows, to equip just one-third of its force structure, the Army must budget \$54 million annually to ensure that it possesses sufficient and updated shelf-life items. This expense is substantially greater than that executed by the USAMMA in previous FYs for shelf-life item replacement. While some unit training funds not shown in Figure 5.1 may have been applied toward keeping shelf-life items updated, we surmise that, given other demands on unit training funds beyond medical materiel, executed spending fell short of the amount required to equip one-third of the force.

This underfunding leads to the risk that the Army will have less than one-third of the units in the force structure ready to deploy with items to make up their unit basic loads, and may require up to 90 days to procure items from vendors and establish sources of supply, assembly, and

² Defense Logistics Agency Troop Support, *Memorandum for Commander, U.S. Army Medical Agency (USAMMA)*, June 2016.

³ Defense Logistics Agency Troop Support, 2016.

⁴ Total U.S. Department of Defense expenditures on medical materiel, including use at global fixed facilities, are only 1 percent of the U.S. market. Adam C. Resnick, William Welsch IV, and Keenan D. Yoho, *Sourcing and Global Distribution of Medical Supplies*, Santa Monica, Calif.: RAND Corporation, RR-125-A, 2014.

distribution to support deploying units. *We recommend focusing available funds on shelf-life items for units that need to deploy rapidly, especially maneuver units. This can be accomplished through programs centrally managed by an agency or headquarters. For any shelf-life items fielded to units, replacement costs should be budgeted within unit training funds to ensure that units have sufficient funds to maintain their expiring medical materiel.*

Monitoring the Readiness of Shelf-Life Items

The USAMMA is accountable for the visibility of shelf-life items within the UDP, which centralizes management of some shelf-life items for EAB medical units. Additionally, the USAMMA is responsible for providing visibility of shelf-life sets for some unit sets—notably for BCTs—that are in APS.

However, visibility for shelf-life items remains low for shelf-life items outside of centrally managed programs. These include items with a shelf life of 60 months or longer fielded to all units and shelf-life items fielded to AC units other than hospitals. This is particularly relevant when the high cost to keep shelf-life items updated is considered. Such costs make it unlikely that such units as BCTs and enablers will be able to keep these items at a high readiness level.

We recommend that the Army improve visibility of all shelf-life items across the entire force by either putting into place a unit-level reporting system to monitor the status of shelf-life items or assigning responsibility to an agency or headquarters for centralized storage and management of shelf-life items for units. Notably, our recommendation includes items with a shelf life of 60 months or longer, which are currently excluded from centralized management and fielded to EAB medical units and hospitals.

The greatest benefit of implementing central management of medical shelf-life item sets or a unit-level reporting system may be increased readiness and reduced risk resulting from greater transparency of materiel status. If item status cannot be observed under unit management, the Army cannot assume that the unit is combat-ready and cannot plan to have the unit deploy rapidly for a contingency operation. Through visibility of readiness, the Army can assume that a unit will be able to deploy rapidly.

Recommendations for Modernization

While the Army does not currently budget sufficient funds to modernize medical equipment for all AC and RC units, it does budget sufficient funds to modernize one-third of units (see Figure 5.1). *We recommend that the Army craft its medical materiel strategy for modernization to focus on those units that need to be combat-ready to deploy rapidly for a contingency operation.*

There are several strategies that can be used to hedge against a reduced number of modernized sets across the force structure. One possible implementation of a prioritization policy would extend the strategies for USAR hospitals to other RC medical units. When USAR medical units do not use their medical materiel for training at a home station, they can store it at RTSs.

Medical sets stored at these sites are likely candidates for deferred modernization. This practice of deferred modernization was implemented for USAR CSHs, which stored their unit sets at SIAD. When the sets were not used over a long period for deploying or training, they were also not inspected and maintained, then deteriorated and became obsolete. With an order from MEDCOM in 2014, USAR CSHs were directed to dissolve their sets completely and transfer any valuable items to the USAMMA for use in assembling the four modernized CSH sets that made up the MMRP program.⁵

USAR medical sets that are not modernized could similarly become obsolete. Creating a central storage program for USAR medical units other than hospitals could help ensure modernization for some unit sets that is sufficient for some designated units.

In the near term, when medical units in the RC are newly created, they may be designated as an equipping priority under the current medical materiel strategy and fielded a unit set. If there are already sufficient unit sets modernized across the force structure for the unit type, the RC unit could instead be fielded a small set of items to support individual and collective training at its home station at less cost than necessary to generate a full set necessary for deployment. USAR CSHs are supported by such a program in the current medical materiel strategy, being fielded medical baseline equipment sets for training.

Net Effects

Adjusting priorities to focus resources on generating units that can rapidly deploy will affect how the Army spends its medical equipment modernization and sustainment funds, currently \$76 million annually.

Changing the funding model for unit training resources and relieving units of the responsibility to sustain shelf-life items would require a set of new policies. These actions would also require supporting guidance on how units should report readiness if they do not possess their full modified table of organization and equipment. Such new policies could increase Army-wide readiness. The overall requirement to sustain medical materiel would decrease, as there could be economies of scale in centralizing materiel management responsibilities. It is possible that a MEDCOM organization or a FORSCOM organization could take responsibility for such a mission, given sufficient resources.

⁵ Headquarters, U.S. Army Medical Command, *Recapitalize, Redistribute or Dispose (Rrd) Reserve Component Hospital Decrement (Rchd) And Hospital Optimization Standardization Program (Hosp) Material*, Fragmentary Order 1 to Operation Order 13-70, Falls Church, Va., April 2014.

6. Conclusions and Implications

The Army can generate higher levels of readiness with the resources it already uses by applying them through modified programs and policies. The Army already increases its readiness through its current medical materiel strategy, deferring procurement of large hospital sets and shelf-life items, and improving the medical equipping readiness of the balance of the force structure.

Our analysis found that, by adjusting its medical materiel strategy, the Army can make measurable improvements toward accomplishing its objectives of achieving sustainable readiness and generating units to support plans. While the Army would need to execute an additional \$39 million annually on expiring shelf-life items to make one-third of the force able to deploy rapidly (Figure 5.1 in Chapter 5), the Army could increase the medical equipping readiness of its core fighting units (BCTs) with a more modest increase in spending or shift in use of existing resources. Currently only ten BCTs can rapidly deploy with full medical shelf-life item sets, drawn from APS. The estimated annual cost to sustain a shelf-life item set for a BCT is slightly less than \$1 million; by establishing additional centrally managed sets or shifting use of existing funds for medical materiel sustainment, the Army could increase the readiness of these focal units.

Overall, changes in equipping priorities would affect portions of the \$62 million in annual procurement for modernization. Only if all the available funds for modernization are spent on sets for deploying units—either fielded to them or maintained in a central program, can the level of readiness projected in Figure 4.1 in Chapter 4 (approximately 40 percent of hospitals and BCTs) be achieved. In practice, many units selected as priorities for modernization would be the same under the recommended program change. Units affected adversely would include those not designated with deployment missions, or those very few units that may have received proportionately more funding than expected to ensure that their medical equipment is modernized.

Details of programs to centrally manage medical shelf-life items will need to be determined by stakeholders. Organizations performing Army medical logistics have suggested that future centralized programs for storage apply to all shelf-life items, rather than just those with a shelf life of less than five years. Our analysis supports such a change, because sustaining items with longer shelf lives would represent only a small proportion of program cost. Items with longer shelf lives are not numerous in medical sets and do not need to be replaced often.

While this research confirms what many Army medical logisticians know about their enterprise, it also revealed aspects of the Army Medical Equipping Strategy that were not known. For example, it was not previously understood that a large portion of the Army investment in medical capability resides in medical units other than hospitals, and that the majority of Army investment in medical capability resides in such nonmedical units as BCTs and enablers. Yet

there remain further questions that need to be understood to continue the improvement of the Army's medical capability.

- Much is assumed about the effect of current medical materiel strategy on the readiness of units in FORSCOM and the Army Service Component Commands. To aid implementation of future strategies, the Army should gain a fuller understanding of the current state of the medical equipping readiness of vital warfighting units.
- During the period of this study, MEDCOM was made aware of the limitations of the capability of the vendors participating in DLA contingency contracts to supply medical materiel to Army and U.S. Department of Defense customers. Many MEDCOM and Army plans assume that medical materiel will be available with enough time to be provided on an as-needed basis. If this is not the case (and it appears not to be), then there are wide-reaching implications for readiness. The capacity of these vendors and the capability generated by these contracts must be better understood. Similarly, the capacity of the DLA (and contractors, when used) to assemble and field sets should be assessed for the sufficiency to supply medical materiel to customers when there are surges in demand.
- While this study has focused on the important mission to deploy forces that are equipped with medical materiel, the Army, Department of Defense, and vendors need to provide additional materiel as soon as unit basic loads are exhausted to sustain deployed forces. The Army's capability to sustain deployed forces can grow by analyzing current capability and proposing options for improvement.

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