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SAVING LIVES IN AFRICA: GETTING DEPARTMENT
OF DEFENSE PERSONNEL TIMELY MEDICAL CARE

By

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ABSTRACT

United States Department of Defense (DOD) personnel serving on the African continent are at risk due to the lack of appropriate medical specialty care. Personnel are located at numerous austere locations over vast distances where the DOD does not have the resources to establish comprehensive medical capabilities in all of these areas. Additionally, host nation medical facilities are virtually non-existent or do not meet Western standards of care where they are available. As a result, the current solution to get DOD personnel appropriate medical or specialty care is to medically evacuate them with an air ambulance. The process in utilizing an air ambulance is timely as well, adding to the delay in getting medical treatment. This paper will utilize the problem/solution framework to find solutions to decrease the delay it takes to get DOD personnel appropriate medical treatment. The goal is to reduce the delay in care caused by the current system by getting patients to treatment sooner, thus reducing the risk of adverse effects from the delay. The DOD can reduce this delay in care by improving the aeromedical evacuation process, utilizing civilian aircraft and medical teams organic to the continent, working with coalition partners to utilize existing military facilities and aeromedical capabilities, adding more U.S. medical assets, and assisting coalition partners in upgrading existing medical facilities to meet acceptable medical standards in strategic locations.

INTRODUCTION

Patient movement within United States African Command (USAFRICOM) region, defined as all nations on the African continent including Madagascar but excluding Egypt, is just a small part of a much larger global aeromedical evacuation (AE) system. The African continent is so large that the United States, Western Europe, and China could all fit within its borders. With the enormity of the continent and the number of troops spread throughout Africa, there are few adequate mechanisms in place to get U.S. military members adequate or timely treatment for medical care. In the vast majority of locations where the U.S. military operates, the surrounding available civilian facilities do not practice to the high standards of care that can be found in the United States and Western European nations. The African medical facilities are grossly inadequate to treat service members with more complex medical needs. Additionally, there is a lack of Department of Defense (DOD) medical facilities to treat patients as well. This results in patients having to move great distances to receive specialty care. The most seriously ill patients must be moved by an air ambulance. The responsibility for moving DOD patients falls under the United States Transportation Command (USTRANSCOM).

Since 2009, there have been 1,433 total DOD and State Department patient movements in Africa to places where adequate care could be rendered.¹ Of those, 320 were so ill or injured that they were required to be medically evacuated within 24 hours.² USTRANSCOM is coordinating an average of 173 patient movements a year out of the Africa.³ The vast majority of these movements, about 79 percent, were due to mostly benign patient conditions such as minor injuries, psychiatric issues, and specialty care.⁴ However, 21 percent of the movements were for more serious conditions, such as trauma, cancer, and myocardial infarctions.⁵ Diseases that

threaten to become pandemic such as the Ebola Virus outbreak in 2014, put an added strain on the system.

The lack of appropriate medical care in Africa results in U.S. military and government employees being required to move great distances to receive medical specialty care. The fastest way of doing this is by aeromedical evacuation. U.S. military medicine has an existing system of aeromedical evacuation which has typically been proven to be effective at evacuating patients to facilities with higher levels of specialty care from anywhere in the world, but this is not the case in Africa.

After a decade and a half, patient movement in the Middle East has evolved to a highly efficient model. However, due to a lower U.S. military presence in Africa with people spread over great distances, the same model does not exist on the African continent. This leaves many service members at risk to delayed care, resulting in possible debilitating injury, disease, or even death. There are many issues that contribute to the lack of medical care in Africa, with the prime reason being DOD personnel spread over far distances, with few medical assets in place.

Moving patients to get medical care through the aeromedical evacuation system becomes a problem because DOD aircraft and aeromedically qualified medical teams are not located on the African continent. Therefore, they must fly thousands of miles from locations typically located in Europe and occasionally from the Middle East to pick up patients, and then fly them to the closest facilities with appropriate medical treatment capabilities.

As a result, the average time to get a seriously ill patient to medical care is more than 38 hours.⁶ Many patients have illnesses that are complex and require time-sensitive treatment, which is often delayed due to inadequate assets in this area. For example, a patient with a heart attack should have therapy to reperfuse the coronary arteries in ninety minutes.⁷ A person with a

stroke only has six hours to receive treatment before the symptoms can become permanent.⁸ A common illness such as appendicitis can lead to septic shock and become deadly without timely treatment.⁹

How can the Department of Defense provide timely medical care to its patients in Africa? This paper maintains the DOD can provide timely medical care to its patients in Africa by improving the aeromedical evacuation process, utilizing civilian aircraft and medical teams organic to the continent, working with coalition partners to utilize existing military facilities and aeromedical capabilities, adding more U.S. medical assets, and to assist coalition partners in upgrading existing medical facilities to meet acceptable medical standards in strategic locations.

The time-to-treatment for DOD personnel in Africa is not adequate to meet patient needs and has the potential for life threatening consequences. This is due to the United States not investing enough resources in the region, despite frequent deployments and the large disbursement of personnel spread across 39 African countries.¹⁰ The United States has coalition partners operating throughout Africa but does not use these capabilities despite the push for joint partnerships. There is a lack of adequate medical facilities in every nation in Africa other than South Africa. There are several strategic locations with growing medical capabilities that could be utilized with assistance from outside nations such as the United States.

The lack of medical teams paired with the lack of available aircraft to transfer patients to functional facilities where appropriate medical care can be provided also impacts patient survivability rates. Civilian air ambulances can be contracted and prepositioned at several locations throughout Africa to enable faster patient transfers. Patients can be transferred to other facilities with Western standards of care that are much closer, such as Dubai. Alternative means such as transporting patients on a commercial airline or a U.S. military plane with a medical

attendant are available but not routinely used. In areas that have higher security risk and a large U.S. military population, military medical assets should be set-up in place.

This research will utilize the problem/solution framework. The first step will be to define the problem: U.S. military members and DOD personnel stationed in Africa are at risk due to inadequate medical facilities throughout Africa. Often, complex medical issues that require urgent aeromedical evacuation to a facility that can appropriately treat their illness or injuries is not available in the area. Landstuhl Regional Medical Center (LRMC), located in Germany, is usually the treatment facility of choice due to its full range of specialty care capabilities and access to one of the major hubs of the global aeromedical evacuation system.

Cities that contain medical centers that exceed acceptable standards of care are known as medical centers of excellence. South Africa has several medical centers of excellence in Pretoria, Cape Town, and Johannesburg.¹¹ The problem with utilizing South Africa is it is a long way from where most U.S. Forces operate. For instance, a flight from Niamey, Niger in Sub-Saharan Africa to Johannesburg, South Africa is over 3,200 miles and would take six and a half hours to get there. A flight from Niamey to Ramstein, Germany is just under 2,500 miles and would take five hours.¹² Consequently, military patients in need of transport to medical centers of excellence are typically transported from the Sub-Saharan Africa region are usually flown to facilities in Germany.

Transporting patients to these facilities is complex, expensive, and time consuming. The ability to receive adequate medical care in a timely manner is instrumental to surviving many illness' or injuries without any long-term adverse effects. This research will determine the population of DOD personnel in AFRICA, where these people are located, and the assets currently in place. Additionally, it will discuss an overview of the African medical capabilities

where U.S. military members and government employees operate. This paper will also address the historic data of how many people have been moved, how long it took them to be moved, where they were moved to, and any adverse effects from not being treated locally. Unfortunately, there are many cases where closer treatment facilities exist but cannot be used due to security risks and lack poor standards of care.

This paper will also research a process of utilizing medical facilities that are building up to standards of care that are followed by Western nations and whether or not it is feasible to get more hospitals approved for use by the DOD. Finally, this paper will research the best transportation options for getting DOD personnel when medical care cannot be received locally.

Background

Evacuating those injured on the battlefield has long been a key component of fighting wars in modern times. Having faith in your nation to take care you if you are injured in battle, helps build the “esprit de corps” in an all-volunteer military service. As a free nation, it is owed to those who have made the sacrifice to serve their nation through sixteen straight years of wars and conflicts to serve them in return. Those who volunteered to serve make great sacrifices. Many earn wages at or near the poverty line, they work long hours, and family life can be a struggle for the entire family.¹³

Logistics used to be the biggest limiting factor in caring for troops. In many of the nation’s earliest wars, members killed in action were buried on the battlefield while injured service members were treated and recovered near the battlefield. Before the airplane was invented, the sick and injured were often transferred by train, then to a port and a long boat ride across the ocean to reach their home. The invention of the airplane and its conversion into an instrument of war has made the world much smaller place. It was once impossible to transport

patients from a battlefield in a foreign nation to home in a quick and efficient manner. Now, with the current system of aeromedical evacuation utilizing aircraft of opportunity, patients can be home in a matter of days. Aeromedical evacuation has been a key to the United States military's projection of power.

Since the beginning of counter-insurgency operations post 9/11, USTRANSCOM has been responsible for coordinating global patient movement.¹⁴ USTRANSCOM's Patient Movement Requirement Centers (TPMRC) have validated and coordinated 312,724 global patient movements.¹⁵ Of those, 205,215 have been moved through the aeromedical evacuation system.¹⁶ These patients have either moved as patients on United States Air Force aeromedical evacuation missions, on civilian air ambulances, or aircraft of opportunity as medical passengers. The remaining patients did not require care in flight and moved on commercial air flights or have moved by other means, such as driving their own car or being moved by ground ambulances.

Medical Capabilities in Africa

Patient movement within Africa is just a small part of a much larger global aeromedical evacuation system. In 2016, there were 170 patient movements out of Africa.¹⁷ Only the Southern Command had fewer patient movements with fifty-eight.¹⁸ The largest generator of patient movements by far is the European Command which generated 2,723 patient movements in 2016, with about half of those patients originating in Central Command's area of responsibility in the Middle East.¹⁹ The Patient Movement Requirements Center in Ramstein, Germany (TPMRC-E) is responsible for 64 percent of all patient movement requirements worldwide and has the coordination responsibility for Africa.²⁰

United States military operations are spread throughout the African continent with the highest concentration in of U.S. Forces at Djibouti conducting Horn of Africa operations.²¹ The

Sub-Saharan region has a high concentration as well. As of November 2016, there were 4,035 DOD personnel located in 39 different African nations.²² Military members stationed at Embassies are included in this number. This number does not include State Department personnel, other government agencies, and contract personnel in which TPMRC-E also coordinates patient movements to appropriate medical facilities. This figure also does not include operations that are sensitive in nature so the number of United States service members, contractors, and government personnel is most likely much higher.

The civilian medical facilities where these troops are operating, as well those in the majority of continent are grossly inadequate.²³ The lack of quality healthcare is due to many reasons, including; poor economic conditions, lack of infrastructure, government instability, sectarian strife, lack of natural resources, disease, war, and too few healthcare professionals. In addition, poor hygiene and rampant counterfeit medications contributes to an already overtaxed system.²⁴

International SOS is Tricare Europe's insurance provider. Their office in London is responsible for medical support for United States European Command (USEUCOM), Central Command (USCENTCOM), and USAFRICOM. If a patient is seen at any civilian medical facility, International SOS pays the bills. They are also a liaison between Military Treatment Facilities (MTF) and the civilian medical facilities. One of the major functions of International SOS is to provide support with patient movements. They find appropriate air and ground ambulance services, work with airport ground handlers, handle contracts, and pay the bill.

International SOS also evaluates medical facilities for quality of care as well as a threat level at the local area. Based on these assessments, they will make recommendations to TPMRC-E on whether a patient needs moved to a more appropriate facility. Additionally, they have

interpreters and medical professionals who speak the language of various nations' medical facility that they are liaising with. Although they are not contracted to legally translate a medical record, they can get sufficient clinical patient history to ensure the receiving facilities has adequate information of the condition of the patient.

Once a DOD medical provider or International SOS request a patient movement to an appropriate medical facility, this usually mean an air ambulance movement. Current transportation options are U.S. Air Force (USAF) aeromedical evacuation (AE) and Civilian Air Ambulances (CAA). CAAs are contracted out by International SOS (Tricare Overseas) or a State Department contract. There have been a few times where a CAA asset prepositioned in a country such as Kenya or Senegal. Most of the time however, CAAs are based in Europe and have to fly six to eight hours just to reach the patient.

U.S. military air assets can be even more difficult to utilize as there are several difficulties to overcome. There has to be an available airframe and these are almost never immediately available. An aircraft has to be taken from an existing mission and flown to Germany or Qatar to pick up a medical crew and equipment. The air crew must have their appropriate crew rest and these all adds to more time to the overall process.

Occasionally, a third asset becomes available or a patient can move unregulated in extenuating circumstances. During the Ebola virus outbreak in Western Africa, the State Department contracted Phoenix Air and had a plane and medical team on stand-by in Liberia. This proved to be one of the fastest ways to evacuate patients; however, this contract required complex documentation and funding movement between the State Department and DOD. Currently, the State Department has a contract CAA based in Dakar, Senegal and USAFRICOM has a contract aircraft available for air ambulance use at Stuttgart, Germany.

CAAs have another advantage over military aircraft, they require less ground support. Frequent military airframes utilized for Africa are C-130s, C-17s, and KC-135s. C-17s require coordination with several agencies in Europe and the U.S. while C-130s and KC-135s are coordinated out of Ramstein, Germany. C-130s used for Africa are based at Ramstein, Germany. A mission to Sub-Saharan Africa would take several days with this aircraft due to the slower speed and required crew rest periods. KC-135s are available for Africa aeromedical evacuation out of RAF Mildenhall. This aircraft cost \$13,742 an hour to operate.²⁵ This airframe can make the trip at a cost of \$170,000 in a single duty day. Even though the KC-135 is the fastest and most cost effective of the useable military options, it does have disadvantages.

The KC-135 airframe makes it difficult to load and unload patients. Litter patients must be loaded through the cargo door. That requires a time-consuming procedure and special ground handling equipment that would not be available at many of the airfields where patients get picked up in Africa. At many places without a specialized lift truck, K-loaders would have to be utilized exposing patients to bad weather conditions. Other disadvantages if this aircraft is it has poor climate control, poor lighting, and restroom facilities with no integral oxygen or electrical for patient use.²⁶ Aeromedical evacuation crews would bring their own oxygen and frequency converter for patient use.

The Aeromedical Evacuation Process

Aeromedical evacuation missions first began during World War I and have greatly improved in size and scope in the wars that followed. The United States Air Force has had dedicated Aeromedical Evacuation Squadrons since 1951 and they were specifically designed to provide patient movement by fixed-wing aircraft. The lessons that were learned over the years have led to survival rates that approach 100 percent today.²⁷²⁸

The key to this astounding survival statistic is the ability for patients to get to an appropriate medical facility quickly. In every major city in the developed world there are hospitals available to treat the ill and wounded. In wartime settings, the U.S. military usually deploys adequate medical facilities to take care of those in need in many of these places where there are inadequate facilities. This is not the case for most of Africa. The U.S. has moderate medical capabilities at Djibouti, but most specialty care cases still require aeromedical evacuation to Germany

The aeromedical evacuation process starts out with a request for movement from an MTF provider, a State Department provider, or an International SOS request because a United States military member or government employee has been hospitalized at a facility that doesn't meet Western standards of care. Virtually all of these movements go to Landstuhl RMC, Germany for treatment. Although there are civilian facilities with excellent standards of care closer to the African continent, it is not that much of a significant delay in care to bypass a civilian facility by aircraft for an hour longer flight. This is in part due to the ability to quickly pick up patients on the flight line at Ramstein, Germany, bypass customs, and have an ambulance ready for the immediate transfer to Landstuhl RMC, Germany.

There is much less coordination with patients going to Landstuhl RMC such as no language barrier and a proven and established system of safe patient movement by ground ambulance. This movement allows for a patient to get back into the United States medical system, which has the ability to transfer the patient back to the United States via aeromedical evacuation routes scheduled twice a week. Landstuhl RMC, is the largest and best equipped U.S. military medical treatment facility in Europe and patients transition through Landstuhl RMC, Germany from USAFRICOM, USCENTCOM, and USEUCOM back to the United States after

stabilization. In addition, nearby Ramstein Air Base is the major overseas hub for logistics. This results in more available aircraft at the location where aeromedical teams are ready to respond.

The TRANSCOM Patient Movement Requirements Center- East (TPMRC-E) located at Ramstein Air Base, Germany is the organization that receives requests for patient movements and coordinates such movements. This unit is comprised of flight surgeons, flight nurses, medics, and hospital administrators who verify that the patient is safe for flight, has the appropriate medical orders, equipment, specialty care and documentation that allows them to enter Germany or another country where care is rendered.

After TPMRC-E validates a patient movement request, it contacts the Aeromedical Evacuation Control Center (AECC) Center at Ramstein Air Base to find an available aircraft that can do the AE mission. AECC will coordinate with the Tanker Airlift Control Center (TACC) at Scott Air Force Base if it is unable to utilize a United States Air Force Europe (USAFE) asset. The most frequently used aircraft in Africa are C-17s and C-130s. For shorter missions to Northern Africa, a C-21 may be used. If AECC cannot find an aircraft for an AE mission, TPMRC-E will contact International SOS to contract a civilian air ambulance. AECC can also contact to the State Department to see if the Dakar or Stuttgart contract aircraft are available.

Patient Movement in Africa

In 2016, there were 139 total patient movements in Africa, with seven being classified as “Urgent”, and 28 being classified as “Priority.”²⁹ Urgent and Priority patients are considered seriously ill. Current DOD policy requires Urgent patients to be moved within 12 hours and Priority patients to be moved within 24 hours.³⁰ The average time for those Urgent and Priority movement patients to be picked up after they were approved for an aeromedical evacuation mission was 28 hours and 21 minutes.³¹

Year	Total Africa Patient Movements	Urgent (movement within 12 hours)	Priority (movement within 24 hours)
2017 (Jan-Apr)	50	3	25
2016	139	7	28
2015	285	14	30
2014	240	10	27
2013	165	7	26
2012	175	9	29
2011	184	5	42
2010	117	9	25
2009	78	7	16
Total	1433	72	248

Table 1: Africa patient movements³²

With the large scope of Africa and great distances to get patients to an appropriate level of care medical center, the average time between an approved patient movement request and arrival at an appropriate medical center is 38 hours and 15 minutes.³³ This is a staggering figure. In Europe, most people can be at an appropriate medical center in a matter of minutes. In USCENTCOM, where very good military assets are in place, the average time to get an Urgent patient to definitive care is under 15 hours and the average time for Priority patients to get delivered to definitive care was about 20 hours.³⁴ Unlike the Africa, USCENTCOM timeframes are skewed longer due to much better medical resources being available in theater that can treat most patients and do not require aeromedical evacuation.

Many Africa patients took several days to move and the risk of a negative outcome from a delay in care was significant. In 2016, a service member involved in a motor vehicle accident in Africa nearly died. This military member was in a rollover vehicle and suffered blunt force trauma to the abdomen. A Corpsman (Navy EMT) who was with the patient requested an Urgent movement from the location. However, TPMRC does not coordinate pick up of a patient from a point of injury for transport to a stabilizing medical facility. That is the function of first

responders such as ambulance services or Medical Evacuation (MEDEVAC), which is usually done by rotary wing aircraft. There was no MEDEVAC available at the time.³⁵

TPMRC tried to come up with two workable solutions. The first solution was to coordinate with International SOS to find the closest acceptable trauma center for life saving interventions. TPMRC was also trying to find an aircraft for an Urgent move after the patient was stabilized. Neither of these solutions were going to get the patient immediate specialty care. During this period, the Corpsman reached out to a forward deployed surgical team. A plan was implemented for a non-regulated movement. This means an aircraft without trained aeromedical crew members or equipment thoroughly tested as safe for flight was not utilized. The forward surgical team had an aircraft of opportunity to fly to the patient's location, pick him up and fly him back to the forward surgical station. At the forward surgical station, it was determined that the patient had significant internal bleeding. This forward surgical team operates out of a small tent and has bare minimum staffing, equipment, and supplies to provide emergent patient stabilization.

During the 12 hours it took before the patient was airlifted out of his location, TPMRC-E was in frequent contact with the control teams that attempted to find an available aircraft. After an aircraft was found, it would have been four hours until the plane was able to depart due to the standard U.S. Air Force alert time and then another eleven hours of flight time round trip. With the added ground time, flight time, and alert time, it would have taken eighteen hours to get the patient definitive care in Germany. It would have taken an additional two hours of flight time to get to the closest center of medical excellence on the African continent in Pretoria, South Africa. This is a significant delay in care. Another available non-medical aircraft was eventually found

and the patient was moved to Germany a few hours faster than a regulated aeromedical evacuation mission could get the patient movement accomplished.

A more recent tragedy occurred in March 2017. Two active duty U.S. soldiers and a civilian were involved in a motor vehicle accident in Burkina Faso. One soldier was driving the vehicle when the single vehicle accident occurred. All occupants were wearing seat belts, however, two passengers sustained significant head trauma with one of them, the civilian, being pronounced dead on scene.³⁶

The other passenger, a U.S. Soldier, was in need of immediate medical attention. He was first taken to a local clinic in Burkina Faso with limited resources where very few interventions, such as placement of oxygen or stabilization of his neck and spine were done. He was then transferred to another facility where they discovered his oxygen saturation was critically low. Only then was it decided to oxygenate the Soldier.

Void of appropriate medical facilities or U.S aircraft available to evacuate the patient to a better facility, the State Department was able to quickly find an aircraft that could get the patient to Landstuhl RMC, Germany, where emergency stabilization could occur. The usual route of patient regulation was not coordinated through the appropriate channel at TPMRC-E. There was very little medical information to pass onto Landstuhl RMC for them to prepare for the patient. Unfortunately, once the patient finally arrived at Landstuhl RMC, he was pronounced dead. These are just two examples of the many Urgent and Priority patient movement request that occur every year on the African continent due to lack of quality medical care.

Identifying the Causes of Delay in Care

Evacuation Options

Currently, the primary options for evacuating patients out of Africa are by U.S. military aircraft or civilian air ambulance.³⁷ It usually takes longer than twenty-four hours to get a U.S. military aircraft with an aeromedical evacuation team to a site in Africa. Often, International SOS can contract a civilian air ambulance that is already on standby with a medical team prepared to respond in much quicker time.³⁸

The Air Force used to have dedicated medical aircraft called the C-9 Nightingale. Unfortunately, this platform was outdated and useless in the tactical environment due to it being a converted airline aircraft that could not perform in an austere environment on short unpaved surfaces with enemies shooting at the aircraft. AE now can use most cargo planes as an aircraft of opportunity. A C-17 aircraft carrying cargo and the aircraft can be quickly reconfigured for an AE mission without removing the cargo. There are aeromedical crews on bravo alert at various strategic locations where the U.S. operates. This means an aircrew can report in less than an hour for an AE mission.³⁹ For Africa, those crews are located in Ramstein, Germany. Even though there is a medical crew ready, that does not mean there is an aircraft ready. Due to the great distances, large aircraft such as C-17s or KC-135s should be utilized. The only airframe of those under the command and control of U.S. Air Force's Europe is the KC-135 out of RAF Mildenhall.

The process of finding an aircraft can be time consuming. It is common to take three hours or more to find an aircraft. If there is an aircraft immediately available, it would still likely be four hours before it is airborne. First the aircrew and medical crew are alerted. The medical crew has one hour to get their uniforms, bags, and other no-go items ready as well as getting

meals before reporting to their squadron. They must complete preflight duties which include checking the latest flight safety bulletins, preflight their medical equipment, print mission paperwork, and come up with a plan for patient care. They also need to attend an intelligence brief and some locations may require a stop at the armory to pick up weapons. The medical crew then must transport all of their gear to an aircraft and configure the aircraft for patient movement. This requires electrical and oxygen to be set up and functional checks on all of their medical equipment to ensure there are no faulty pieces of equipment and it interfaces correctly with the aircraft systems. Four hours later, they are finally airborne.

Available Medical Facilities

International SOS assesses and publishes yearly global health and travel security data for the DOD and other agencies. This data is based upon Medical Capability Reports that is prepared for the Defense Health Agency. International SOS gathers the information in this report through reliable sources such as the World Health Organization and making site visits to some of the facilities where they can evaluate standards and make observations that normally would not be available without an inspection.

The Medical Capabilities Report evaluates the major-medical systems in each nation and is broken down into several sections. These sections break down the location and overall geographic scope, standard of healthcare, individual hospitals, and medical transport systems. The standard of healthcare and overall hospital sections are the most important part of the Medical Capabilities Report as it pertains to options for treatment for DOD personnel. The hospital section list medical specialties, laboratory, radiology, and inpatient care capabilities. It also assesses the education level of the nursing staff and if English is available or well spoken.

International SOS also publishes a global map that highlights the travel risk, medical risk, and International SOS aligned medical clinics. There are five categories of travel risk, from insignificant to severe and five levels of medical risk, from low to very high. As expected, areas where United States military personnel operate in Sub-Saharan Africa are rated high-to-extreme travel risk. Not surprising, the medical care in these areas are high-to-very high medical risk nations.⁴⁰

In high risk nations such as Niger, Nigeria, Chad, and Djibouti, basic emergency and dental care services may be available with limited specialty care. In the extreme travel risk nations such as the Central African Republic, and parts of Congo, Nigeria, and South Sudan, healthcare is virtually non-existent. That precludes any civilian healthcare options in many of the areas United States Forces are operating in throughout Africa. Currently, the only viable options in these areas are to bring in their own medical assets or have the patient quickly evacuate to a facility in another nation with a capable standard of care.

The only medical centers of excellence on the continent of Africa are in South Africa.⁴¹ These hospitals meet or exceed international standards are amongst the best hospitals in the world. They are the main referral center for Sub-Saharan Africa. Netcare Unitas Hospital in Pretoria is International SOS' number one choice for Tricare beneficiaries on the African continent.⁴² The problem with evacuating patients to these facilities, which may be closer geographically to them, is they are far from where United States Forces are located. If a DOD patient needed treatment in Niamey, Niger, it is 3200 miles to the closest African medical facility with capability in Africa at Pretoria. It is a six hour and half hour plane ride to get to from Niamey to Pretoria. The closest facilities for care to Sub-Saharan Africa are in southern Europe. The closest capable facility to Niamey would be in Lisbon, Portugal 1850 miles away.



Figure 1: International SOS Travel Risk Map 2017⁴³

There are numerous facilities within USCENTCOM much closer to many places in Africa where the U.S. operates. The U.S. has robust medical facilities in Qatar, Kuwait, United Arab Emirates, and Bahrain that are much closer to locations such as Djibouti than the medical centers of excellence in Germany and South Africa. Adding to their capabilities, near these bases are medical centers of excellence with world-class medical capabilities. Even though most of these facilities are less than a three-hour flight from locations such as Djibouti, they are never used. The U.S. facilities in Africa fall under USAFRICOM whereas those in the Persian Gulf region fall under USCENTCOM. Despite the Goldwater-Nichols Department of Defense

Reorganization Act of 1986 and the push for joint operations, both Geographical Combat Commands follow their own chain of commands with separate funding sources. Using a USCENTCOM asset for USAFRICOM requires a great amount of coordination would result in a significant delay of care. There have been no agreements that addresses patient movement between the two theaters of operation.

Available Medical Resources

Commercial Air and Medical Passengers

What resources are available that would minimize a delay in medical care? There are several options available. The least expensive and fastest way to get patients to appropriate care is to fly them on a commercial plane. Patients can either fly by themselves, with a non-medical attendant, or with a medical attendant to an appropriate facility. For a patient to be approved to fly on a commercial plane, they should be in no need of care or assistance in flight. There are many conditions that require an immediate specialty care referral such as a suspected cancer patient or a patient that suffer an injury such as a broken arm that is splinted but needs orthopedic evaluation.

Patients who could fly commercially with a non-medical attendant are those that do not require care in flight, but still need some sort of assistance. These patients would include, those who are on crutches for a torn anterior cruciate ligament (ACL), or a patient with back pain who would not be able to carry their bags. Patients in need of a non-medical attendant would utilize them to help carry their bags and assist with other activities of daily living. There is a caveat with some of these commercial movements. A patient with a torn ACL likely has been placed in a long-legged splint that does not bend. This patient would only be able to sit in a first-class seat that has enough leg room for the long-leg splint.

Unfortunately, in the DOD, there is not a quick an easy way to get the local travel office and Finance office to pay for a first-class ticket. Current regulations require the first two-star General Officer in the patient's chain of command to sign off on a first-class seat. This is a time-consuming task and would cause a significant delay a care. That process would need to be streamlined where a policy would grant the Tricare Area Office, International SOS, or TPMRC-E the approval authority for a first-class ticket.

A patient who could fly commercial with a medical attendant should require little care in the air. TPMRC-E has recently coordinated a patient with acute appendicitis at a location where basic surgical care was not available. International SOS has the ability to liaise with airline medical directors and get approval for a patient to fly with intravenous lines and medications. This should be utilized when appropriate, but the risk versus benefits must be weighed.

Another method of getting a patient to care is to move them as medical passenger. TPMRC-E is able to space block patients with Air Mobility Command assets through TACC at Scott Air Force Base or AECT at Ramstein Air Base. This gives medical patients priority access to any available seats on AMC aircraft which include C-17s, C-130s, C-5s, KC-135s, and KC-10s. Typically patients should not require any care in flight for this type of transport, but in the many austere locations such as in Africa, a risk versus benefit analysis would be performed similar to that of the patients moving by commercial air.

A medical attendant could provide care in similar fashion as it is suggested for commercial air movement. However, this movement is much easier to execute because there is no need to get International SOS involved to clear the patient through an airport and airline. Utilizing MEDPAX movement would allow the patient to transit directly to a major hub, such as Ramstein, where the local Military Treatment Facility can assist in off-loading and transporting

the patient from the aircraft directly to the hospital. A commercial flight would involve transportation to and from the airport which is a lengthy process. Landstuhl RMC is an over an hour taxi ride from Frankfurt International Airport with no traffic.

Utilizing an Air Mobility Command asset for MEDPAX movement with a medical attendant would have one significant benefit; the medical equipment has been standardized and approved by the Air Force for flight and interfaces with the aircraft systems. Connecting medical equipment to aircraft electrical and oxygen systems requires a fair amount of knowledge in how the equipment works and the warnings associated with improper use, or potential for a hazard to exist.

Medical providers going to these locations should get a basic overview from either the Air Force School of Aerospace Medicine where AE is taught, or from any of the Aeromedical Evacuation Squadrons where they teach flight nurses and aeromedical technicians how to properly use this equipment and its interface with the aircraft. In-depth knowledge of medical equipment and how it interfaces with USAF aircraft would not be required because a MEDPAX patient would only require basic equipment such as an intravenous pump for a flight. Any more equipment needed is a sure indication that the patient needs a higher level of monitoring and care, which would require an aeromedical evacuation crew.

Civilian Air Ambulance

Civilian Air Ambulances have been the most efficient and effective way of transporting patients out of Africa. There are numerous advantages to using CAA services. CAAs are faster and less expensive at getting patients moved from Africa than utilizing military aeromedical evacuation. Using CAA assets enables USAF assets to be used for other missions supporting the

war on terror. Getting supplies to military members serving in combat zones is equally important as patient movement. Utilizing CAAs reduces the need to remove USAF assets from the fight.

Evacuating patients is an expensive operation. The average cost of a Civilian Air Ambulance out of Africa is \$118,610.⁴⁴ TPMRC-E contracted this out 70 times in the last five years, costing over \$8.3 million dollars.⁴⁵ Even though this cost is high, it is not nearly as expensive as using Air Force assets. Common airframes utilized for this mission are C-17s, C-130s, and KC-135s. C-17s cost \$15,702 an hour to operate and can typically make the trip from Ramstein, where AE crews are based, to a patient in sub-Saharan Africa and back to Ramstein in a single Crew Duty Day.⁴⁶

The majority of Africa patients come out of Djibouti. The median cost of using military airframes is \$190,000 versus the median cost of \$109,689 for civilian air ambulances out of Djibouti. This 3,300-mile journey with military aircraft takes 14 hours roundtrip of flight time costing around \$220,000. C-130Js are cheaper per hour at \$11,650 per hour.⁴⁷ However, this plane flies much slower than a C-17 and this same trip would take 17 hours roundtrip at a cost of about \$190,000.⁴⁸ The slower flight time means this airframe cannot make the trip in the same crew duty day. Crew rest cycles will require the crew to rest for 12 hours before the return flight resulting in a delay in care of at least 15 hours versus the C-17.

During the Ebola outbreak in 2014, there was much publicity over the fear of bringing back the disease to the United States. There was a lot of political pressure on ensuring the safety of not only our nation, but for the healthcare providers on scene trying to control the spread of infection. The United States deployed medical assets to Liberia and developed a plan for evacuating those military members. A specialized Gulfstream airframe was utilized that could isolate patients and provide safe movement back to the United States for treatment. This mission

was contracted out to Phoenix Air. With this asset on location, timely aeromedical evacuation was assured.

Phoenix Air currently has two contracts that have been utilized for aeromedical evacuation. One is based out of Stuttgart, Germany and is contacted through USAFRICOM to do a multitude of roles from personnel movements to aeromedical evacuation. Even when it is available for aeromedical evacuation, it takes several hours to configure the aircraft for an aeromedical evacuation mission. The aircraft has to fly from Stuttgart to Ramstein to pick up the aeromedical evacuation crew who must configure the aircraft with its own medical equipment before finally underway for the long flight to Africa. Again, this results in a delay in care.

The other Phoenix Air Asset is contracted by the State Department. This airframe is prepositioned in Dakar, Senegal. It is place on a 12-hour posture and is capable of transporting up to two litter and 12 ambulatory patients.⁴⁹ This contract aircraft and crew are based out of Cartersville, GA. It is an all-American crew with nurses and paramedics that rotate every three weeks to Dakar, Senegal.⁵⁰

It has not been used frequently but has conducted eight aeromedical evacuations in support of DOD over the past two years.⁵¹ One of the complications is that reimbursement is compensated annually from Defense Health Agency (DHA) as opposed to direct funding from USTRANSCOM. This reimbursement is for mission costs only and are typically 30-40 percent below International SOS mission costs.⁵²

Utilizing Host Nation Facilities

Although the vast majority of facilities in Sub-Saharan and the Horn of Africa are inadequate and located in areas of high risk for violence, there are a few locations and facilities that could be adequate with the help of the U.S. military or other government agencies. Nairobi,

Kenya is one of those locations. Kenyan medical standards are good and Kenya has many medical specialist available.⁵³ English is widely spoken and most health professionals there have trained in Europe. Nurses have four-year degrees with specialty nurses practicing at the Master's Degree level. Kenya in general still has a high medical risk rating as it's a developing nation but International SOS still recommends evacuation to a center of medical excellence outside of Kenya after initial stabilization.⁵⁴ One of the most positive aspects of utilizing Nairobi for medical care is it is less than a two-hour flight from Djibouti.

Another fairly close location by air to Djibouti where good medical treatment can be obtained is the Gulf State nations' region. World-class healthcare is available in United Arab Emirates and Qatar which is less than a three hour via air ambulance. Before patients can be evacuated to the Gulf States Nations, there are a few more administrative problems that need worked out. Qatar has a rigid immigration process that has caused many issues for U.S. personnel transitioning through their nation. TPMRC-E has had numerous problems coordinating USCENCOM movements via Al Udeid for these reasons. There have been patients that lose their identification due to combat or just carelessness and could not immigrate in to Qatar. These patients have had to wait on the flight line until another mission could be generated to return them to their originating facility. Usually these patients are barred from returning to Qatar, even when they get their new identification cards. Patients are currently required to be on USCENCOM orders to process through Qatar. Patients from Africa will be on USAFRICOM orders, preventing them from immigrating in to Qatar without a visa. There are also diplomatic clearance issues of flying over Saudi Arabia. In any event, the quickest way to get a patient to any treatment facility would be to utilize an asset that is on location, and does not

have to fly several hours in just to pick up the patient and take them to another facility hours away by air ambulance.

Although Nairobi is a good alternative location for United States Forces in Djibouti, it is still a four to five hour flight from Forces in Sub-Saharan nations such as Niger, Chad, Nigeria and Western African nations such as Liberia, Ivory Coast, and Sierra Leone. Another site with less potential, but closer to U.S. Forces in Sub-Saharan Africa is Accra, Ghana. Ghana is working towards internationally accepted standards.⁵⁵ Inpatient care is still not recommended but an acceptable standard of care may be available on a case-by-case basis.⁵⁶ The 37 Military Hospital is an interesting solution if the United States is interested in continuing coalition building the Ghanaian people. The United States has participated in military exercises with Ghana as well as bilateral trade reaching \$1.2 billion in 2015 with American companies in Ghana such a Coca-Cola, IBM, and Newmont Mining.⁵⁷

Share NATO and Coalition Partner Assets

The North Atlantic Treaty Organization (NATO) partners of the United States have aeromedical evacuation capabilities that would be a great resource if efforts were coordinated. The European Air Transport Command (EATC) is a European consortium of seven NATO nations from Western European nations that share resources. The nations that comprise the EATC are Germany, France, Luxembourg, Belgium, The Netherlands, Italy, and Spain. Although these are NATO countries, EATC is not a NATO function.

Within the EATC is the Aeromedical Evacuation Control Centre (AECC). The AECC has evacuated nearly seven thousand patients since late 2010.⁵⁸ The AECC prides itself on multinational collaboration. They utilize a model of where the French may be flying an aircraft with a Dutch medical crew who picks up a German patient. This collaboration goes beyond

patient movement. The EATC shares an entire system of logistical movement. This enables a high efficiency and cost effective level that controls cost.

In the past ten years, the United States has evacuated 992 NATO military members to a higher level of care. Many of these patients have been from nations that are represented in the EATC.⁵⁹ It would be beneficial for the United States to join the EATC consortium. Fortunately, this is already being planned, however, the aeromedical evacuation portion has much work still to accomplish. The AECC has a large global impact conducting AE missions from 90 countries around the world with a large presence centered in Africa, particularly nearly 100 patient movements out of Djibouti.⁶⁰

Since 2009, the United States has evacuated 854 patients out of Djibouti.⁶¹ Getting those patients out of Djibouti has been an ongoing problem since the United States stood up Horn of Africa operations. Due to lack of available aircraft, the United States has contracted a civilian air ambulance 31 times in the last five years at a cost of over \$4.6 million dollars.⁶² The French military operate out of Djibouti as well. They fly two aeromedical evacuations missions each week from Djibouti to France. Utilizing a French asset that is already flying near Ramstein twice a week would reduce the cost significantly and more important, save precious time.

A system has been developed that will provide a multi-national framework for mutual support through an exchange of services.⁶³ This is known as the “Air Transportation and Refueling Exchange of Services” (ATARES). ATARES is a cash-free exchange of services between nations that promotes sharing and pooling of airlift capabilities.⁶⁴ This means an Italian aircraft could fly out of the French base at Djibouti to take an American patient to Landstuhl RMC with a Spanish medical crew. Integrating with NATO partners would save time, money, and resources.

Establishing More U.S. Medical Assets

The DOD spends an exorbitant amount of money on healthcare. Healthcare is nearly 10 percent of the entire DOD base budget.⁶⁵ The fiscal 2017 Defense Health Budget estimates total healthcare cost to exceed \$43 billion dollars.⁶⁶ Needless to say, taking care of DOD service members is an expensive operation considering the considerable medical transportation costs involved. Alternative options are limited. Establishing more medical assets in Africa would add to already strained budgets. The Air Force has developed the Expeditionary Medical Support System (EMEDS) that can be deployed anywhere on short notice. It is a lean and modular medical system can be set-up to fill a void in medical capabilities. The primary mission of EMEDS is to provide forward stabilization operations that can care for a patient until they are aeromedically evacuated.⁶⁷ It is designed to provide high quality medical care and services from tailored to a specific population.

The first increment is a 40 member EMEDS Health Response Team (HRT) that can stabilize and hold up to four patients for 24 hours.⁶⁸ This expandable and modular system can be delivered by an aircraft such as a C-17 and set up anywhere. Ideally, an EMDS HRT could be set-up in a strategic location such as Niamey, Niger where many areas of Sub-Saharan Africa are a short flight away. An aeromedical evacuation team or a contracted civilian air ambulance could be set-up at the same location for quicker response if an urgent evacuation was required due to specialty care treatment not available at the EMEDS HRT.

Non-Regulated Patient Movements

When patients are moved by aeromedical evacuation or civilian air ambulances, the movements called regulated patient movements. Non-regulated patient movement are the other option for getting injured or ill patients to the care they need. A non-regulated patient movement

means that there is a non-AE aircraft available within theater and a patient is moved using assets those assets that are immediately available. This may mean taking a physician or a medic with the patient and utilizing their own supplies. The biggest drawback of a non-regulated patient movement is that the medical professional traveling with and caring for the patient has not been trained on how to provide patient care at altitude in the hyperbaric environment. There are numerous stresses of flight that can cause a patient's condition to change dramatically in flight. If a patient has air in their eye globe or free air in another part of the body, Boyle's law states that the air pocket will get much larger at altitude and can cause loss of eyesight or death.⁶⁹

There are many dangers that untrained medical professionals could face without understanding the interface between aircraft power and the medical equipment. An aircraft like a C-130 only has 400 Hz power available. There would be no way to connect hospital grade equipment that runs on a standard power to a C-130 without the specialty adaptation equipment an aeromedical evacuation crew carries. Unfortunately, an IV pump or ventilator could not run on battery power for a seven-hour flight to Germany without it failing. There also is not any integral oxygen on most planes that can be used for patient use. Aeromedical evacuation teams are experts on aircraft systems, stresses of flight, aircraft and patient emergencies, and medical equipment configuration on aircraft. In addition, they carry equipment that can work on a wide array of frequently used aircraft such as C-17s, KC-135s, and C-130s. The typical medical professional that would accompany a patient on a non-regulated movement would not possess this knowledge.

Of course, if a patient is having a hemorrhagic stroke, the risk of death outweighs the risk of the time delay in getting an aeromedical evacuation team from Germany to transport the patient. The risk versus benefits will be considered for every unregulated move. A patient with

appendicitis at Niamey, Niger may not need to wait for an aeromedical evacuation team. An unregulated movement would most likely be quicker and reduce and delay in care.

Recommendations and Conclusion

United States DOD personnel serve over vast geographical distances in Africa where limited healthcare is available. The U.S. has some intrinsic medical care available, but those who require specialty care are at great risk. This is due to the U.S. not having enough medical resources in Africa and the inability to utilize the majority of host nation medical facilities due to poor quality of care. The result is patients must be moved by air ambulance to receive high quality care. The process for moving patients by air ambulance is not efficient and rarely meets the time requirements established for moving more seriously ill patients. This adds another level of risk to those serving in Africa.

Providing DOD personnel adequate and timely medical care in Africa, where very few medical resources are available, presents many challenges. One of the challenges is to get DOD personnel to medical treatment faster when it is not available locally. The first set of recommendations will address solutions to overcome these challenges.

The first recommendation would be a relatively easy one to implement and would not utilize U.S. medical and aircraft resources. A civilian air ambulance should be contracted at a strategic location within Africa such as Djibouti, where patient movements are usually generated. This would reduce the time it takes to pick-up a patient and deliver them to specialty care. It would accomplish this in several ways. First, the process it takes to get a CAA contract would be eliminated. Currently International SOS solicits two bids and TPMRC-E will approve the bid that is best for the patient. This process typically takes about four hours. Second, the CAA usually flies from Europe to Africa to pick up the patient after several more hours are required

for the alert process. The result is the average time from a patient movement request being approved until the patient is picked up by a CAA is 28 hours.⁷⁰ A contracted CAA that is dedicated for patient movement on location would eliminate bid process and flights from Europe, saving 25 hours of transit time.

Existing DOD and State Department contracts of multi-use airframes show much potential. The draw back to current contracts is they are still far from where U.S. Forces are operating and because they are multi-use, they have to be configured for aeromedical usage and alert times can exceed 12 hours. In some instances, the FAA Part 135 mandates a ceiling of 14-hour crew duty days, requiring the crew to “remain overnight” (RON) and obtain crew rest before completing the mission adding at least 12-hours to the total mission time.⁷¹ A dedicated airframe that only is used for aeromedical evacuation would solve these issues. A set-up similar to the State Department’s Phoenix Air Gulfstream III contract in Dakar where medical members rotate out every three weeks would be ideal.

The Phoenix Air Gulfstream can hold a combination of one litter patient and nine passengers or two litter patients and eight passengers.⁷² This aircraft has a range of 3,400 nautical miles, has hospital grade electrical power, and 13,000 liters of medical-grade oxygen.⁷³ This would allow an intubated patient to reach anywhere in Africa to a center of medical excellence in Germany or South Africa without a stop for fuel. If the CAA operation was set-up on the U.S. military side of an airport such as Djibouti, it would allow for better safety, ease of access, and communications for the civilian American aircrew.

A second recommendation that would reduce the time for a patient to get treatment would be to contract International SOS to medically evacuate patients that requires nominal medical care in flight on a commercial flight with a medical attendant. This type of solution has proven to

be a quick and efficient process on two recent occasions, one in March 2017 and one in September 2016.⁷⁴ International SOS can get approval from the medical directors of airlines to utilize medical attendants and supplies on their respective airlines during the flight. A patient with appendicitis can board an airplane with an IV and the medical attendant can give intravenous antibiotics and pain medications during the flight. This option is significantly cheaper than contracting a civilian air ambulance and can get the patient to medical treatment quicker. The average cost for this has been \$30,512 dollars compared to \$118,610 dollars for a CAA.⁷⁵

A third recommendation is to utilize unregulated movements if the time frame for military and civilian air ambulances are not quick enough to respond and there is another airframe immediately available. This type of patient movement would utilize any available U.S. military aircraft that could be used to move a patient. This would require medical personnel to fly with the patient and administer medical interventions in flight. The advantage of this is the patient can receive specialty care much quicker than other methods. There are numerous disadvantages such as the medical attendants are not likely trained for care in the hypobaric realm, have much knowledge of how medical equipment interfaces with the aircraft, aircraft safety procedures, or have medical-grade oxygen available.

A fourth recommendation to decrease the time it takes to get a patient to care is to utilize coalition partners existing AE platforms. If a U.S. coalition partner such as France is already on location and ready to fly aeromedical evacuation missions, this would save time, money, and U.S. resources. This system would use the ATARES system credits where the U.S. would repay the coalition partner by moving their patients or cargo when the U.S. has assets in certain areas where the coalition partner does not have assets. Sharing assets and resources on a vast continent

such as Africa would ensure more coverage and increased efficiency than if a nation had to operate on it alone.

The fifth recommendation is to utilize assets out of Al Udeid Air Base, Qatar. Al Udeid has airframes, aeromedical evacuation teams, and critical care air transport teams available on site. This is the closest location with aeromedical evacuation capabilities to the Horn of Africa where most patient movements in Africa originate. A C-17 can fly from Al Udeid to Djibouti in just under three hours.⁷⁶ These are USCENTCOM assets that would be utilized for USAFRICOM so agreements would need to be in place for command & control and funding differences.

The final recommendation for improving the time it takes to get DOD personnel medical care is to have a dedicated bravo alert airframe and crew for Africa. KC-135s at RAF Mildenhall are the ideal platform. It can reach the Sub-Saharan and the Horn of Africa faster than any other U.S cargo aircraft and has the longest range of any U.S. cargo aircraft.⁷⁷ This aircraft would require to fly an hour to Ramstein to pick up the aeromedical evacuation aircrew before heading to the African continent, but is slated to move to Ramstein, Germany under European Infrastructure Consolidation review.⁷⁸

The next set of recommendations will be address access to medical care within or close to Africa. The first of these recommendations is to utilize more host nations facilities despite them not being considered appropriate by International SOS's standards. If a patient is hemorrhaging, there is no time to wait for a transfer to a center of medical excellence. The risk versus benefits must be clearly weighed. Some facilities could be utilized that are developing to higher standards of care but has not been recommended by International SOS. Facilities in Accra, Ghana and Nairobi, Kenya are examples of those type of facilities that have doctors and nurses trained to

Western standards in Europe with comparable educational requirements to those in the United States.⁷⁹⁸⁰

The second recommendation is to utilize facilities in USCENTCOM for places closer to the Middle East such as Djibouti. Many of these facilities meet or exceed Western standards of care in places such as Qatar and United Arab Emirates. These areas are considered medical centers of excellence and amongst the best in the world and can be reached from Djibouti in three hours by air ambulance.⁸¹ This would reduce flight time to Europe by at least four hours. For illnesses with time-sensitive treatments such as stroke care, this time savings can be the difference between life and death. The U.S. operates military bases near Doha, Kuwait City, and Abu Dhabi and could act as liaisons between the U.S. military and host nation governments. These areas have the advantage of scheduled aeromedical evacuation mission three times a week to Germany after a patient is stabilized. The immigration process would need streamlined for this to be effective to prevent patients from being deported due to strict immigration procedures.

The last recommendation for improving access to medical care in Africa is to establish an EMEDS HRT. This would require the most resources and would only provide initial stabilization at a single location for a wide range of medical issues and is designed to hold patients for up to 24 hours.⁸² The equipment package itself for an EMEDS 10-bed facility cost over \$4.5 million dollars.⁸³ This does not include the cost of manpower or transportation which would increase the cost significantly. The benefit to this option is it is modular and can be expanded with more medical resources in a quick manner. It could also be used as an aeromedical evacuation staging facility. This would allow for rapid AE to locations in Sub-Saharan Africa and back to the EMEDS HRT. AE can be designed for an “Alpha Alert,” which means an AE mission can be

airborne on the way to pick up a patient in less than an hour.⁸⁴ It can be augmented with a Critical Care Transport Team that can respond to most medical emergencies.

These nine recommendations would greatly improve time-to-treatment for patients located in austere locations within Africa and help prevent adverse effects or even death. Despite these recommendations, there are some medical emergencies that just cannot be treated in Sub-Saharan and the Horn of Africa. There are no cardiac catheterization labs or stroke centers available to patients in these areas. However, with air ambulance resources based in these areas and immediately available to transfer patients to capable medical centers, patients would be given a greater chance of survival the faster they can be delivered to appropriate care. As an all-volunteer service, military members inherently signed-up for risks associated with serving in austere and dangerous locations. It is the responsibility of the DOD to take care of those serving in Africa by giving them the best medical support available.

Notes

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