A SILENT ENEMY:
How Arthritis Is Threatening Veterans and the U.S. Military

Issue Brief
Prepared by the Arthritis Foundation
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Introduction

Arthritis: A Devastating Yet Unrecognized Threat

The epidemic of arthritis among our service members and veterans is a direct consequence of the injuries and physical stresses from time served in the military. It is also a significant and largely unrecognized threat for those who have served our country selflessly.

We owe an enormous debt of gratitude to everyone who has served in the armed forces, especially those who have been injured in the line of duty.

We also owe these men and women resources to reduce the risk of arthritis, the best post-injury care available, and continued research to enhance their lives and health outcomes.

That is why the Arthritis Foundation is committed to better serving the 1 in 3 veterans who has arthritis and who lives with limitations in daily function and mobility, and reduced quality of life.

Because of the prevalence of arthritis, the Arthritis Foundation believes it’s imperative to do more research on the causes of arthritis, to help find better
treatments and, ultimately, a cure. That’s why we’re publishing this issue brief—

**urging legislative action NOW to create a dedicated arthritis research program**—with at least $20 million funded annually—at the Department of Defense (DoD).

This will ensure a committed investment in arthritis research and accelerate the robust research already underway through the DoD—research that is not being done anywhere else. Research that will benefit service members, veterans and everyone with some form of arthritis.
Section 1: The Causes and Impact of Arthritis on Service Members and Veterans

Prevalence in the military and post-service

The arthritis burden among active duty personnel and veterans is significantly greater than in the U.S. civilian population.

Comparing Prevalence of Arthritis

<table>
<thead>
<tr>
<th>Veterans</th>
<th>Civilians</th>
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<tr>
<td>1 in 3</td>
<td>1 in 5</td>
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Approximately 11,000 new cases of osteoarthritis (OA) are diagnosed each year among 1.3 million active duty service members (Rivera et al., 2012).

Demographics

The prevalence of arthritis is higher among veterans than non-veterans across most categories (CDC, 2015).

- **Age:** Cameron et al. (2011) found that the rate of OA in military and veteran populations aged 20-24 was 26 percent higher than civilians, and service members over 40 were twice as likely to develop the disease after returning to civilian life. The rate increases exponentially in the above-40 age group, with OA rates 19 times higher than service members in the below-20 age group (Cameron et al., 2011).

- **Sex:** According to the CDC, 25 percent of male veterans and 31.3 percent of female veterans have arthritis. Male veterans have higher rates of arthritis than civilians in all age groups, and female veterans have
higher rates than civilians in the young (18-44) and middle-aged (44-64) cohorts (CDC, 2015).

Arthritis prevalence among female veterans who reported being unable to work was 67.9 percent, per the CDC, and consistent with previous studies (Cameron et al., 2011). The difference in incidence rates increases around the time of menopause, suggesting that decreased bone density among women during menopause may increase the incidence of OA. However, more research is needed to determine the precise causes of increased arthritis rates among female veterans.

- **Race**: Studies have found higher rates of OA among African-American service members compared to other races. A 2011 study by Cameron et al. found African-American service members 15 percent more likely to be diagnosed with OA than Caucasian service members and 26 percent more likely than other races. Increased OA risk among African-Americans may relate to higher bone mineral density and muscle mass, which can be associated with an increased risk of OA in the lower extremities.

- **Branch and Rank**: Army personnel experience the highest rates of OA of any military branch, followed by Air Force, Marine Corps and Navy. Junior enlisted service members have the highest rates of OA by rank, followed by senior enlisted, senior officers and junior officers (Cameron et al., 2011).

Data collection and surveillance have helped illuminate these disparities in arthritis rates for service members versus civilians. More research is necessary to identify the exact causes of these disparities and subsequently develop prevention methods and treatments to mitigate the impact of arthritis among military personnel.

**Understanding arthritis**

Arthritis is an umbrella term that refers to more than 100 different musculoskeletal diseases. By far the most common type is osteoarthritis (OA), an often progressive disease of joint degeneration, characterized by loss of cartilage, changes to the soft tissue and bone, as well as disturbances in biochemical homeostasis within the joint capsule. Symptoms of OA include pain, joint instability and joint fluid accumulation. OA is commonly called simply “arthritis.” Rheumatoid arthritis (RA), gout and psoriatic arthritis are examples of other types of arthritis.
There is no cure for arthritis, and for some forms of the disease, including OA, which affects 27 million Americans, there are no FDA-approved disease-modifying therapeutic treatments.

This is why the Arthritis Foundation believes arthritis should be a top national health priority. As the Champion of Yes for all people with arthritis, we believe resources should be invested in arthritis research to find a cure, to fund innovative treatments and public health programs that will mitigate its impact, and to prevent the disease completely.

**Limitations in work and daily living**

Arthritis is the leading cause of disability in the United States.

Arthritis is a more frequent cause of work limitations than heart disease, cancer and diabetes, restricting the productivity of one in three working-age adults with the disease and limiting the daily activities of nearly 23 million people. In fact, the World Health Organization ranks osteoarthritis (OA) fourth among diseases having the greatest impact on years of life lost due to disability (Rivera et al., 2012).

Some people with arthritis often face daily challenges, including grasping small objects, sitting for more than two hours, climbing a flight of stairs, standing for more than two hours, bending down or kneeling, and lifting or carrying objects heavier than 10 pounds.

As reported in a Centers for Disease Control and Prevention (CDC) survey, 43 percent of those with arthritis say it is “very difficult” to perform or they “cannot do” at least one of nine important daily functional activities. Fourteen million adults reported limits in their ability to stoop, bend or kneel, and 11 million reported that they cannot walk a quarter of a mile (CDC, 2015).
According to the CDC, “the prevalence of arthritis-attributable activity limitation among all adults ranges from 6.4 percent to 17.5 percent. These high rates are projected to increase as the population ages, requiring increased intervention measures to reduce impact” (CDC, 2015).

Even in states with the lowest levels of arthritis-attributable work limitations, one in three working-age adults with arthritis is affected. In over a quarter of states, roughly half of people with arthritis have arthritis-attributable work limitations, resulting in lost wages and impacting their ability to perform normal activities.

**Military-related causes of OA**

Military training and service can be extremely strenuous and dangerous, and both are prominent contributing factors in OA development.
OA is a disease that progresses along a continuum, commencing with a specific event, like injury or accumulation of mechanical joint stress. High physical demands among service members accelerate the wear and tear of joints over time, thus increasing the risk of OA (Robbins, 2011).

Starting with basic training and throughout duty, service members’ bodies can be pushed to extreme limits of endurance and physical abilities.

During training, the physically demanding intensity, duration and repetition of running, marching, field exercises and weapons training strain the joints through high-impact, repetitive motion, causing stress and microtrauma to the cartilage, the smooth, slick tissue covering bone ends that allows frictionless movement. The result is “wear and tear” that leads to arthritis.

In potentially under-conditioned recruits, the abrupt onset of physical challenges, including twisting joint movements like pivoting, creates significant risk of soft tissue injury at the start of one’s military career. Sprains, strains and tears of soft tissues, such as tendons and ligaments—commonly the anterior cruciate ligament (ACL) and the meniscus, a cartilage pad—sets men and women up for post-injury, or post-traumatic, OA.

Those physical demands continue into active duty. Repetitive joint stress from kneeling, squatting, lifting large loads (over 55 pounds, just half of the loads service members may carry) and long marches (often carrying those loads), further increases the risk of OA (Robbins, 2011).

An important contributor to the arthritis burden in the military and among veterans is injury. When our service men and women are wounded, their injuries can immediately trigger the beginnings of arthritis, which lasts a lifetime (Cameron et al., 2011).

A review of 464 wounded service members conducted by the United States Army Institute of Surgical Research revealed that 69 percent of conditions were orthopedic-related. Lower extremity injuries make up the largest percentage of injury numbers. The lower extremities are usually most exposed to shrapnel and account for the greatest body surface area. All of these injuries put service members at high risk of post-traumatic arthritis. Orthopedic-related disability has a significant impact on patients, our health care system, and, in the case of
wounded service members, on military strength and readiness (Cross et al., 2011).

The impact of arthritis in the military

Arthritis can have severe and far-reaching effects on our military and veteran populations. For example, OA is the primary reason for disability discharge among military personnel (Rivera et al., 2012), and the second most common reason soldiers are medically discharged from the U.S. Army.

One study that reviewed Army Physical Evaluation Board results to identify permanently disabling conditions found that arthritis was the most common unfitting condition, with 94.4 percent of cases attributed to combat injury. The most common causes were intra-articular fractures secondary to explosions, traumatic arthrotomies resulting from fragment projectiles and gunshot wounds (Rivera et al., 2012).

The increased level of combat-related injuries from repeated deployments is having a significant impact on arthritis in service members. A 2011 study by Cross, Ficke, Hsu, Masini and Wenke found that, among veterans of the Iraq War, OA is a major reason for service member discharge.

From a group of 450 troops, 29 percent were declared to have traumatic arthritis and were thus ruled unfit for duty (CDC, 2015). Among the Iraq War veterans evaluated in this study, 80 of 83 who had knee (37 cases), elbow (22 cases) or ankle (21 cases) injuries were declared unfit for duty because of arthritis in those joints, and 81 percent of the orthopedic injuries resulting in arthritis were caused by explosions.

Notably, the OA that results in troops who are injured by roadside bombs and other blasts is accelerated. The shock waves from bomb blasts affect cartilage cells, causing damage that the body cannot repair. For these service members, the breakdown in cartilage is not gradual, as is the case in civilian populations. Rather, it can happen suddenly, within two years of being injured (Yelin et al., 2007). In contrast, those who develop arthritis as a result of a civilian injury usually develop the disease after 10 years or more.

Post-traumatic OA can be severely disabling and debilitating. Wounded service members often require costly lifelong care for their condition (NCVAS, 2013). This is of particular concern since the younger the onset, the larger the number of
disability-adjusted life years associated with the disease, translating to a higher rate of poor long-term health outcomes and higher health costs among service members and veterans.
Section 2: Why Reducing Arthritis in the Military Is a Critical Mission

Figure 2.0 Health Care and Disability Costs

A growing burden

As previously noted, repeated deployments to places like Iraq and Afghanistan over the past 15 years have resulted in a larger number of service members engaged in combat and heavy-duty service for more years, thus accumulating greater damage to the body and greater risk of OA.

Approximately 2.8 million service members have been deployed to the Middle East since the Global War on Terror (GWOT) began in 2001. Between 2001 and 2011, more than 44,600 service members in Iraq and Afghanistan were wounded in battle, and more than 7,900 were evacuated for musculoskeletal disorders (Golding, 2011).
In fact, musculoskeletal disorders were the most common medical condition diagnosed among GWOT veterans, accounting for 55 percent of post-9/11 veterans who used Veterans Health Administration services.

**Arthritis is a costly disease**

Arthritis for all Americans costs more than $156 billion a year in direct and indirect expenses for OA and RA alone, including lost wages and productivity (CDC, 2015). National medical costs attributable to arthritis and other rheumatic conditions grew by 24 percent between 1997 and 2003.

This rise in medical costs resulted from an increase in the number of people with arthritis. The medical costs associated with arthritis translate to hundreds of millions to even billions of dollars to individual states annually (see Appendix Part 1, page 41, for state costs chart).

Important points:

- Primary OA—also known as “wear and tear” OA—accounts for 22.3 percent of all non-injury-related ambulatory visits and 70 percent of non-federal short-stay hospital admissions among all Americans (Yelin, 2007).

- Each year, arthritis contributes to more than 44 million outpatient visits, 1 million hospitalizations and more than 9,000 deaths.

- Annually, there are 500,000 knee replacements and 250,000 hip replacements primarily related to arthritis. The costs of total hip and knee replacements total more than $41 billion annually (Murphy, 2012).

- Post-traumatic OA alone costs more than $12 billion a year in direct health care costs (Brown et al., 2006).

The cost to people suffering from arthritis is significant, with OA accounting for $2,600 to $7,500 in out-of-pocket expenses per person every year (Yelin, 2007). Further, by 2040, the number of people with arthritis is expected to soar to an estimated 78.4 million. That’s a 49 percent increase over today. This growing problem will exponentially increase these health care costs (Hootman et. al, 2016).
Depleting our defense budget

Health care expenditures currently account for 9 percent of the total defense budget, and the increasing rates of arthritis among service members and veterans will greatly contribute to growing medical expenditures from the Department of Defense (DoD) (OMB, 2013). The Congressional Budget Office estimates that defense health costs will grow from $51 billion in 2013 to $65 billion in 2017 and $77 billion in 2022, a growth rate of 4.6 percent a year (OMB, 2013).

The DoD received $32.5 billion in FY 2015 for its Defense Health Program, up from $13.7 billion in FY 2001. The larger number of post-9/11 service members accounts for a significant part of this increase in spending and health costs. Overseas contingency operations add even more to the overall health costs incurred by the DoD (approximately $2 billion a year), as they are not included in the baseline Defense Health Program budget (CBO, 2012).

The rising number of U.S. service members will significantly increase health care costs.

Veterans’ care

Health care costs are straining the Department of Veterans Affairs (VA) budget as well. There were 22 million veterans in the United States as of September 2014, and an additional 25.7 million family members and dependents eligible for certain VA benefits. Approximately 5.5 million of those veterans have doctor-diagnosed arthritis (CDC, 2015).

Since arthritis is a lifelong disease, these 5.5 million veterans will likely require ongoing care to manage their disease, from basic pain management to expensive treatments like joint replacement surgery.

More than 5.7 million veterans and nearly 300,000 non-veteran patients accessed VA health care services in FY 2013, at a cost of more than $44 billion. This is up from 3.4 million veteran patients in FY 2000, at a cost of $16.8 billion (NCVAS, 2013).

For five years after separation from the armed forces, the Veterans Health Administration (VHA) provides free health care for medical conditions that are either directly or potentially related to military service in combat operations in Iraq and Afghanistan. Those who deployed are eligible for these services beyond the five-year window (NCVAS, 2013).
Once a service member is discharged, his or her care is typically transferred to the VA, which spends more than $60 billion a year on health care. Veterans are usually eligible to receive health care benefits from the VHA if they have served a minimum amount of time on active duty, were medically discharged or are determined to have a service-connected disability.

For veterans with service-connected disabilities, the Veterans Benefits Administration (VBA) pays out monthly disability compensation; in 2014, the VBA paid compensation to 4.3 million veterans, totaling more than $49 billion, up from 2.3 million veterans in FY 2000, when $14.7 billion was spent (VA, 2015).

Eligibility and access to VA health benefits in any given year is dependent on a veteran’s priority group. Top priority goes to those with service-connected disabilities that are rated 50 percent or more; next, to those with service-connected disabilities rated 30 to 40 percent; and finally, to those rated 10 to 20 percent or with disabilities incurred/aggravated in the line of duty (VA, 2015).

Most veterans with arthritis-related disabilities fall into the top three priority groups for VHA access. The range of arthritis disability ratings depends on the type of arthritis and severity of disability. Knee replacement, for example, has a disability rating of 100 percent the first year following surgery, then a disability rating of 60 percent thereafter if there is weakness and severe pain with motion, and a minimum disability rating of 30 percent for all affected.

In FY 2014, more than 2.8 million veterans received care in the top three priority groups, with the average expenditures per patient ranging from $5,773 in priority group three to $11,702 in priority group one.

The younger a service member is when he or she becomes a veteran, the higher the health costs (and, if applicable, the disability compensation costs) are to the federal government over time. More importantly, medical discharge may prevent that service member from remaining on active duty and completing his or her military career, which also means the cost invested in training those service members is lost.

Thus, the growing number of veterans from Iraq and Afghanistan being diagnosed with post-traumatic OA as a result of combat injuries and subsequently discharged from the military will potentially add billions of dollars in VA costs over the coming decades. As an increasing number of veterans enter
the VA system and an increasing number of people receive an arthritis diagnosis, these costs will continue to escalate.

**Prevention is critical**

Research on arthritis prevention is vitally important to keep service members healthy, on active duty and free from the consequences of arthritis.

Prevention begins during basic training. Joint wear and common injuries such as stress fractures can lead to arthritis-related medical discharge later on, and may even prevent recruits from finishing basic training (Springer & Ross, 2011). Therefore, taking steps to prevent these types of injuries is vital to military readiness.

Prevention will also help reduce costs and ensure a return on investment for training new recruits. It costs tens of thousands of dollars to train a single recruit, and can cost more than $1 million to train each member of the special operations units.

If OA keeps a service member from remaining on active duty, the military absorbs both the costs to provide that service member with health care and to train another candidate to take his or her place. More research is essential to prevent this loss of human capital.

The Department of Defense and various institutions around the country support human performance research specifically to increase prevention capabilities. For example, the Neuromuscular Research Laboratory at the University of Pittsburgh supports the Warrior Human Performance Research Center, based on the notion that injury, including arthritis, is the greatest cause of morbidity in the U.S. military. The objectives of the Research Center include mitigating the incidence and severity of injuries and enhancing the quality of life outlook after military service.

In addition, the Army Capabilities Integration Center has initiated a project called Force 2025 and Beyond, which provides a strategic vision for Army readiness in 2025, including an emphasis on human performance optimization. The goals of the initiative include an increase in resilience, post-traumatic growth and injury prevention, and a reduction of short- and long-term disability (ACIC, 2016).
This work studying human performance optimization has the potential to greatly decrease the incidence of PTOA and OA in service members and veterans, but more research is critical to realizing the goals of these projects and to improving the health and well-being of our country’s military personnel.
Section 3: Arthritis Research: Past, Present and Future

Research on this population is not being done anywhere else

Because of the direct link between military service and arthritis, focused research on service members should be heavily supported by the Department of Defense (DoD). Studying service members requires access to military health records and the ability to identify and enroll military personnel in clinical trials.

All service members complete a medical examination when entering the military. This provides robust data to establish a baseline of health, therefore accurately measuring disease incidence and progression. All care is given by the military health system, which adds to this robust database of information and creates a comprehensive medical record for each service member, using the same measures and processes over time.

The Armed Forces Health Surveillance Center has strict standards for consistent and complete data processing (AFHSC, 2015). This closed health system is particularly helpful in studying the progression of disease, from pre-injury through diagnosis, which can help researchers identify the underlying mechanisms of disease.

It would be difficult—if not impossible—for other federal agencies to conduct this research, given the need to isolate this specific population. Studying a specific military or veteran cohort allows researchers to isolate the effects of arthritis on these populations. The availability of blood and tissue samples from all service members enables us to study the progression of arthritis among service members on a large scale.

For example, the collection of blood samples from all service members at regular intervals affords the research community a unique opportunity to study pre-onset disease factors. Studying the pre-symptomatic stage of rheumatoid arthritis (RA) could help researchers identify the causes of RA and ultimately develop a screening test to predict who will develop RA, with the goal of preventing the disease altogether.
It is difficult to design this kind of study in the civilian population because civilians do not present for clinical studies when they are not symptomatic. However, since the DoD already has a collection of more than 40 million blood samples, researchers can use those samples to identify who developed RA and look at their pre-onset blood samples to discover clues about what causes disease onset.

This is the type of research that is currently being supported by the Peer Reviewed Medical Research Program at the DoD.

Some of the big research needs around OA and post-traumatic osteoarthritis include:

- Research that will definitively define the phenotypes and eventually genotypes needed for accurately diagnosing OA.
- Research around preventing PTOA by understanding more about how to rest the body and how to push the body, especially for our youth and young adults.
- Research that will result in new and effective approved treatments to stop the progression of OA for each of the specific OA phenotypes and eventually genotypes.

**Connecting current research to military populations can meet unique needs**

There are important research projects being supported across the federal government to identify better diagnostics, prevention tools and treatments for arthritis. However, there are many gaps in knowledge about what causes arthritis, how to effectively diagnose it and how to best treat it with minimal side effects.

Many of the symptoms and overall health outcomes are compounded among military personnel and veterans, so these research gaps are particularly acute for this population.

Examples include:

- The nature of military-related injury and wear and tear that leads to arthritis is different than in the civilian population. Research needs to address the nature of combat-related injury to identify the causes of the
higher rates of OA in this population, and properly target interventions and treatments.

• Data on arthritis incidence within specific military occupational groups is needed to determine which physical activities are associated with the highest rates of arthritis, in order to fulfill America’s promise to protect our service members and care for our veterans.

• Even autoimmune forms of arthritis like RA can present differently in military personnel, potentially due to a correlation in the cellular pathways that cause inflammation in RA and in the physical stress of combat (Cameron et al., 2011).

The fundamental questions about genetics, genomics, molecular pathways, behavioral factors, treatment outcomes and clinical research needs are fully relevant to military personnel. But we need a separate subset of research questions and findings to target the correlation between those broad topics and military-specific factors.

Though there is promising research being done around arthritis and the military, it is only beginning to uncover some of the major links that may lead to answers about arthritis in this population. Dedicated research funds for arthritis-related research at the DoD will guarantee a more focused approach to this issue.

Future research must move from theory to answers and, ultimately, to better treatment and prevention. Such research promises to reduce the prevalence and severity of arthritis in service members, reduce health care costs over time and allow service members to remain on active duty.

**Examining the history and current state of DoD funding is key to planning for the future**

Since 1992, Congress has invested more than $13 billion in medical research through the Congressionally Directed Medical Research Program (CDMRP) at the DoD. This program is focused on improving the health of service members, targeting gaps in research through high-risk, high-reward research and supporting the next generation of scientists.

Arthritis research first became eligible for funding under the authorized topic of autoimmune diseases within the CDMRP Peer Reviewed Medical Research
Program (PRMRP) in FY 2005. Post-traumatic osteoarthritis (PTOA) and arthritis were the first two arthritis-specific topics, authorized in 2010 and 2012, respectively. Rheumatoid arthritis was added as an authorized topic in FY 2013, and osteoarthritis (OA) was added as an authorized topic in FY 2015.

Under the PRMRP, there have been a total of 40 arthritis awards (33 research projects) funded between FY 2009 and FY 2014, totaling over $29 million. Of the 40 awards, 15 are for RA-funded awards, under the topic areas of rheumatoid arthritis, arthritis and autoimmune diseases; 22 are for PTOA; and three are for general arthritis. For FY 2015, 12 arthritis-related PRMRP research awards are currently under negotiations and will be made public when the awards are finalized. See Appendix Part 2, on page 42, for the related chart.

The DoD-funded programs span a wide range of research questions related to arthritis in the military. Some research is addressing therapeutic strategies for PTOA, to identify early interventions and better treatments for the disease. Some research seeks to identify prevention of PTOA. Other projects are concerned with the causes and biologic mechanisms underlying PTOA, OA and RA.

The overall goal of the research is to learn more about arthritis among service members in an effort to identify future risk, prevention methods, early interventions and better treatments. Major breakthroughs in this research could lead to a host of interventions to improve the outcomes of military personnel, from changing the structure of basic training to applying interventions immediately following traumatic injury.

*Importantly, breakthroughs from this program will benefit all Americans with arthritis.*

Total arthritis funding in the Peer Reviewed Medical Research Program for FY 2014 was more than $7.4 million, representing less than 5 percent of the total funding within the PRMRP. FY 2016 funding for the overall PRMRP was increased by $31.2 million over FY 2015, bringing the total to $278.7 million. The increase in funding creates an opportunity for more arthritis research in the coming year. However, funding is not guaranteed. Topics in the PRMRP are only authorized; funding depends on multiple factors, including the number and quality of research proposals that are submitted, as well as the scientific merit and military relevance of the proposed research.
**Peer Reviewed Orthopaedic Research Program (PRORP)**

The PRORP was initiated in FY 2009 and has been funding PTOA research since its inception. From FY 2009 to FY 2014, more than 50 PTOA research awards have been supported by PRORP funding. Likewise, more than 20 OA research awards have been supported by the PRORP. PTOA- and OA-related research projects make up approximately 37 percent of the entire PRORP portfolio (FY09- FY14). PRORP’s mission is to provide all service members affected by orthopedic injuries sustained during military service the opportunity for optimal recovery and restoration of function.

To date, a number of promising research outcomes have built momentum in several core research areas. Like the PRMRP, funding for the PRORP is appropriated by Congress and added to the DoD budget on an annual basis. While program funding is no guaranteed, the program’s vision is adapted yearly, and a spectrum of funding opportunities are developed according to the program’s needs.

**Stand-alone programs within the Congressionally Directed Medical Research Program (CDMRP)**

In FY 2016, there were more than 20 stand-alone, disease-specific peer reviewed programs within the CDMRP, totaling more than $573 million.

**CDMRP Programs**

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Figure 3.0 CDMRP Program Funding. CDMRP, 2015

Despite the high rate of arthritis among service members and veterans, arthritis does not have a stand-alone program in the Department of Defense. Instead, the arthritis topics in the Peer Reviewed Medical Research Program must compete with 37 other authorized topics in the program, and funding for arthritis research is not guaranteed.
Section 4: Life With Arthritis: Personal Profiles

For a complete understanding of how military and veteran populations are affected by arthritis, knowing their personal stories makes it real. What follows are the daily experiences of veterans with arthritis, the physicians who treat them, researchers and the arthritis peer reviewers who help determine the research that gets funded.

Profiles: Service Members

I am a 36-year-old veteran. I served six years, from April 2001 to April 2007, in the United States Navy. I was a nuclear electrician’s mate on the USS Oklahoma City fast attack submarine, SSN 723. I enjoyed the day-to-day challenges. I definitely saw some places, met some people and did some things I never would have done without this experience.

My job consisted of operating the electrical switchboard and electrical plant systems, and maintaining power in all necessary places for safe operation of the submarine. My division and I were also responsible for all the electrical maintenance and troubleshooting of electrical components on the submarine. This included working in a lot of small places, and awkward positions due to the lack of space onboard.

Around June 2005, after I had been stationed on the USS Oklahoma City for a few years, I began to awaken with soreness in my shoulders and hands unlike anything I had ever experienced. It seemed to get worse with time, so I went to my boat doc to see what he could do. He gave me the typical submarine standard issue NSAID and told me to suck it up.

The divisions on a submarine are small, and when one person is not carrying their weight, the entire division gets more burdened—and sometimes the entire department does. I tried to help my division
the best I could, but it got bad enough after months of no relief that I set up appointments with the Squadron MD, and then Portsmouth Naval Hospital.

After months of follow-up appointments and blood tests, I finally found a rheumatologist for a nuclear bone scan. In September 2006, this bone scan, along with blood test results, made the diagnosis easy: I had rheumatoid arthritis, as a relatively active, otherwise healthy 27-year-old.

I was immediately placed on a steroid to reduce the pain, and went through six different combinations of RA-specific medication before trying a biologic. It was my miracle drug, and allowed me to live my life again. The medication worked for over three years without issue, then it seemed to quit helping overnight. I tried a different biologic that didn’t seem to help, and then was prescribed another, which I have been on for the past three years.

Due to my newly-diagnosed condition, I was removed from submarine service and placed in an office job until the end of my enlistment, April 2007. Currently, my disease is being monitored with appointments and blood tests every three months. I have a good job as a reactor operator for Duke Energy at the Brunswick Nuclear Plant.

Overall, I feel my health is good. I have moments where I would say my health is great; I was even able to take up running for a while, and completed two half marathons and two sprint triathlons. I have a very positive outlook on the future. I have no intention of letting this disease or anything else stand in my way.

—David Scott Rutland
U.S. Navy Veteran, Wilmington, NC
My military service in the U.S. Navy included early deployments as a young Navy corpsman to Guantanamo Bay Cuba, and a one-year deployment to Vietnam with the U.S. Marines in 1969. Combat experience in Vietnam included many long days as we managed heavy equipment and materials.

As I continued my Navy career through the next 30 years, I began to experience joint pain in my knees, back and ankles, now diagnosed as post-traumatic osteoarthritis. Some days the pain limits my activities. I have found the recommendations from the Arthritis Foundation regarding exercise and moving to be very helpful.

The Arthritis Foundation has worked hard to support research to find a cure for all forms of arthritis. They offer many resources that help and support veterans and active duty service members to manage and control the many symptoms of arthritis.

—Edward Patterson Wyatt Jr.
U.S. Navy, Retired, Round Hill, VA

Arthritis is often overlooked as just a simple ache or pain. But left untreated, it can significantly diminish quality of life for an individual. As a soldier, we trained hard, both mentally and physically. Arthritis is a top cause of disability among veterans and military personnel. Due to the nature of our work, soldiers suffer with arthritis at a higher rate than most civilians.

I noticed changes in my body prior to estimated time of separation, and thought, ‘I’m too young for this.’ Later I was diagnosed with arthritis and fibromyalgia. I was able to get the right treatment and learn more about the condition through my passion as an Arthritis Foundation Advocate and Ambassador in South Carolina.

I want veterans to know that help is available, that arthritis is not a ‘myth,’ and I want our elected officials to know how important this disease is to the veteran/military population.
As a veteran with arthritis, each day is a challenge to feel good and maintain physical fitness. I continue to exercise, which helps with flexibility, pain management and self-efficacy—just knowing my body and its limitations. I enjoy the ‘good days’ because I know the pain will worsen.

Being an Ambassador is important to me. I get to exercise my right as a citizen to be heard, and I use my background in research and clinical training to better explain the progression of this disease to others while spreading awareness.

I learn more about the burden of arthritis each time I advocate or speak on the importance of DoD funding for research. This is a chance to voice my concerns, share my story and advocate for individuals diagnosed with one of the more than 100 joint diseases.

—Kiona Harvey
U.S. Army Veteran, Fort Jackson, SC

I served as an airborne infantryman in the 2nd Ranger Battalion from 1994 until 1998. I am writing to you today to explain how serving your country can cause wear and tear on a soldier’s body that lasts long after we become civilians again, and to ask that you strongly support funding for arthritis research.

I served my country proudly and would do it again. My concern is that my choices to help keep this country safe have now caught up to me because I’ve been diagnosed with osteoarthritis. There is no cure for arthritis, only pain and inflammation management.

I live with this pain daily. I am not the only veteran who has been diagnosed with arthritis, due in part, if not completely, to the excessive wear and tear military life can have on the body.

My primary job in the Army was that of a heavy machine gunner, which meant I was either carrying a 30-pound gun or
approximately 600 rounds of ammunition that often weighed more than 50 pounds, in addition to the normal load. As you can imagine, jumping out of airplanes with this type of weight made me an anchor as I crashed to the ground.

Unfortunately, while I was on active duty, I also sustained several injuries, such as breaking my collarbone and shattering my ankle. All this wear and tear took a toll on my body, which I ignored. As a soldier, you are expected to carry on, to make sure the mission is a success.

Now I’m out of the military and I often feel pain in almost every joint, from my shoulders to my ankles. My back, knees, ankles and feet are often in pain. I have been rated at a disability level of 30 percent from my service-connected disabilities. This includes OA, which attacks my joints due to the excessive deterioration from my time in the military. Throughout these hospital visits I have been prescribed an NSAID to help keep the inflammation at a minimum. While this is not a great solution, it is what is available to me right now.

It is my hope that, through continued funding for research, one day a cure or a better treatment for arthritis will be found. I hope you will see that the sacrifices other soldiers and I have made are not forgettable. That the pain we feel should not be ignored.

Your support for arthritis research will show veterans and future soldiers that their hard work is valuable to the country we served.

—Nicholas R. Steen Jr.
U.S. Army Veteran, Loma Rica, CA
I spent 30 years as a U.S. Navy orthopedic surgeon, and I have had my share of patients who served in very demanding roles in incredibly physically-austere environments. The number one medical reason for members being boarded out of the military is the development of premature osteoarthritis.

One of my most memorable patients was a Navy Master Chief who had been with SEAL Team Six for 10 years. Those 10 years had been very hard on the patient’s knees, and he was having significant pain and dysfunction that precluded him from continuing on because of the holes burned into the cartilage of his knees. He was referred to me as a last ditch effort to see if there was anything that could be done.

I did my medical school training at the University of Michigan and had the benefit of taking cellular molecular genetics with one of the finest departments in the world. In 1998, I was working with industry on developing injectable substances that could be used to calm the inflammation that occurs locally and systemically with osteoarthritis.

I had also trained as a naval aviator and had vector analysis drilled into me at the famous Naval Aviation Officer Candidate School in Pensacola, Florida. A combination of all of this training enabled me to come up with a surgical treatment plan that subsequently evolved into a multimodal program for the Master Chief.

On physical exam, the soldier could barely walk and could certainly not do so without pain. After examining him, I outlined a surgical plan that subsequently evolved into the multimodal program that my team has since written about and published extensively.

Over a period of six months, he worked very hard to return to full function with the assistance of certified sports therapists. He returned to full duty and was ready on September 11, 2001. He subsequently did five tours of service in Afghanistan and continues
today to facilitate the training of one of our nation’s most elite combat teams.

—Michael J. Langworthy, MD
U.S. Navy, Retired, New Bedford, MA

U.S. military personnel are faced with a new epidemic...arthritis. While joint disease is commonly associated with seniors, many are not aware that younger individuals are affected in staggering numbers. Our offices are flooded with young patients with post-traumatic arthritis. Many were not aware they had arthritis.

The physical demands begin in basic training, where soldiers carry up to 100-pound packs. Each additional pound carried adds four pounds of pressure on the knees, which equals up to 400 pounds of pressure on knee joints.

Military personnel are also experiencing increased knee trauma, including anterior cruciate ligament (ACL) tears, requiring surgery. Following a knee injury, an immediate chemical change occurs within the joint fluid, causing an imbalance of inflammation and degeneration of cartilage. The arthritic process starts right after injury, and may not show up on an MRI or affect the patient’s symptoms until later on, but will likely arrive at some point.

Research is desperately needed to address the great void between limited conservative measures and surgery. A recent study found that, by analyzing West Point cadets’ blood levels with biomarkers, ACL injuries could potentially be predicted and avoided.

The Arthritis Foundation is conducting research to prevent joint disease following ACL tears. Further research is needed to better understand how biologic-based medicine—including stem cells—may potentially benefit soldiers.

Total joint replacements are on the rise, especially in patients under 65 years old. These replacements are often associated with more complications. Prosthetic joints were designed for a more
sedentary community, and younger people may wear down their metallic joints too fast, requiring challenging revisions.

With advances in science and technology, we have the potential to make dramatic strides in combating arthritis. Through congressional funding dedicated to arthritis research, we can better care for our veterans and promote a more active lifestyle.

—Steven Sampson, DO
Osteopathic Physician,
Los Angeles, CA

Profiles: Arthritis Researchers (DoD-funded)

Emergency medicine is the gateway to initiating early goal-directed therapies, which in this case would be designed to preserve cartilage tissue in the long term by relubricating cartilage with a biosimilar protein (lubricin), which has been shown to prevent wear-induced loss of chondrocytes in small animal models. Large animal studies are now underway after producing the protein in a bioprocess that can be scaled up and is commercially viable.

Lubricin levels appear to be decreased following a joint injury, and inflammation may also alter the lubricin molecule. During the peri-injury period following an ACL tear or meniscus injury, lubricin levels are low-rendering, making the mechanically loaded joint vulnerable to damage.

Eventually, lubricin levels likely return to normal, but the joint may have lost chondrocytes during the peri-injury period that create a nidus (origin point) for the much later development of OA. Emerging studies from a number of laboratories are indicating how critical lubricin is in preserving joint health.
In the case of lubricin, the treatment would be initiated following injury or possibly arthroscopy after resident lubricin had irrigated out prior to weight bearing. This is unlike hyaluronate injections that were initially regulated as devices intended to lubricate joints.

However, the clinical studies that support their use in advanced OA suggest that it is working pharmacologically and their use has become controversial due to lack of efficacy. Regardless, the regulatory pathway that lubricin will follow is similar.

—Gregory Jay, MD, PhD  
Rhode Island Hospital, Providence, RI

Due to the decade-long wars in Afghanistan and Iraq, and the increased physical toll and risk of injury from prolonged combat duty, osteoarthritis (OA) incidence in the military has increased dramatically and stands among the leading causes of disability among active service members.

Although certain drugs can ease OA joint pain, no pharmaceutical agent (or dietary supplement) is capable of slowing the progressive joint degeneration or stimulating the regrowth of lost cartilage. Thus, many people with OA gradually lose the use of their affected joints, leaving joint replacement surgery as the only medical option.

In our ongoing study funded by the Department of Defense, we are testing a gene-based therapy for post-traumatic OA. Research in several laboratories has identified interleukin-1 (IL-1) as a key inflammatory protein responsible for driving the processes that lead to cartilage loss in OA. Using a harmless virus, we can deliver the gene for a naturally-occurring IL-1 inhibitor to the cells and tissues in diseased joints.

This converts the diseased tissues into local factories that produce and release the IL-1 inhibitor into the joint fluids and tissues. Through treatment in this manner, the diseased joints continuously make
their own medicine for well over six months, and we can deliver genes that relieve OA pain and stop joint erosion.

Following promising results in small animals, in the current project we are performing in-depth analyses of the efficacy of this treatment in horses with chronic OA. In choosing the horse as a model, we can assess the effectiveness of the treatment on a scale relevant to human disease. We can also deliver doses that would be used in human joints, allowing us to determine the risks of treatment and potential problems.

During the study, we treat horses with symptomatic OA in the forelimb joints and then monitor the effects of treatment over the course of a year using diagnostics, such as radiography, MRI and arthroscopy, used clinically in human disease. With the intention of using these data to progress to human testing, we will also perform in-depth analyses of safety over this period.

If the project is successful, we will have demonstrated long-term efficacy and safety in a large animal, which we will use in applying to the FDA for human testing approval.

The long-term goal of this work is to generate a safe and effective treatment for OA—one capable of stopping joint degeneration to preserve and extend joint function and mobility—and improve quality of life for the thousands of active service members and military veterans who suffer with this condition.

—Steven Ghivizzani, PhD
University of Florida College of Medicine, Gainesville, FL

Rheumatoid arthritis (RA) is a chronic disease that affects more than 1.3 million Americans. When untreated, it leads to pain and permanent disability. Although our current treatments can provide a significant improvement in the quality of life of a person with RA,
these therapies are expensive, lead to systemic immune suppression and do not cure the disease.

New scientific tools are teaching us a great deal about the cells that cause RA. Understanding these cells will allow us to develop therapies that are more specific, less toxic and have a higher likelihood of success.

Our group at the Benaroya Research Institute in Seattle has developed one of these tools: citrulline specific tetramers (cit-TMR). Cit-TMR can detect the T cells, a type of white blood cell that causes the body’s immune system to attack its joints. But a tool is only useful when you can use it on a material or problem worth working on. We felt that the cit-TMR would be most useful when we used it to understand how joint specific T cells change over time in RA, specifically at the time of diagnosis, at times of active and mild disease and during treatment.

When I tell people that our study of RA is funded by the DoD, they frequently ask ‘why?’ Fortunately, the DoD has recognized that RA is a disease that often begins at the age when military personnel are on active duty, adversely affecting their careers as well as their quality of life.

Further, those affected with RA during their military career will then require long-term care in VA medical facilities when they leave the service. In fact, a review of VA databases indicates that the number of patients with RA is nearly 1 percent—similar to that of the general population. Thus, the DoD has recognized the need to develop better and more targeted treatments for RA to benefit both active duty and retired veterans, as well as the general population.

The DoD’s support for this project is unique in several ways. First, it gives support for a type of study for which it is typically hard to find significant long-term funding: longitudinal studies of patients that require a long-term commitment.
Second, the grant allows our group to collaborate with the physicians at the Puget Sound VA, which expands our ability to enroll patients for the study and enhances collaboration.

Finally, I think it is important that veterans be included in this type of study. As someone who spent a significant amount of my medical training at a VA, and was taught much by the veterans who I cared for, I am happy to have the opportunity to work with them again.

Veterans have already served our country. Through participation in research, they are given the chance to serve again, this time in the battle against RA.

—Jane Hoyt Buckner, MD
Benaroya Research Institute at Virginia Mason,
Seattle, WA

Profiles: DoD Arthritis Peer Reviewers

The peer review program through the Department of Defense is important to me, a 43-year-old woman living with chronic rheumatoid arthritis (RA), because researchers are looking at causes and predictors that may trigger RA.

If researchers can discover predictors for RA (among other things that may trigger it), they might be able to find a way to intervene before a person becomes sick from the disease. Even better would be for researchers to find a cure for those already stricken with disease. I would love a cure!

As a peer reviewer for the DoD, I am excited and inspired by the work researchers are doing for our veterans and their families, and I am honored to be a part of the program. Veterans are affected by all forms of arthritis and sometimes at rates higher than the civilian population.
The great thing about research at the DoD is that it can be generalized to all Americans. Being able to review the applications for the DoD tells me people with rheumatoid arthritis are not forgotten, that my opinion and experiences living with RA matter.

I am honored my participation in the peer review process is benefiting those living with the same frustrating disease I live with, and I take my role very seriously.

—Jessica Edgar, MSN, CPNP
Glendale, AZ

In 2014, I had the distinct honor and privilege to serve as a consumer reviewer for the Department of Defense Congressionally Directed Medical Research Program. I was selected to work as a consumer reviewer on two different programs.

From both programs, I learned that post-traumatic knee osteoarthritis (PTOA) is one of the major causes of disability and discharge in the military, and that it affects a large segment of the veteran population. This is one of the reasons RA and PTOA were two of the 27 diseases eligible for possible research funding.

One of the most rewarding experiences was the acceptance of a consumer reviewer by the scientific reviewers. They readily admitted that normally they do not meet patients in their research work. They were very interested in the viewpoints of the consumer reviewer, and we had many lively discussions about the proposed research.

In addition to learning about the negative effects arthritis has on the military and civilian populations, I learned more about how to better manage three forms of arthritis (psoriatic arthritis, RA and OA) and about the prospects for future disease-modifying treatments.

—Deane K. Felter
Section 5: Policy Priorities and Recommendations

➢ **Fund a Dedicated Arthritis Research Program at the Department of Defense**

At a minimum, the four arthritis topics authorized within the Peer Reviewed Medical Research Program in the FY 2015 appropriations bill should be reauthorized in future years. However, the best way to build a robust research portfolio on arthritis in the military is to create a stand-alone program within the Congressionally Directed Medical Research Program, funded at a minimum of $20 million.

This level of dedicated funding would allow researchers to build on initial findings about PTOA, OA and RA in military populations, and to work more aggressively to identify interventions, prevention strategies and treatment methods.

➢ **Increase the Research Investment at the Department of Veterans Affairs**

Veterans Affairs (VA) medical and prosthetic research activities should be funded at a minimum of $665 million, and VA research facilities should be funded at a minimum of $225 million, to maintain a robust level of research, including arthritis-specific projects.

These funding levels are recommended by the Friends of VA Medical Care and Health Research, a coalition of more than 80 health care and veteran organizations.

➢ **Increase Funding for the Centers for Disease Control and Prevention (CDC) Arthritis Program**

The CDC Arthritis Program is the only federal public health program dedicated solely to arthritis. It provides grants to 12 states to support public health programs, provide education services, perform public health research and support data collection.

Connecting all Americans with arthritis to resources that help them manage their disease is the goal of this program, and the CDC specifically recommends the
program to veterans in order to reduce the impact of arthritis on their lives.

Evidence-based programs like Enhance Fitness help keep older adults active, and have shown a 35 percent improvement in physical function, resulting in fewer hospitalizations and lower health costs compared to non-participants. Self-management arthritis programs have proven to reduce the impact of arthritis symptoms in people who use them.

For example, the Arthritis Self-Management Program (ASMP) is a science-based program that teaches participants practice techniques and helps them implement a self-management plan. Participants in the ASMP continue to report benefits one year out.

The CDC Arthritis Program should be expanded to all 50 states, so that all veterans have access to self-management and other programs.
Conclusion

Today, arthritis is the top cause of disability among veterans, and one of the major reasons military personnel are discharged from service. It is also the number one cause of disability for all Americans.

As evidenced in this report, research supporting evidence-based prevention strategies, interventions and treatments is crucial to reducing the number of service members and veterans suffering from arthritis.

Congress should join the Arthritis Foundation as a Champion of Yes and authorize the creation of a stand-alone arthritis program within the DoD’s Congressionally Directed Medical Research Program, funded at $20 million, at minimum, to ensure constant, dedicated research funding to meet the growing needs of active duty personnel and veterans.

One in three veterans with arthritis is an alarming statistic. A dedicated arthritis research program at the DoD, and increased resources at the VA and CDC, can help change that statistic and improve the lives of millions of service members and veterans who suffer from this debilitating disease.
## Section 6: Appendix

### Part 1: State Costs of Arthritis

<table>
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<tr>
<th>Total Costs (in Millions) Attributable to Arthritis and Other Rheumatic Conditions, By State, United States, 2003</th>
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</thead>
<tbody>
<tr>
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<tr>
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Figure A-1.1 Arthritis Costs. CDC, 2015
## Part 2: Peer Reviewed Medical Research Program (PRMRP)

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<tr>
<th>Year</th>
<th>Topic</th>
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<td>Bernard Ng</td>
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Figure A-1.2 Arthritis Funding Awards. CDRMP, 2015
Part 3: References


http://www.va.gov/vetdata/Utilization.asp


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