PROGRAM PROFILE

Ten-Year Outcomes of a Systems-Based Approach to Longitudinal Amputation Care in the US Department of Veteran Affairs

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Background: The goal of the US Department of Veterans Affairs (VA) Amputation System of Care (ASoC) is to enhance the quality and consistency of amputation rehabilitation care for veterans with limb loss.

Objective: The ASoC provides specialized expertise in amputation rehabilitation incorporating the latest practices in medical management, rehabilitation, and artificial limbs in order to minimize disability and to enable the highest level of social, vocational, and recreational success for veterans with amputation.

Discussion: The ASoC serves veterans with limb amputation from any etiology. Between 2009 and 2019, the VA experienced a 34% increase in the number of veterans with amputation who received care. During the same 10-year period, the percentage of veterans with major limb amputation seen in an outpatient amputation specialty clinic each year increased from 4.8 to 26%. This article highlights how the mission of the ASoC has been accomplished over the past decade through prioritization and implementation of key strategic initiatives in learning organization creation, trust in VA care, modernization, and development of a high-performance network with enhanced access and customer service.

Conclusions: This synopsis of the VA amputation care program serves as a model of amputation care that can be utilized outside the federal sector and has the potential to serve as a systems-based example for providing longitudinal care to other populations within the VA.

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The US Department of Veterans Affairs (VA) established a formal Amputation System of Care (ASoC) in 2008 with the goal of enhancing the quality and consistency of amputation rehabilitation care for veterans with limb loss.[1,2] Throughout its history, the VA has placed a high priority on the care that is provided to veterans with limb amputation.[1,3] Amputations have medical, physical, social, and psychological ramifications for the veteran and his or her family. Therefore, management of veterans with limb loss requires a comprehensive, coordinated, transdisciplinary program of services throughout the continuum of care. This includes offering the latest practices in medical interventions, artificial limbs, assistive technologies, and rehabilitation strategies to restore function and thereby optimize quality of life.

AMPUTATION SYSTEM OF CARE

The ASoC is an integrated system within the Veterans Health Administration (VHA) that provides specialized expertise in amputation rehabilitation incorporating the latest practices in medical management, rehabilitation therapies, artificial limbs, and assistive technologies. The system facilitates patient-centered, gender-sensitive, lifelong care and care coordination across the entire health continuum from acute inpatient hospitalization through a spectrum of inpatient, residential, and outpatient rehabilitation care settings. Through the provision of quality rehabilitation and prosthetic limb care, the ASoC strives to minimize disability and enable the highest level of social, vocational, and recreational success for veterans with an amputation.[1-3]

The policy and procedures for the ASoC have been detailed in prior VA Handbooks and in the ASoC Directive.[1] This article highlights the background, population served, and organizational structure of the ASoC by detailing the outcomes and accomplishments of this systems-based approach to longitudinal amputation care between 2009 and 2019. Four core areas of activities and accomplishments are highlighted: (1) learning organization creation; (2) trust in VA care; (3) system modernization; and (4) customer service. This analysis and description of the VA amputation care program serves as a model of

amputation care that can be used in the civilian sector. There also is potential for the ASoC to serve as a care model example for other populations within the VA.

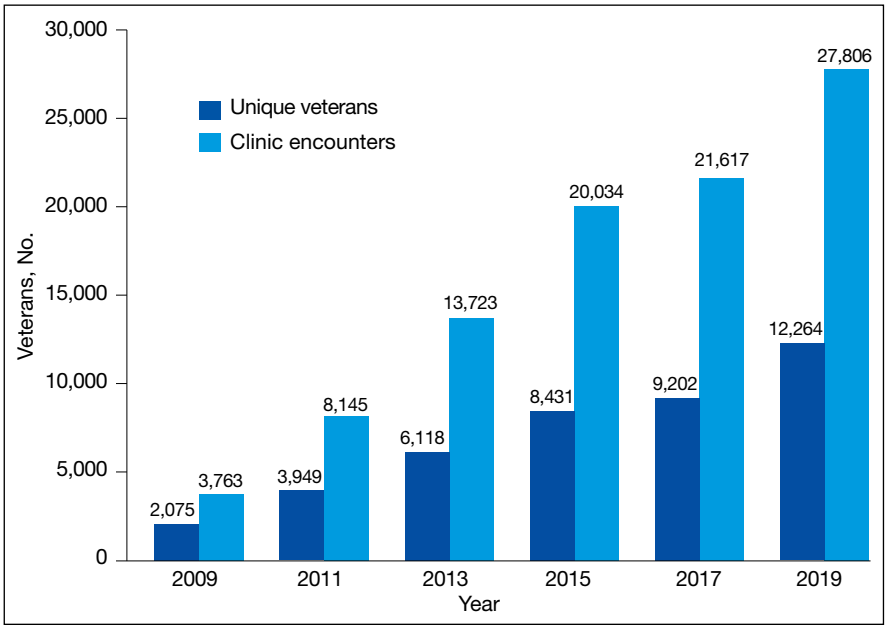
Organizational Structure

The ASoC is an integrated, national health care delivery system in which each VA medical center (VAMC) has a specific designation that reflects the level of expertise and accessibility across the system based on an individual veteran's needs and the specific capabilities of each VAMC.[1-3] The organizational structure for the ASoC is similar to the Polytrauma System of Care in that facilities are divided into 4 tiers.[1,4]

For the ASoC, the 4 tiers are Regional Amputation Centers (RAC) at 7 VAMCs, Polytrauma Amputation Network Sites (PANS) at 18 VAMCs, Amputation Clinic Teams (ACT) at 106 VAMCs, and Amputation Points of Contact (APoC) at 22 VAMCs. The RAC locations provide the highest level of specialized expertise in clinical care and prosthetic limb technology and have rehabilitation capabilities to manage the most complicated cases. Like the RAC facilities, PANS provide a full range of clinical and ancillary services to veterans within their catchment area and serve as referral locations for veterans with needs that are more complex. ACT sites have a core amputation specialty team that provides regular follow-up and address ongoing care needs. ACT sites may or may not have full ancillary services, such as surgical subspecialties or an in-house prosthetics laboratory. APoC facilities have at least 1 person on staff who serves as the point of contact for consultation, assessment, and referral of a veteran with an amputation to a facility capable of providing the level of services required.[1]

The VA also places a high priority on both primary and secondary amputation prevention. The Preventing Amputations in Veterans Everywhere (PAVE) program and the ASoC coordinate efforts in order to address the prevention of an initial amputation, the rehabilitation of veterans who have had an amputation, and the prevention of a second amputation in those with an amputation.[1,5]

FIGURE 1 Amputation Outpatient Specialty Clinic Workload

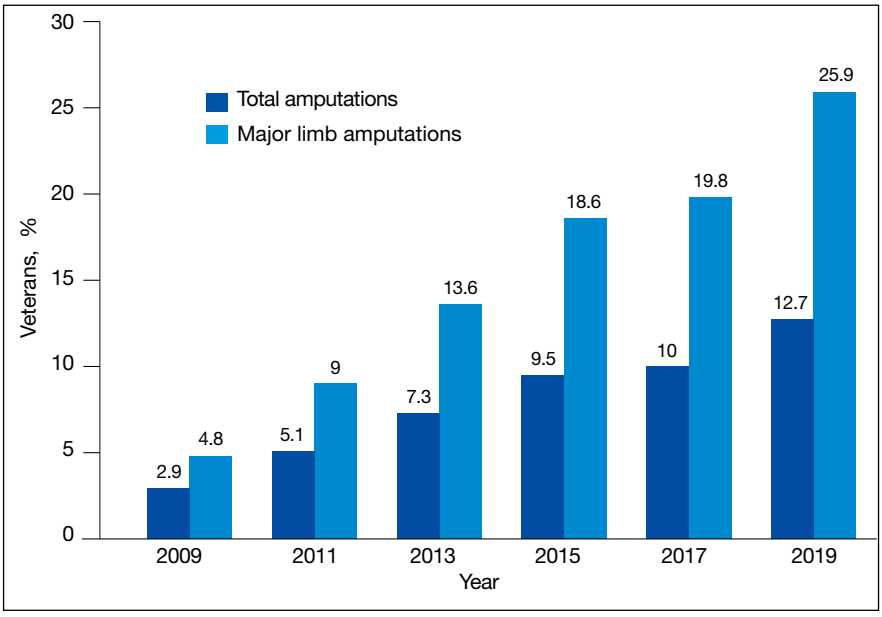


Population Served

The ASoC serves veterans with limb loss regardless of the etiology. This includes care of individuals with complex limb trauma and those with other injuries or disease processes resulting in a high likelihood of requiring a limb amputation. In 2019, the VA provided care to 96,519 veterans with amputation, and about half (46,214) had at least 1 major limb amputation, which is defined as an amputation at or proximal to the wrist or ankle.[6] The majority of veterans with amputation treated within the VA have limb loss resulting from disease processes, such as diabetes mellitus (DM) and peripheral vascular disease (PVD). Amputations caused by these diseases generally occur in the older veteran population and are associated with comorbidities, such as cardiovascular disease, hypertension, and end-stage renal disease. Veterans with amputation due to trauma, including conflict-related injuries, are commonly younger at the time of their amputation. Although the number of conflict-related amputations is small compared with the number of amputations associated with disease processes, both groups require high-quality, comprehensive, lifelong care.

Between 2009 and 2019, the number of veterans with limb loss receiving care in the VA increased 34%.[6] With advances in

FIGURE 2 Veterans With Amputation Seen at a VA Facility and Amputation Specialty Clinic During the Same Year



Abbreviaiton: VA, Department of Veterans Affairs.

TABLE Amputation System of Care

Hallmarks
Veteran-centric care
Transdisciplinary team approach
Care coordination
Lifelong continuum of care
Integration
Collaboration
Education and training
Technology advances

Abbreviation: VA, US Department of Veterans Affairs.

vascular surgery and limb-sparing procedures, minor amputations are more common than major limb amputations and more below-knee rather than above-knee amputations have been noted over the same time. However, the high prevalence of DM in the overall veteran population places about 1.8 million veterans at risk for amputation, and it is anticipated that the volume of limb loss in the veteran population will continue to grow and possibly accelerate.[5]

Performance Metrics

Over the past 10 years, the ASoC has focused on ensuring that an amputation specialty care team addresses the needs of veterans with amputation. Between 2009 and 2019, the VA amputation specialty clinics saw a 49% annual increase in the number of unique veterans treated and a 64% annual increase in the number of total clinic encounters (Figure 1).[6] This growth is attributed to the larger amputation population receiving enhanced access to the specialty team providing consistent, comprehensive, lifelong care.

During this same period, the amputation specialty clinic encounter to unique ratio (a measure of how frequently patients return to the clinic each year) rose from 1.8 in 2009 to 2.3 in 2019 for both the total amputation population and for those with major limb amputation. When looking more specifically at the RAC facilities, the encounter to unique ratio increased from 1.5 to 3.0 over the same time, reflecting the added benefit of having dedicated resources for the amputation specialty program.[6]

Comparing the percentage of veterans with amputation who are seen in the VA for any service with those who also are seen in the amputation specialty clinic in the same year is a performance metric that reflects the penetration of amputation specialty services across the system. Between 2009 and 2019, this increased from 2.9 to 12.7% for the overall amputation population and from 4.8 to 26% for those with major limb amputation (Figure 2). This metric improved to a greater extent in RAC facilities; 44% of veterans with major limb amputation seen at a RAC were also seen in the amputation specialty clinic in 2019.[6]

System Hallmarks

One of the primary hallmarks of the ASoC is the interdisciplinary team approach addressing all aspects of management across the continuum of care (Table). The core team consists of a physician, therapist, and prosthetist, and may include a variety of other disciplines based on a veteran's individual needs. This model promotes veteran-centric care. Comprehensive management of veterans with limb loss includes addressing

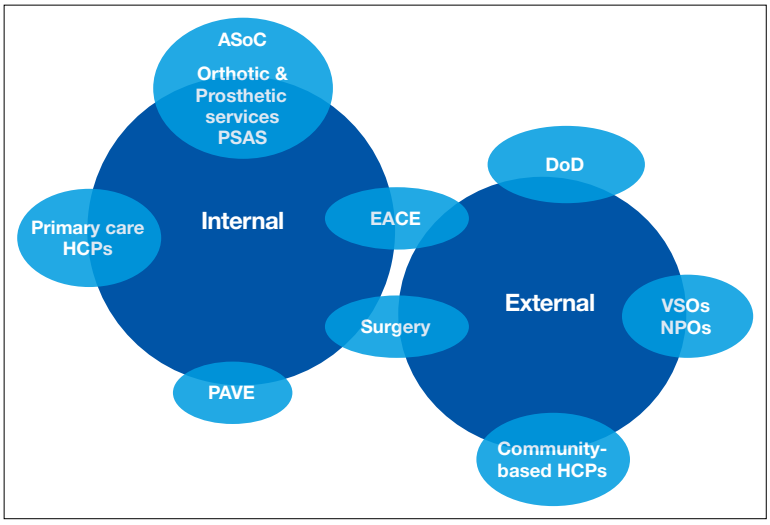
medical considerations such as residual limb skin health to the prescription of artificial limbs and the provision of therapy services for prosthetic limb gait training.[1,2]

Lifelong care for veterans living with limb loss is another hallmark of the ASoC. The provision of care coordination across the continuum of care from acute hospitalization following an amputation to long-term follow-up in the outpatient setting for veteran's lifespan is essential. Care coordination is provided across the system of care, which assures that a veteran with limb loss can obtain the required services through consultation or referral to a RAC or PANS as needed. Care coordination for the ASoC is facilitated by amputation rehabilitation coordinators at each of the RAC and PANS designated VAMCs.

Integration of services and resource collaboration are additional key aspects of the ASoC (Figure 3). In order to be successful, care of the veteran facing potential amputation or living with the challenges postamputation must be well-integrated into the broader care of the individual. Many veterans who undergo amputation have significant medical comorbidities, including a high prevalence of DM and peripheral vascular disease. Management of these conditions in collaboration with primary care and other medical specialties promotes the achievement of rehabilitation goals. Integration of surgical services and amputation prevention strategies is critical. Another essential element of the system is maintaining amputation specialty care team contact with all veterans with limb loss on at least an annual basis. A clinical practice guideline published in 2017 on lower Limb amputation rehabilitation emphasizes this need for an annual contact and includes a management and referral algorithm to assist primary care providers in the management of veterans with amputation (Figure 4).[7]

Collaboration with external partners has been an important element in the system of care development. The VA has partnered extensively with the US Department of Defense (DoD) to transition service members with amputation from the military health care system to the VA. The VA and DoD also have collaborated through the development and provision of joint provider trainings, clinical practice guidelines, incentive funding programs, and patient education materials. Congress authorized the Extremity Trauma and Amputation Center of Excellence (EACE) in 2009 with the mission to serve as the joint DoD and VA lead element focused on the mitigation, treatment, and rehabilitation of traumatic extremity injuries and amputations. The EACE has several lines of effort, including clinical affairs, research, and global outreach focused on building partnerships and fostering collaboration to optimize quality of life for those with extremity trauma and amputation. The Amputee Coalition, the largest nonprofit consumer-based amputee advocacy organization in the US, has been an important strategic partner for the dissemination of guideline recommendations and patient education as well as the development and provision of peer support services.

FIGURE 3 Integration and Collaboration of Internal and External Stakeholders

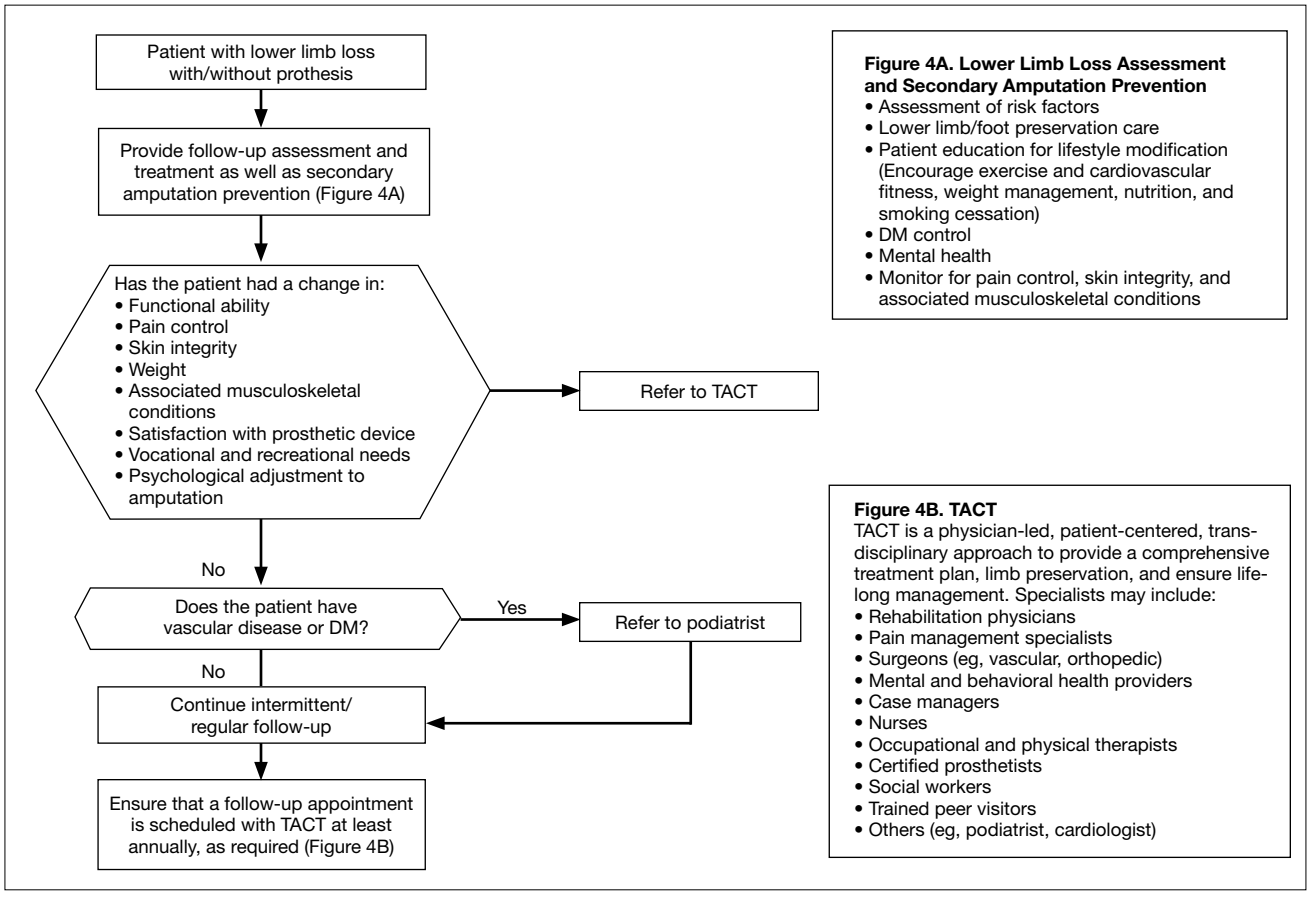


Abbreviations: ASoC, Amputation System of Care; DoD, US Department of Defense; EACE, Extremity Trauma and Amputation Center of Excellence; HCP, health care provider; NPO, nonprofit organization; PAVE, Preventing Amputation in Veterans Everywhere; PSAS, Prosthetic and Sensory Aids Service; VA, US Department of Veterans Affairs; VSO, veteran service organization.

METHODS

The ASoC created a learning organization to develop and maintain a knowledgeable and highly skilled clinical workforce through the identification of best practices related to amputation rehabilitation and the use of innovative education delivery models. During the past 10 years, the ASoC conducted 9 national, live health care provider training events in conjunction with the DoD. In

FIGURE 4 VA/DoD CPG Recommended Primary Care Follow-up and Lifelong Care Algorithm[a,7,10]

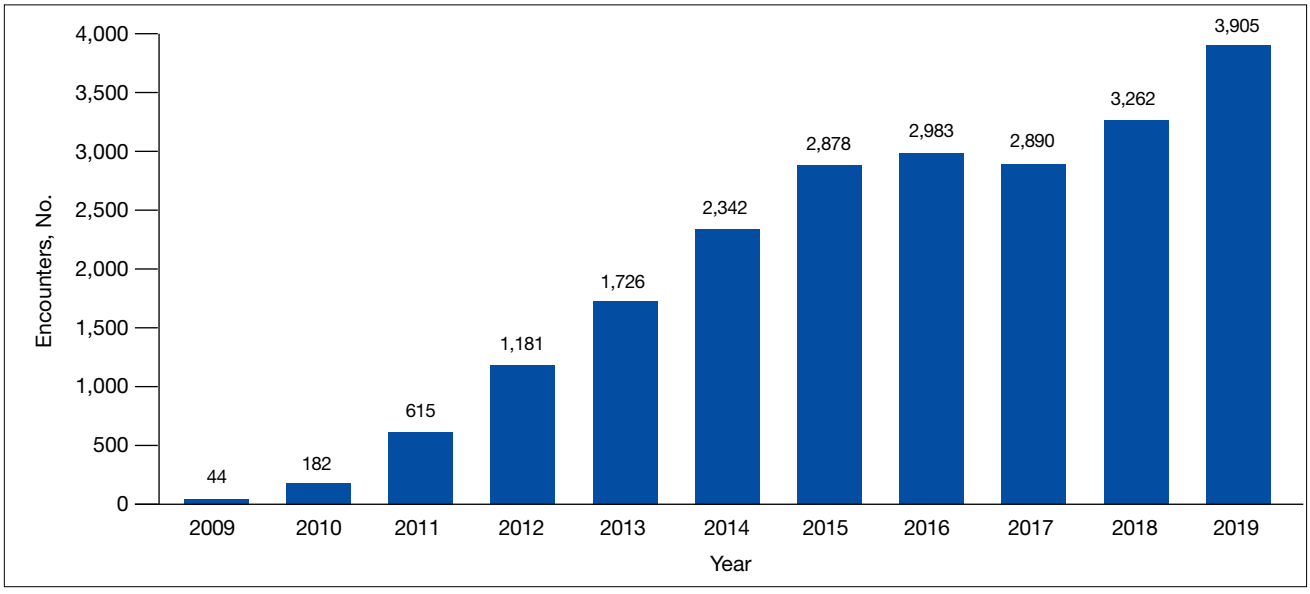


Abbreviations: CPG, clinical practice guideline; DM, diabetes mellitus; DoD, US Department of Defense; TACT: transdisciplinary amputation care team; VA, US Department of Veterans Affairs.
[a]Adapted from the VA/DoD CPG for rehabilitation of individuals with lower limb amputation.

conjunction with the EACE, the ASoC holds 6 national Grand Rounds sessions each year. Dissemination of information and trainings across both the VA and DoD has been facilitated through a national listserv referred to as the Federal Amputation Interest Group (FAIG), which has > 800 members. Since 2009, the VA, in collaboration with the DoD, has produced 3 clinical practice guidelines (CPGs) related to amputation care. The Lower Limb Amputation CPG was published in 2007 and updated in 2017, and a CPG and associated clinician resources focused on upper extremity amputation were published in 2014.[7,8] In addition to these formal, comprehensive, and evidence-driven guidelines, the ASoC has developed other clinical support documents covering a range of topics from prosthesis prescription candidacy determination to osseointegration. In conjunction with the EACE, The ASoC also has published guidance for clinical implementation of new technologies such as the Mobius Bionics LUKE arm and Dynamic Response Ankle-Foot Orthoses.

The ASoC strives to improve the psychosocial welfare of veterans with amputation and enhance trust in VA amputation care services through sharing results on the quality and timeliness of care. The Commission on Accreditation for Rehabilitation Facilities (CARF) provides an international, independent, peer-reviewed system of accreditation that is widely recognized by federal agencies, state governments, major insurers, and professional organizations.[1,2] CARF offers amputation specialty accreditation for inpatient and outpatient programs that signifies the attainment of a distinguished level of exper-

FIGURE 5 Telehealth Amputation Care Clinical Encounters



tise and the provision of a comprehensive spectrum of services related to amputation care and rehabilitation. During its development, the ASoC established the expectation that each of the RAC and PANS designated VAMCs would attain and maintain CARF amputation specialty accreditation. The ASoC has achieved 100% success on this metric.

In addition, the ASoC has completed many other initiatives focused on enhancing trust in VA amputation care services. These include assuring compliance with implementation of the Mission Act as it relates to the provision of amputation care and prosthetic limb delivery so that any services provided in the community are well integrated and at the direction of the amputation specialty team. The ASoC has maintained a strong relationship with the Amputee Coalition to provide veterans with high-quality patient education materials as well as integrated peer support services.

ASoC virtual and face-to-face training events incorporate suicide prevention training for providers. Special focus has been placed on care provision for Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn veterans with conflict-related multiple limb amputations. Although relatively small, this cohort is recognized as a unique and important population due to their unique care needs and increased risk for secondary complications. In 2019, 83% of these individuals were contacted to assure their amputation care needs were being adequately addressed.

DISCUSSION

Over the past 10 years, the ASoC has built a modern, high-performance network of care to best serve veterans with amputation. Maturation of the system has included the addition of 3 new PANS locations to improve access to services as well as to better support geographic regions near large DoD military treatment facilities. The number of ACT designated VAMCs also has grown from 101 to 106 locations. The regional organization of sites has been modified to enhance the availability of referral and consultative services across the system. In addition, the ASoC has supported the development of an upper extremity amputation specialty program for consultation or referral to a highly specialized team of providers well versed in the significant technology advances that have taken place with upper extremity prostheses.[9]

One of the key components to high-performance network development is attaining a clear picture of the clinical demands and service delivery needs of the population served. The Amputee Data Repository was developed with the support of the VHA Support Service Center (VSSC) in order to

better understand and track the population of veterans with amputation.[6] The development and implementation of the Amputee Data Repository took place over several years, and the product was officially released into publication in 2015. The overall goals of this resource are to provide a data system for the ASoC to identify clinical care volumes and patterns of treatment; better understand the demographics of the veteran amputee population; assess the effectiveness of new treatment strategies; and utilize data analysis outcomes to influence clinical practice. The acquisition and analysis of this information will provide justification for the modification of clinical practice and will enhance the quality of care for all veterans with amputation.

Although the ASoC focuses primarily on the provision of clinical services, the system has been leveraged to support research activities and the advancement of artificial limb technologies. For example, ASoC providers and investigators supported the clinical research required to test and optimize the development of the DEKA arm. These research efforts resulted in the US Food and Drug Administration approval and commercialization of this device. Once the device became commercially available as the LUKE arm, the ASoC developed a clinical implementation strategy that assured availability and appropriate prescription and training with the new technology. The VA also has supported research and program development in osseointegration with further investigations and clinical implementation being planned.

Telehealth

The goal of the ASoC is to provide timely access and greater choice to specialty amputation rehabilitation services for veterans as determined by their clinical needs. One key strategy used to achieve this goal has been the expansion of virtual communication tools to enhance access to clinical expertise. Telehealth (Virtual Care) amputation services afford the opportunity to provide specialized clinical expertise to veterans who otherwise may not have access to this level of service or consultation.[1,2] For others, virtual care services reduce the need for travel. The ASoC has leveraged these services effectively to enhance specialty amputation care for veterans in rural areas. Over time, the scope of virtual care services has expanded to provide virtual peer support services as well as care in the veteran's home.

Another unique example is the use of virtual care to see veterans when they are being provided services by a community prosthetist. This service improves the timeliness of care and reduces the travel burden for the veteran. Between 2009 and 2019, total virtual care encounters to provide amputation-related services grew from 44 encounters to 3,905 encounters (Figure 5). In 2019, 13.8% of veterans seen in a VA outpatient amputation specialty clinic had at least 1 virtual encounter in the same year.[6]

In addition to the expansion of virtual care and building capacity through increasing the number of amputation specialty clinics and providers, the ASoC has used a host of other strategies to improve care access. The development of provider expertise in amputation care has been achieved through the methods of extensive provider training. Implementation of Patient Self-Referral Direct Scheduling allows veterans to access the outpatient amputation specialty clinic without a referral and without having to be seen by their primary care provider. This initiative provides easier and more timely access to amputation specialty services while reducing burden on primary care services. The amputation outpatient specialty clinic was one of a few specialty programs to be an early adopter of national online scheduling. The implementation of this service is still ongoing, but this program gives veterans greater control over scheduling, canceling, and rescheduling appointments.

CONCLUSIONS

During the 10 years following its implementation, the VA ASoC has successfully enhanced the quality and consistency of care and rehabilitation services provided to veterans with limb loss through the provision of highly specialized services in the areas of medical care, rehabilitation services, and prosthetic technology. This mission has been accomplished through prioritization and implementation of key strategic initiatives in learning organization creation, trust in VA care, development of

a modern, high-performance network, and customer service. Collaborative partnerships both internally within the VA and externally with key stakeholders has facilitated this development, and these will need to be enhanced for future success. Evolving trends in amputation surgery, limb transplantation, artificial limb control and suspension strategies as well as advances in assistive technology also will need to be integrated into best practices and program development.

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Author disclosures

The authors report no actual or potential conflicts of interest with regard to this article.

Disclaimer

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References

1. US Department of Veterans Affairs, Veterans Health Administration. VHA Directive 1172.03(1): Amputation system of care. https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=7482. Published August 3, 2018. Accessed July 31, 2020.
2. Webster JB, Poorman CE, Cifu DX. Guest editorial: Department of Veterans Affairs Amputations System of care: 5 years of accomplishments and outcomes. *J Rehabil Res Dev*. 2014;51(4):vii-xvi. doi:10.1682/JRRD.2014.01.0024
3. Reiber GE, Smith DG. VA paradigm shift in care of veterans with limb loss. *J Rehabil Res Dev.* 2010;47(4):vii-x. doi:10.1682/jrrd.2010.03.0030
4. US Department of Veterans Affairs, Veterans Health Administration. VHA Directive 1172.01: Polytrauma system of care. https://www.va.gov/OPTOMETRY/docs/VHA_Directive_1172-01_Polytrauma_System_of_Care_1172_01_D_2019-01-24.pdf. Published January 24, 2019. Accessed July 31, 2020.
5. VHA Directive 1410, Prevention of amputation in veterans everywhere (PAVE) program, https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=5364. Published March 31, 2017. Accessed July 31, 2020.
6. VHA Amputee Data Repository. VHA Support Service Center. http://vssc.med.va.gov. [Nonpublic source, not verified.]
7. US Department of Veterans Affairs, US Department of Defense. VA/DoD Clinical practice guidelines: rehabilitation of lower limb amputation. Version 2.0 -2017. https://www.healthquality.va.gov/guidelines/Rehab/amp/VADoDLLACPG092817.pdf. Accessed July 16, 2020.
8. US Department of Veterans Affairs, US Department of Defense. VA/DoD Clinical practice guidelines: The Management of upper extremity amputation rehabilitation.Version 1-2014. https://www.healthquality.va.gov/guidelines/Rehab/UEAR/VADoDCPGManagementofUEAR121614Corrected508.pdf. Accessed July 16, 2020.
9. Resnik L, Meucci MR, Lieberman-Klinger S, et al. Advanced upper limb prosthetic devices: implications for upper limb prosthetic rehabilitation. *Arch Phys Med Rehabil*. 2012;93(4):710-717. doi:10.1016/j.apmr.2011.11.010
10. US Department of Veterans Affairs, US Department of Defense. VA/DoD Clinical practice guidelines: rehabilitation of lower limb amputation. Version 2.0 -2017. Pocket card. https://www.healthquality.va.gov/guidelines/Rehab/amp/VADoDLLACPGPocketCard092817.pdf. Accessed July 31, 2020.