



VA/DoD CLINICAL PRACTICE GUIDELINE FOR THE MANAGEMENT OF UPPER LIMB AMPUTATION REHABILITATION

Department of Veterans Affairs

Department of Defense

Patient Summary

*Words that first appear in *italics* are defined in the [Limb Loss Definitions/Glossary](#) section of this summary.

Table 1. Facts About Upper Limb Amputation

- Nearly two million Americans are living with limb loss. Approximately 3% of this population involve loss of one or both upper limbs.(1)
- 70% of all traumatic amputations involve the upper limbs.(2)
- From 2001 – 2014, more than 700 Service Members with some level of upper limb amputation were cared for in one of three military advanced rehabilitation facilities, accounting for approximately 30% of the total number of patients with amputations treated.(3)
- In the DoD, over 30,000 beneficiaries have some level of upper limb amputation. This represents 51.2% of the total population with amputation cared for in the DoD over the past decade.(3)
- Individuals who have sustained a more proximal amputation (at or proximal to the elbow)(utilized OT services more frequently the first year (specifically months 4 – 12) following amputation as compared to individuals with more distal amputations.(4)

I. The Care Team Approach

The overall goal of *rehabilitation* after upper limb *amputation* is to optimize your health, independence in daily activities, and quality of life.

The rehabilitation *care team* is comprised of doctors, physical therapists and occupational therapists, prosthetists, and others working together to provide you with a comprehensive treatment program. Of the care team members, you are the most important member when addressing and attaining your personal goals. Your care team is there to support and guide you while we work together to achieve the goals listed below.

Table 2. Goals of Amputation Rehabilitation

- Reduce pain in the *residual limb*
- Reduce *phantom limb pain* and *phantom limb sensation*
- Become independent and safe in self-care, work, and recreational/leisure activities
- Improve your quality of life; address factors that may impact your quality of life
- Facilitate healthy *body image* and self-esteem
- Improve/maintain your psychological and emotional well-being
- Improve/maintain physical health
- Improve ability to access the community
- Prevent injuries or the development of other painful conditions in remaining limb(s)
- Achieve satisfaction with your independence, your prosthesis, and your care team
- Optimize quality of life

A variety of factors such as your level of amputation, physical condition, diet, social support, emotional well-being, and personal motivation impact your recovery following amputation. A comprehensive rehabilitation program that addresses your needs, abilities, and emotional well-being can help you achieve an independent lifestyle. Most patients with upper limb amputation(s) are candidates for a *prosthesis*, commonly referred to as an *artificial limb*; however, there are other approaches that your care team can assist with to improve your independence in daily activities without a prosthesis.

A. Expectations for Rehabilitation

Your rehabilitation should include:

- Training in *activities of daily living (ADL)* such as bathing, hygiene, toileting, eating, and dressing.
- Training in *instrumental activities of daily living (IADL)*, which allow you to care for your household independently, such as cooking, cleaning, laundry, shopping, taking care of family members, work tasks, recreational/sports tasks, and many others.
- Considering other methods for accomplishing tasks (in other words, equipment that may be adapted to ease the difficulty of tasks and using one-handed techniques).
- Care of your residual limb to control swelling, pain, sensitivity, skincare, and shaping.
- Range of motion (ROM) exercises to prevent contractures or limitation of motion in remaining joints.
- Exercises to improve strength, endurance, symmetry, posture, and balance.
- Conditioning exercises for overall health and increased energy needs.
- Any necessary modifications or *assistive technologies* such as hands-free phones and computers that may be needed in your home, automobile, and workplace to facilitate independence in your activities.
- Peer support programs that provide an opportunity for you to interact with others with a similar condition, and who face similar challenges, emotions, and experiences – this can be in the form of either individual or group peer support.

B. Pain Following Amputation

Several different types of pain may be experienced after amputation, including:

- **Immediate post-surgical pain** – pain experienced after any surgery where skin, muscle, bone, and nerves are cut.
- **Residual limb pain (RLP)** – pain that occurs specifically in the remaining part of the amputated limb. It is an expected symptom following amputation. This pain can reappear later due to poor prosthetic *socket* fit, bruising of the limb, chafing, or rubbing of the skin, and other factors.
- **Phantom limb pain (PLP)** – pain that is felt in the missing part of the limb. It is commonly the most difficult post-amputation pain to manage, as it is not well understood.
- **Phantom limb sensations (PLS)** – non-painful feelings that the amputated limb is still there, thus the term phantom limb. These are common and may be present throughout your lifetime.
- **Associated musculoskeletal pain** – pain that occurs in body regions other than the amputated limb, such as the back, neck, shoulder, or opposite limb, and may be related to extra motions required for use of the prosthesis or by the demands of living with an amputation. These may be aggravated by your job, recreation, environment, and advancing age.

C. Pain Management

Due to the variety of pain symptoms that can occur following upper limb loss, multiple treatment approaches may result in the best outcome. Medications, as well as other treatment approaches, should be considered. Ask your doctor what medications can be prescribed to help with your pain. You can also ask if there are other appropriate treatment options available. Always follow up with your doctor to assure your treatment regimen is both safe and effective.

II. Phases of Rehabilitation Care

There are four phases of rehabilitation care that you will progress through following upper limb amputation. These phases are not defined by fixed points in time. Phases often overlap based on your needs, injury severity, wound healing, pain tolerance, and rehabilitation goals. Additionally, progression through the phases of care does not necessarily occur sequentially. Phases may be repeated based on your needs. The four phases are:

- Perioperative
- Pre-prosthetic
- Prosthetic training
- Lifelong care

A. Perioperative Phase

The perioperative phase of rehabilitation begins when the decision has been made that amputation is necessary. This phase ends when the residual limb wounds are free of infection, closed, sutures are removed, and you have become independent in self-care activities using one-handed strategies and adaptive equipment. Members of the care team complete assessments of your medical, functional, and

emotional status to understand your level of function, prepare you for rehabilitation, and, ultimately, lifetime care. During this phase, the team provides proper medical, surgical, and psychological management, begins rehabilitation, and works to protect and improve the health of your residual limb.

B. Pre-prosthetic Phase

The goal of the pre-prosthetic phase is to prepare the residual limb for initial prosthetic fitting. During this phase, wound closure and pain control continue to be monitored, ongoing rehabilitation occurs, and continued psychosocial support is provided. You must be cleared by your care team for a *diagnostic socket* fitting to occur. The pre-prosthetic phase ends with the fitting of your first *prosthesis*. This phase will typically occur in an outpatient or rehabilitation setting.

a. Prosthesis Options

There are a variety of prosthetic options that are potentially available for you:

- No prosthesis
- Cosmetic or *passive prostheses*
- *Body-powered prostheses*
- *Battery powered prostheses*
- *Hybrid prostheses*, which are a combination of body and battery powered features
- *Activity specific prostheses* (e.g., swimming, golfing, yard work, biking)

Different prostheses should be considered to assist you in meeting your functional goals. New goals may require changes to the design of the prosthesis, consideration of a different *terminal device*, or warrant the prescription of a completely new prosthesis.

C. Prosthetic Training Phase

The prosthetic training phase starts upon delivery of your first prosthesis and continues until you demonstrate successful function during desired activities. This phase involves continued conditioning, functional prosthetic training, return to work and leisure activities, and continued psychological support.

Once the prosthesis is fabricated, ready for use, and a prescription for training is placed, the prosthetist will provide you, your family/caregiver, and rehabilitation care team education on:

- Proper terminology related to the prosthesis and its parts
- How the prosthesis works (e.g., prosthetic control strategy)
 - ◆ Functional and mechanical limitations
 - ◆ Proper and safe prosthesis use
 - ◆ Identification of precautions
 - ◆ Appropriate care and maintenance of the device

In prosthetic training you should focus on:

- Donning and doffing
- Establishing a wear schedule
- Learning to care for and monitor your residual limb (see [Table 3](#))
- Becoming proficient with controlling the prosthesis
- Functional training with the prosthesis

Table 3. Signs and Symptoms the Prosthesis Needs to Be Modified

Report any of the following symptoms:

- Ongoing pain in the residual limb or associated with a prosthetic harness
- Skin breakdown
- Change in limb volume (for example due to swelling, weight gain, or loss)
- Change in the ability to don and doff the prosthesis
- Change in pattern of usage

D. Lifelong Care

The last phase of upper limb amputation rehabilitation is lifelong care. This phase typically begins once the initial prosthetic fitting and functional training are completed or when a desired level of function and stability from both a medical and rehabilitation perspective has been reached.

During this phase, you should return to your care team for a follow-up assessment at least every 12 months. The goal of the lifelong care phase is to ensure you continue to maintain functional independence. The care team should provide any necessary rehabilitation services that you may need, keep you informed about emerging technologies in upper limb amputation rehabilitation, address any changes in goals or health status, and minimize any effects of long-term prosthetic use.

III. Other Resources

For more information, check out some of the following:

- **DAV (Erlanger, KY)** – a non-profit charity that provides support to Veterans. Find out more here: <https://www.dav.org/veterans/resources/veterans-with-amputations-limb-loss/>
- **Amputee Coalition (Knoxville, TN)** – a non-profit organization that provides numerous resources, outreach, and education for individuals with limb loss. Find out more here: <https://www.amputee-coalition.org/>
- **InMotion Magazine (offered by Amputee Coalition, Knoxville, TN)** – a magazine published bimonthly for amputees, caregivers, and healthcare professionals. Read the current issue here: <https://www.amputee-coalition.org/limb-loss-resource-center/publications/inmotion/>
- **Challenge Magazine (Disabled Sports USA, Rockville, MD)** – a magazine that provides information about adaptive sports to adults and children with disabilities. Check it out here: <https://www.disabledsportsusa.org/resources/challenge-magazine/>

- **Walter Reed National Military Medical Center, Advanced Training Center (MATC) (Bethesda, MD)** – a facility in the U.S. tri-service military medical center dedicated to offering rehabilitation services to Service Members, retirees, and family members using sophisticated prosthetics and cutting-edge athletic equipment. Find out more here: <https://walterreed.tricare.mil/Health-Services/Specialty-Care/Amputee-Care>
- **Brooke Army Medical Center, Center for the Intrepid (CFI) (San Antonio, TX)** – a rehabilitation facility to treat amputees and burn victims. Check it out here: <https://bamc.tricare.mil/Clinics/Center-for-the-Intrepid>
- **Naval Medical Center San Diego, Comprehensive Combat and Complex Casualty Care (C5) (San Diego, CA)** – a program of care that manages a severely injured or ill patient from medical evacuation through inpatient care, outpatient rehabilitation, and eventual return to active duty or transition from the military. Find out more here: <https://sandiego.tricare.mil/Health-Services/Specialty-Care/Comprehensive-Combat-and-Complex-Casualty-Care>
- **VA Rehabilitation and Prosthetics Services (Washington DC)** – the office responsible for the national policies and programs for medical rehabilitation, prosthetic and sensory aids services. Find out more here: <https://www.prosthetics.va.gov/>

IV. Definitions/Glossary

Activities of daily living (ADL) – a term generally used to refer to dressing, bathing, grooming, toileting, personal hygiene, feeding, and mobility within the home.(5,6)

Activity specific prosthesis – a prosthesis designed for a specific activity (e.g., swimming, cycling, kayaking).

Amputation – the cutting off of a limb or part of a limb.(7)

Assistive technologies – any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.(8)

Body image – the awareness and perception of one’s own body in relation to both appearance and function.(7)

Body-powered prosthesis – an arm prosthesis powered by movement in the upper extremity portion of the body, specifically the muscles of the shoulder(s), neck, and back. The motion of these movements is then captured by a harness system that generates tension in a cable, allowing a terminal device (hook or prosthetic hand) to open and close.(7)

Care team – a physician-led, patient-centered, multidisciplinary approach to provide a comprehensive treatment plan and ensure lifelong management. Specialists involved may include: rehabilitation physicians, anesthesiologists, surgeons (hand specialists, orthopedic surgeons, plastic surgeons), mental and behavioral health specialists, case managers, nurses, occupational and physical therapists, driver rehabilitation specialists, certified prosthetists, recreation therapists, social workers, trained peer visitors, and others.

Diagnostic socket – a temporary socket, often transparent, made over the plaster model to aid in obtaining proper fit and function of the prosthesis.(7)

Donning and doffing – putting on and taking off a prosthesis, respectively.(7)

Extremity – synonymous with limb, usually referring to an arm or leg.(7)

Externally powered, or myoelectric prosthesis – an externally powered prosthesis that utilizes muscle electronics. It is a technology used to control the prosthesis via muscle contraction using electrical signals from the muscles to power the prosthesis.(7)

Hybrid prosthesis – a prosthesis that combines several prosthetic options in a single prosthesis, usually for individuals who have a transhumeral (AE) amputation or difference. The most common hybrid prostheses are found in upper extremity cases where the device utilizes a body-powered elbow and a myoelectrically-controlled terminal device (hook or hand).(7)

Instrumental activities of daily living (IADL) – a broad topic term that includes home management tasks (for example, meal planning preparation, clean-up, routine housekeeping, yard work, seasonal home care); laundry; shopping (for example, community mobility, money management); child care; pet care; work; and individual recreational, leisure, or sport activities.(5,6)

Occupational therapy – the teaching of how to perform activities of daily living as independently as possible, or how to maximize independence in the case of disability.(7)

Phantom limb pain – pain that originates in the amputated portion of the limb.(7)

Physiatrist – a doctor of rehabilitation medicine who specializes in the comprehensive management of patients with impairments and disabilities arising from neuromuscular, musculoskeletal, and vascular disorders.(7)

Physical therapy – a rehabilitative therapy that is concerned with a patient’s gross motor activities such as transfers, gait training, and how to function/mobilize with or without a prosthesis.(7)

Prosthesis – an artificial limb, usually an arm or a leg, that provides a replacement for the amputated or missing limb. Prostheses is plural.(7)

Prosthetics – the profession of providing those with limb loss or with a limb difference a functional and/or cosmetic restoration of missing or underdeveloped human parts.(7)

Prosthetist – a person involved in the science and art of prosthetics; one who designs and fits artificial limbs.(7)

Rehabilitation – the process of restoring a person who has been debilitated by a disease or injury to a normal, functional life.(7)

Socket – the portion of the prosthesis that fits around and envelopes the *residual limb* and to which the prosthetic components are attached.(7)

Terminal devices – devices attached to the wrist unit of an upper extremity prosthesis that provides some aspect of normal hand function (for example, grasp, release).(7)

V. References

1. Ziegler-Graham K, MacKenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. *Arch Phys Med Rehabil*. Mar 2008;89(3):422-429.
2. National Limb Loss Information Center. *Limb Loss Statistics*. Knoxville, TN: Amputee Coalition of America; 2008. <https://www.amputee-coalition.org/resources/limb-loss-statistics/#1>
3. Military Health System. Military Health System Data Repository. Aug 2021. Available from: <https://health.mil/Military-Health-Topics/Technology/Clinical-Support/Military-Health-System-Data-Repository>.
4. Cancio JM, Orr A, Eskridge S, Shannon K, Mazzone B, Farrokhi S. Occupational therapy practice patterns for military Service Members with upper limb amputation. *Mil Med*. 2020 Mar 2;185(3-4):444-450.
5. Radomski MV, Latham CAT. *Occupational therapy for physical dysfunction*. Lippincott Williams & Wilkins; 2008.
6. Fasoli SE, Chen CC. What do clinicians need from a rehabilitation treatment taxonomy? An alternate approach for describing treatment content versus process. *Arch Phys Med Rehabil*. Jan 2014;95 (1 Suppl):S74-76.
7. National Limb Loss Information Center. *Limb loss definitions*. Knoxville, TN: Amputee Coalition of America; 2008. https://www.amputee-coalition.org/fact_sheets/definitions.html
8. Technology related assistance to individuals with disabilities act, Public Law 100-407(1988).