Residual Limb Management in Lower Limb Amputation

Overview

Phase	Care Management
Pre-Amputation	Optimize limb prior to surgery by addressing skin issues, strength limitations, range of motion limitations, etc. Assess functional and prosthetic implications of residual limb length and amputation level. Assess sensation of the affected limb.
Peri-Operative	Local wound care and advanced wound care specialist for surgical incision and other wounds (e.g., negative pressure wound therapy). For complex wound healing or other vascular challenges, consider consult to advanced wound care team. Consult predischarge- in collaboration with surgeon's recs. Monitor the surgical wound for signs and symptoms of ischemia or infection. Control edema and shape residual limb (e.g., elastic bandage wrapping or shrinker application). Protect residuum using rigid dressings (e.g., rigid cast, rigid removable device, etc.) for transtibial amputations.
Post-Amputation	Continue local wound care, limb shaping, edema management, and protection of the residuum. Patient education on residual limb management and desensitization techniques. Advance ROM and strengthening of proximal joints and muscles. Consider longer term residual limb protection for those with higher fall risk or skin risk (when not using prosthesis or if not a prosthesis candidate).
Prosthetic Training	Reinforce use of residual limb compression (e.g., shrinker) when out of prosthesis. Progressive prosthesis wear schedule. Consider early prosthesis use only during therapy if there are safety concerns. Educate on skin checks and pressure points, skin hygiene, sock ply management, and wear schedule.
Lifelong Care	Assess residual limb condition and intervene as needed. Re-emphasize importance of skin checks and pressure points, skin hygiene, and sock ply management.

Residual Limb Problems

Problem	Key Historical or Examination Features	Non-prosthesis management	Prosthesis evaluation/ management
Focal redness (any location)	Look for potential causes of excess direct pressure, shear forces	Rule out local infection or dermatitis	Assess socket fit Assess static and dynamic alignment Assess donning technique Limit wear time if redness does not resolve in 15-20 min
Blister	Look for potential causes of shear force, excess focal negative pressure, or impaired venous return Quality of skin/soft tissue? (E.g., prone to blisters due to chronic venous stasis?)	Blisters could appear nearly spontaneously in some clinical situations (chronic venous stasis, chronic heart failure causing limb edema). Address underlying medical conditions as able.	Prosthetic liners and sleeves can create excess shear force, especially if donned improperly (pulled up rather than rolled up)
Distal limb reddish or purplish discoloration, +/- edema, +/- wound	Look for possible proximal constriction leading to impaired venous return and/or lack of consistent distal contact or excess distal negative pressure. (Historically called “choking syndrome.”)	Consider infectious workup if etiology is not clear When not using a prosthesis: Is shrinker or elastic bandage creating a proximal constriction?	Using too many socks? Socket too tight? Is there pistoning (excess up and down movement of the residual limb within the socket during the gait cycle)? Potential causes of pistoning: insufficient suspension, socket too loose, locking liner too compliant
Verrucous hyperplasia (distal limb)	History of impaired venous return / lack of distal contact syndrome. Wartlike appearance, +/- wounds.	Consider referral to dermatology (increased risk of malignancy)	Restore distal contact if possible If advanced with chronic wounds, may need to offload distal limb
Callus	Look for etiology of excess pressure	Address etiology if possible (e.g., add distal gel cup if appropriate, or offload)	Address etiology if possible (e.g., add distal gel cup if appropriate, or offload)
Rash	Consider if fungal vs. contact dermatitis	Age of liners, liner hygiene Change in liner or other material against the skin? Could spot-test to evaluate sensitivity. Consider alternate cause such as pharmacologic side effect.	Age of liners, liner hygiene Change in liner or other material against the skin? Could spot-test to evaluate sensitivity.
Folliculitis or epidermal cyst	Does it correlate to shear forces or excess direct pressure?	Consider preventive daily cleansing with surgical scrub Consider prophylactic pharmacologic approach for recurrent folliculitis (perhaps referral to infectious disease specialist)	Reduce shear forces or direct pressure as able Reinforce liner hygiene practices
Scar adherence	Evaluate on physical exam	Tissue mobilization techniques Consider advanced dermatologic interventions	Consider interface with more padding / protection

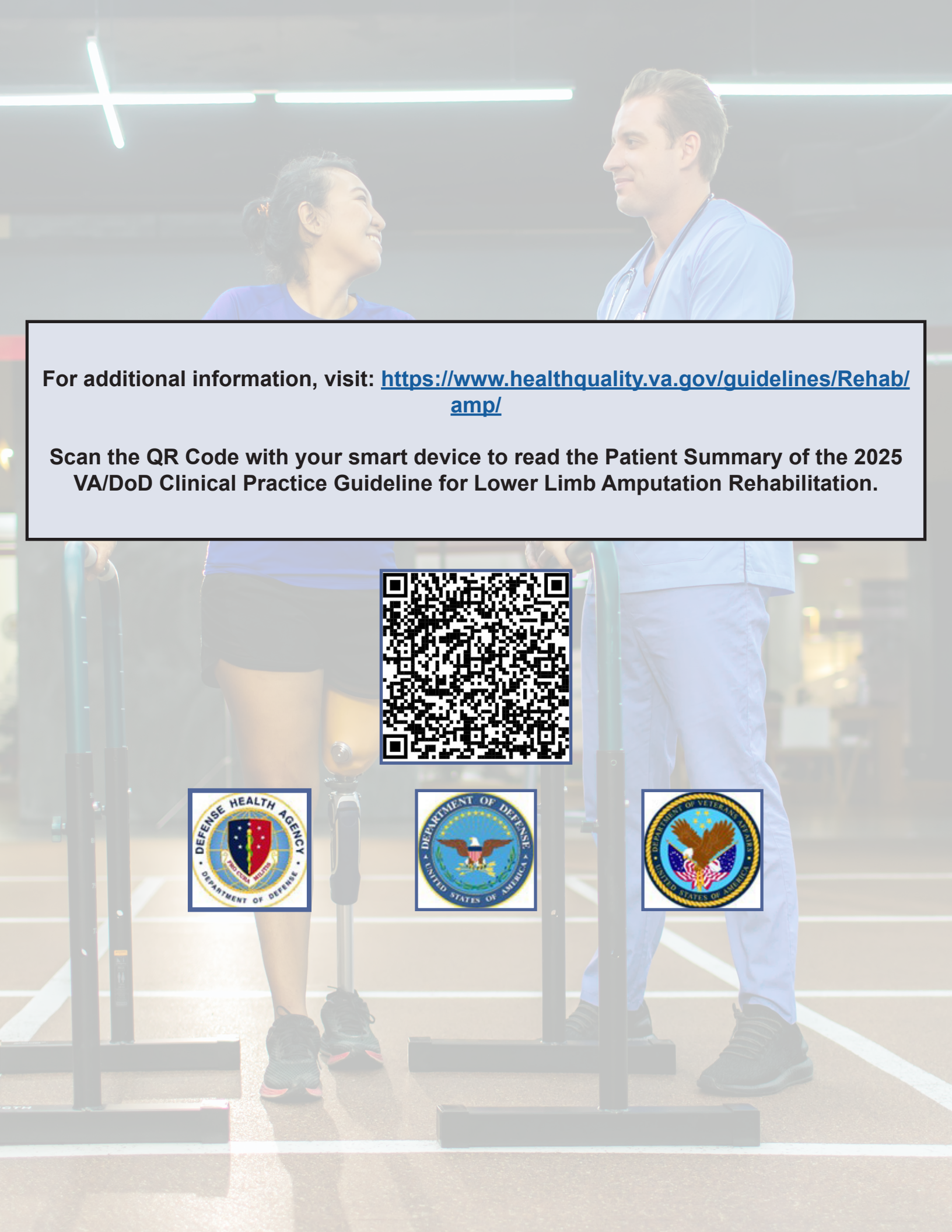
Problem	Key Historical or Examination Features	Non-prosthesis management	Prosthesis evaluation/ management
Scar invagination or other irregular residual limb morphology	Evaluate on physical exam	Consider surgical revision if prosthesis use is impeded despite trouble-shooting	Consider custom gel liner Consider closed cell foam liner (+/- other soft interface) to accommodatee shape
Pseudobursa (adventitious bursa)	Physical exam + history suggestive of repeated focal shear foces; may need imaging or other workup to differentiate from other etiologies	Compression of residual limb when not in prosthesis Consider bursectomy	Reduce focal shear forces Consider adding relief to socket (however, socket relief could exacerbate the fluid collection)
Redundant soft tissue	Evaluate on physical exam	Consider surgical revision if prosthesis use is impeded despite trouble-shooting Consider osseointegration if appropriate	Consider liner with different stiffness or matrix to stabilize the soft tissue. Consider different suspension to stabilize distal soft tissue; can depend on specific situation. Locking liner suspension (pin lock, lanyard) may be helpful for some; passive suction or elevated vacuum may be helpful in some situations.
Poor soft tissue coverage of distal limb (any etiology, such as myodesis failure)		Consider surgical revision if prosthesis use is impeded despite trouble-shooting Consider osseointegration if appropriate	Offload distal limb (consider different socket design; optimize socket fit to help redistribute pressures; thigh corset and side joints for transtibial residual limb offloading)
Heterotopic ossification / exogenous bone growth	May be visible on x-ray if mature MRI or nuclear imaging to identify earlier	Mixed evidence on pharmacologic management Consider referral for surgical management if causing skin/ soft tissue breakdown or otherwise impeding prosthesis use	Offload or relieve if focal area Consider an alternate approach to stabilizing the residual limb in the socket, such as alternating longitudinal pressure/relief
Knee instability (transtibial amputation)	Physical examination of knee ROM; varus/valgus stress		Thigh corset and side joints Integrated knee orthosis
Wound (See separate table)			
Pain (See Residual limb Pain Toolkit)			

Approach to Residual Limb Wounds: Assessment

Assessment	Considerations
Wound and patient characteristics	
Dimensions	May need to debride wound to get accurate dimensions
Border characteristics	Regular vs. irregular Raised? Rolled? Undermining?
Wound bed	Epithelial tissue? (pink or white) Granulating tissue? (red and moist) Slough? (yellowish; dead cells and debris) Necrotic tissue? (dry and black)
Surrounding tissue	Maceration? (White, saturated tissue from excess moisture) Erythema? Edema?
Drainage (type, amount)	Serous, sanguinous, purulent
Odor	Malodorous vs. normal perspiration and wear scent
Are there signs of local infection?	Surrounding erythema Purulent drainage Pain at wound site
Are there symptoms of systemic infection?	Fever, chills, nausea, vomiting
Are other residual limb problems leading to wound(s)?	Assess for folliculitis, pseudobursa, or other potential contributory residual limb problems.
Prosthesis contributors	
Is there prosthesis contribution?	Think about specific types of pressure Do consider socket fit, but don't assume it's a socket fit problem Consider donning technique or wear habits Consider alignment
Is direct pressure contributing?	Is the wound over a bony prominence? Is there malalignment causing pressure? (E.g., excess lateral transtibial socket thrust could create excess direct pressure at the medial knee) Is the socket too loose, leading to excess end weightbearing?
Are shear forces contributing?	E.g., if sealing sleeve or liner is pulled up rather than rolled up
Is excess focal negative pressure, and/or constricted venous return contributing?	Possible scenarios: • Pistoning • Lack of distal contact in socket • Constriction proximal to the distal residual limb • "Milking" from locking liner (pin locking or lanyard suspension)
Are elements of the socket or interface between the socket and the skin contributing?	Is there breakdown of the gel liner? If foam liner, is it packed out? Have the prosthetic fitting socks thinned?
Residual limb factors	
Did the residual limb volume or shape change?	Body weight change? Maturation of residual limb?
Are there residual limb volume fluctuations? (Day to day, or over the course of a day?)	Is patient using shrinker when not in prosthesis? Wear time and pattern of wear as relates to residual limb volume. (E.g., does patient tend to first don the prosthesis later in the day, when they may have more dependent edema if they've been sitting?) Medical conditions
Is there a secondary element due to recent residual limb swelling?	Residual limb could swell due to initial irritation / wound, leading to secondary skin/soft tissue injury If patient reduces prosthesis wear time (to reduce pressure on the wound) but still uses the prosthesis intermittently, the socket may be too tight
Are residual limb characteristics contributing?	Bony or soft tissue morphology (e.g., very short residual limb could lead to excess direct pressure and excess shear pressure) Skin/soft tissue characteristics (e.g., fragile skin from longstanding venous stasis syndrome)

Approach to Residual Limb Wounds: Management

Plan element	Details
Offloading: Prosthesis rest until wound is healed	Does patient have a safe alternate mobility strategy? (Ideally, this would be evaluated and planned for proactively) PT, OT evaluations if indicated If patient is unable to get by safely in their home without a prosthesis, consider if alternate setting is medically necessary
Local wound care	Follow principles of wound care: 1. Cleansing of wound 2. Debride dead tissue and debris 3. Select appropriate dressings to create a moist but not overly wet wound healing environment 4. Refer to wound care specialist as appropriate
Treat for skin/soft tissue infection if appropriate	For mild infection, oral antibiotics based on patient characteristics and local setting Are there signs of more complex or serious infection? (Consider facilitating presentation to setting for urgent or emergent medical evaluation and care.) Refer to infectious disease specialist if appropriate
Further workup	For deep infection, osteomyelitis Vascular status
Medical risk factor management	Smoking cessation Diabetes control Dialysis adequacy
Control edema	Shrinker Elevate limb
Address prosthesis contributors	Socket adjustments, or new socket if indicated Alignment adjustments
Return to prosthesis use	1. Do not return to prosthesis use until advised 2. Be aware that residual limb may gain some volume due to not using a prosthesis 3. Return to normal usage gradually



For additional information, visit: https://www.healthquality.va.gov/guidelines/Rehab/amp/

Scan the QR Code with your smart device to read the Patient Summary of the 2025 VA/DoD Clinical Practice Guideline for Lower Limb Amputation Rehabilitation.