Evidence-Based Wound Care Practice Guidelines

2nd Edition

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SerenaGroup
Building the Nation's Leading Wound Care Team

Late Effects of Radiation Injury

TYPE OF ULCER	Late effects of radiation injury (subacute ORN)
DEFINITION	After receiving radiation therapy, the bony tissue of the mandible and, less frequently, the maxilla thins, leading to osteoradionecrosis. Hyperbaric oxygen therapy (HBOT) is indicated in patients undergoing dental procedures who have had previous radiation to the head and neck.
CAUSE	Radiation exposure to the head and neck causing progressive microvascular disease to the mandible: • Pain, swelling • Dental carries • Dry mouth • Difficulty swallowing
TREATMENT	Hyperbaric oxygen therapy (HBOT) at, typically, 2.4 ATA for 90 minutes for a total of 20 treatments before dental extraction and 10 treatments post extraction.
RISK FACTORS	Pathologic fracture Loss of bony support of the jaw Need for major surgical intervention Disfigurement
ORDER TESTS	MRI/X-ray of the mandible
FOLLOW-UP	Demonstrate clinical improvement during HBOT: • Reduction in pain • Improvement in quality of life
CODES RELATED	L59.8, M27.2, M27.8

Arterial or Ischemic Ulcers (AUs)

TYPE OF ULCER	arterial or Ischemic Ulcers (AUs)
DEFINITION	Ulceration of the skin and soft tissue that fails to heal secondary to poor perfusion.
CAUSE	AUs are caused by poor perfusion (delivery of nutrient-rich blood) to the skin and soft tissues.
TREATMENT	The preferred treatment is arterial revascularization by either endovascular or open surgical technique. If revascularization is not possible, the wound should be kept clean and dry. Consider HBOT in patients with indirect angiosome revascularization or patients with unreconstructable critical limb ischemia. HBOT maybe combined with cilostazole 100mg BID.
RISK FACTORS	• Hypercholesterolemia • Cigarette smoking • Hypertension • Diabetes mellitus • Advanced age • Male gender • Hypertriglyceridemia • Sedentary lifestyle • Family history of vascular disease • Berger's Disease
COMPLICATIONS	Left untreated, arterial ulcers can lead to serious complications, including infection, gangrene and amputation of the affected limb.
DRESSING OPTIONS	• Post revascularization: maintain proper moisture balance (refer to woundsource.com for dressing selection). • Prior to revascularization of non0surgical candidates, maintain a dry wound bed. Avoid the use of betadine. • Debride only after revascularization.

ORDER TESTS	• Vascular screening to quantify perfusion and oxygenation on patient's initial visit to the clinic and following any change in vascular status.
	• Tests that measure perfusion:
	  ◦ Ankle brachial index
	  ◦ Toe brachial index

Arterial or Ischemic Ulcers (AUs) Cont.

ORDER TESTS	◦ Pulse volume recording ◦ Skin perfusion pressure • Tests that measure oxygenation: ◦ Transcutaneous oxygen measurement (TCOM) ◦ Near infrared reflective spectroscopy (NIRS)
FOLLOW-UP	Weekly follow-up visits until ulcer is healed
CODES RELATED	I70.231 - I70.678

Minor Burns

TYPE OF ULCER	Minor Burns (less than 25% body surface area (BSA)
DEFINITION	Damage to the skin or deeper tissues 3 kinds of burns: 1st, 2nd and 3rd degree
CAUSE	Caused by: • Solar exposure • Fire • Hot liquids • Chemicals • Electricity
TREATMENT	1st degree: top layer of skin healed with home care: soak in cool water 5 minutes or longer, recommend over-the-counter-pain medication, apply nonadherent dressing. Should heal in 7 to 10 days. 1st degree burns do not typically scar. 2nd degree: damage beyond the epidermis; soak in water 15 minutes or longer, recommend over-the-counter pain medication, apply nonadherent dressing. The presence of blisters indicates a longer healing time. 3rd degree: penetrates every layer of skin; early surgical intervention, within 5-7 days, improves outcomes. Skin grafting and other skin procedures may be necessary. Consider consultation with burn services. Consider HBOT.
RISK FACTORS	• Infection and sepsis • Blood loss • Hypothermia • Hypotension • Contractures that can lead to disability • Scarring
DRESSING OPTIONS	1st and 2nd degree: nonadherent dressing or antimicrobial gel 3rd degree: compression therapy, skin grafts, daily dressing changes Scars: laser therapy, corticosteroid treatments, surgery, silicone.

Minor Burns Cont.

FOLLOW-UP	• Weekly follow-up until healed • Surgery, rehabilitation, physical therapy • Scars: laser therapy, silicone gel
CODES RELATED	T20.01 - T32.9

Diabetic Foot Ulcer (DFU)

TYPE OF ULCER	Diabetic Foot Ulcer (DFU)
DEFINITION	Diabetic foot ulcers occur in approximately 34% of patients with diabetes during their lifetime and 50% of DFUs become infected.1 DFU's are commonly found on the plantar aspect of the foot but may occur anywhere on the foot.
CAUSE	DFUs develop due to compromised biology: sensory neuropathy leading to the loss of protective sensation, motor neuropathy with the loss of muscular tone in the intrinsic muscles of the foot, causing structural deformities; autonomic neuropathy resulting in dry cracked feet; hyperglycemia-induced peripheral arterial disease; glycosylation of ligaments decreasing mobility; and decreased white blood cell function, immunopathy.
ASSESSMENT	DFU's are graded by severity. The Wagner grading system is the most used acuity scale. It is also essential for reimbursement. <u>Wagner Scale</u> • Wagner I: partial or full thickness not down to any underlying structure • Wagner II: The ulcer extends down to deeper structure • Wagner III: The ulcer extends into deep tissues such as the joint with abscess, infection and or osteomyelitis • Wagner IV: localized gangrene in the foot • Wagner V: extensive gangrene in the foot
DIAGNOSIS	• Screen all patients for arterial disease. • Test for sensory neuropathy using 5.07 Semmes-Weinstein monofilament on nine locations on the foot. Patients who cannot sense the 10 grams of pressure exerted by the monofilament have lost protective sensation in their feet.
TESTING	• Hemoglobin A1C • 2 View Plain X-Ray • MRI if osteomyelitis is suspected • Consider fluorescence imaging

Diabetic Foot Ulcer (DFU) Cont.

PREVENTION | TREATMENT	• Prevention
	  ◦ Control Blood glucose
	  ◦ Smoking cessation
	  ◦ Protective footwear
	  ◦ Regular exercise
	  ◦ Adherence to diabetic diet
	  ◦ Routine foot care
	  ◦ Patient education
	  ◦ Inspect feet daily
	  ◦ Ensure appropriate moisturization of the skin.
	• Nutritional Evaluation
	• Treatment: Offloading
	  ◦ Total contact casting (TCC) is the gold standard for offloading plantar diabetic foot ulcers. Contraindications to TCC include arterial insufficiency, infection, and highly exudative wounds.
	  ◦ In patients who cannot tolerate TCC, a fixed ankle walker is acceptable.
	• Infection Control: ISDA Guidelines for the treatment of diabetic foot infection.
	
	Pedis 1: no sign of infection.
	Pedis 2: Superficial tissue lesion with at least 2 of the following signs: local warmth, erythema >0.2-2cm around the ulcer, local tenderness/pain, local swelling/induration, purulent drainage. *other causes of inflammation of the skin must be excluded.
	Pedis 3*: Erythema >2cm and one of the findings above or: infection involving structures beneath the skin/subcutaneous tissues (eg: deep abscess, lymphangitis, osteomyelitis, septic arthritis or fasciitis) or No systemic inflammatory response (see Pedis 4).
	***Patients with Pedis 3 grade or higher should be admitted for intravenous antibiotic.**
	Pedis 4: Presence of systematic signs with at least 2 of the following: temperature >39^0 C or <36^0 C, pulse >90bpm, respiratory rate >20/min, $PaCO_2$ <32mmHG, white cell count: 12,000mm^3 or <4,000mm^3, 10% immature leukocytes.

Diabetic Foot Ulcer (DFU) Cont.

PREVENTION | TREATMENT	• Treatment - Debridement
	  ◦ Remove necrotic, devitalized tissue via surgical debridement.
	  ◦ If infection is suspected in a debrided ulcer or if epithelialization from the margin is not progressing within two weeks of debridement and initiation of offloading therapy, determine type and level of infection by MolecuLight procedure or punch biopsy for quantitative tissue culture of molecular diagnostic (PCR testing).
	• Treatment - Maintain appropriate moisture balance
	  ◦ Use clinical judgement to select a dressing that maintain the proper moisture balance. Wound Source is a good resource for dressing selection (www.woundsource.com).
	  ◦ Do not order wet-to-dry dressings.
	  ◦ Select dressings that will stay in place, minimize shear/friction and will not cause additional tissue damage
	• Hyperbaric Oxygen Therapy (HBOT)
	  ◦ HBOT is indicated for Wagner III or higher DFUs that have not shown signs of improvement after 30 days of standard wound care (The literature defines lack of improvement as less than 40% reduction in wound area in 4 weeks).
	  ◦ Consider HBOT for all limb preservation and amputation minimization efforts.
	• Cellular or Tissue-based Products for Wound Care (CTPs)
	• Consider CTPs for DFU's Wagner II or lower which have failed to heal by 40% in 30 days of standard wound therapy. Surgical Intervention:
	• Achilles tendon lengthening improves healing of diabetic forefoot wounds. Lengthening the Achilles tendon reduces pressure on forefoot plantar ulcers in patients with limited dorsiflexion and may be of benefit in healing certain diabetic foot ulcers.
	• Patients with Ischemia should be considered for a revascularization procedure.

Diabetic Foot Ulcer (DFU) Cont.

RISK FACTORS	Infection: • Osteomyelitis • Sepsis • Amputation • Death
DRESSING OPTIONS	Refer to www.woundsource.com
ORDER TESTS	Fasting blood glucose Hemoglobin A1C CBC Vascular Screening Plain X-ray MRI if osteomyelitis is suspected
FOLLOW-UP	Weekly wound visits Twice weekly visits for initial total contact casting (TCC)
CODES RELATED	E11.621, E10.621
REFERENCE	1. NJM Lifetime risk 1. Armstrong D et al., Diabetic foot Ulcers and their recurrence. N Engl J Med 2017; 376:2367-2375.DOI: 10.1056/NEJMra1615439

Typical Features of DFUs According to Aetiology

FEATURE	NEUROPATHIC	ISCHEMIC	NEUROISCHAEMIC
SENSATION	SENSORY LOSS	PAIN	DEGREE OF SENSORY LOSS
CALLUS | NECROSIS	CALLUS PRESENT AND OFTEN THICKENING	NECROSIS COMMON	MINIMAL CALLUS, PRONE TO NECROSIS
WOUND BED	PINK AND GRANULATING, SURROUNDED BY CALLUS	PALE AND SLOUGHY WITH POOR GRANULATION	POOR GRANULATION
FOOT TEMP. AND PULSE	WARM WITH BOUNDING PULSES	COOL WITH ABSENT PULSES	COOL WITH ABSENT PULSES
OTHER	DRY SKIN AND FISSURING	DELAYED HEALING	HIGH RISK OF INFECTION
TYPICAL LOCATION	WEIGHT-BEARING AREA OF THE FOOT, SUCH AS METATARSAL HEADS, THE HEAL AND OVER THE DORSUM OF CLAWED TOES	TIPS OF TOES, NAIL EDGES AND BETWEEN THE TOES AND LATERAL BORDERS OF THE FOOT	MARGINS OF THE FOOT AND TOES
PREVALENCE	35%	15%	50%

Non-Healing Surgical Wound

TYPE OF ULCER	Non-healing surgical wound
DEFINITION	Non-healing surgical wounds include post-operative incisional dehiscence, surgical site infection and post-operative incisions left open to heal by secondary intention.
CAUSE	Factors that may contribute to non-healing surgical wounds: • Infection • Pre-existing medical issues • Uncontrolled Diabetes • Disorders of immunosuppression • Tobacco use • Advanced age • Malnutrition • Obesity • Pre-and-post operative anemia • Renal disease • Chronic steroid use • Radiation therapy or chemotherapy • Break in surgical technique • Prolonged operative time
ASSESSMENT	Based on the risk of contamination and infection, non-healing surgical wounds are classified into four categories: • **Clean wounds:** These wounds show no sign of infection or inflammation, and risk of infection is usually less than 2%. They often involve skin, eyes, or the vascular system; the gastrointestional tract is not entered. These wounds are closed by primary intention. • **Clean-contaminated wounds:** These wounds also show no outward signs of infection. The bowel is entered in a controlled fashion. This category also includes procedures in which there is a minor break in aseptic technique. The risk of developing a surgical site infection (SSI) with this type of wound is usually less than 10%. • **Contaminated wounds:** Open wounds in which there is uncontrolled bowel spillage, infection is present or there is a major break in aseptic technique. These wounds may be left open.

Non-Healing Surgical Wound Cont.

ASSESSMENT CONT.	• The risk of infection with this type of wound is approximately 20-25%. • **Dirty-contaminated wounds:** wounds in which an infection is present at the time of surgery. These wounds are left open. The risk of developing an SSI with this type of wound is high at nearly 40%. • In wounds that contain a foreign body, the foreign material must be removed.
DIAGNOSIS	Wounds can dehisce without surgical site infection (SSI). The diagnosis of SSI is made using clinical signs and symptoms, cultures, and laboratory testing.
TREATMENT	The treatment of surgical wounds is based on the location and size of the wound.[1] • Refer to The Practice of Wound Care for standard wound care. • There is good evidence for the use of negative pressure wound therapy. • Consider nutritional supplementation.
RISK FACTORS	See cause above
DRESSING OPTIONS	• Refer to SerenaGroup® Formulary • For inpatients consider instillation negative pressure wound therapy.
ORDER TESTS	• CBC • Culture if SSI is suspected and untreated • Fluorescence imaging
FOLLOW-UP	Weekly follow-up visits until ulcer is healed
CODES RELATED	S08.111S-S08.89XS, S09.311S-S09.313S, S28.1XXS-S29.002S, S38.211S-S39.023S, T81.30XS-T81.89XS,T87.41-T87.89
REFERENCE	1. Berríos-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surg. 2017;152(8):784–791. doi:https://doi.org/10.1001/jamasurg.2017.0904

Pressure Ulcers/Injury (PrUs)

TYPE OF ULCER	Pressure Ulcers/Injury (PrUs)
DEFINITION	A localized injury to the skin or underlying tissue, usually over a bony prominence or related medical or other device, resulting from intense pressure in combination with shear and/or friction (NPIAP & NDNQI). PrUs can also result from low perfusion to the skin and soft tissues. In addition, PrUs may develop at life's end (Refer to SCALE).
CAUSE	Caused by prolonged pressure, friction, or shear either by themselves or in combination of each other over a bony prominence or where a medical or other device is left in place for a period of time.In addition, PrUs can develop due to a lack of blood supply, oxygen nutrients.
ASSESSMENT	Staged according to severity: [1,2] • **Stage I**- Intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes do not include purple or maroon discoloration. • **Stage II**- Partial thickness loss with exposed dermis. The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. • **Stage III**- Full thickness loss of skin, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. • **Stage IV**- Full thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage, or bone in the ulcer. Slough and/or eschar may be visible. Epibole (rolled edges), undermining and tunneling typically occur.

Pressure Ulcers/Injury (PrUs) Cont.

ASSESSMENT	• **Unstageable**- Full thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar. • **Deep Tissue Injury (DTI)**-Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood-filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin.
PREVENTION | TREATMENT	Based on the severity of the Stage of the Pressure Injury • Prevention ◦ Turn and reposition ◦ Keep the skin clean and dry ◦ When possible, avoid activities that lead to sheering ◦ Keep the head of the bead less than 30 degrees unless contraindicated ◦ Consider the use of specialty mattresses and cushions ◦ Mobilize the patient as much as possible ◦ Use a validated scoring system to assess risk of skin breakdown (e.g. Braden Scale) ◦ Avoid dehydration ◦ Consider nutritional supplementation or dietary consult ◦ Manage fecal and urinary incontinence. • Treatment ◦ Continue guidelines for prevention™ ◦ Follow The Practice of Wound Care ◦ Evaluate the patient for osteomyelitis ◦ Consider negative wound pressure therapy ◦ Consider surgical referral for flap closure
RISK FACTORS	• Infection • Osteomyelitis • Fluid imbalance • Protein-calorie malnutrition • Disruption of quality of life
DRESSING OPTIONS	Maintain proper moisture balance Refer to SerenaGroup® Formulary

Pressure Ulcers/Injury (PrUs) Cont.

ORDER TESTS	While there is no definitive lab test, there is agreement the following should be ordered, followed, and managed: • **HgbA1C**- an indicator of long-term glucose control. The test reflects average glucose levels for the preceding 8-12 weeks. • **Glucose**- elevated level can impede PMN leukocyte, chemotaxis, diapedesis & phagocyte production. • **CBC**- measures: RBC, WBC, HGB, HCT, & platelets. Platelets release cytokines & PDGF which recruit cells to take part in healing. Note: Pre-albumin and albumin levels are unreliable in most cases.
FOLLOW-UP	• Weekly in the acute phase • Bi-weekly when stabilized • Monthly if palliative in nature
CODES RELATED	L89.010 - L89.894
REFERENCE	1. The National Pressure Injury Advisory Panel. Pressure injury states. www.npiap.com.2016. 2. Edsberg, L. E., Black, J. M., Goldberg, M., McNichol, L., Moore, L., & Sieggreen, M. (2016). Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System: Revised Pressure Injury Staging System. J Wound Ostomy Continence Nurs, 43(6), 585-597. doi:10.1097/won.0000000000000281.

Late Effects of Radiation Therapy

TYPE OF ULCER	Late Effects of Radiation Therapy
DEFINITION	The late effects of radiation therapy are caused by exposure of the soft tissue to ionizing radiation.
CAUSE	Histologically, tissues exhibit increased fibrosis, decreased cellularity and hypoxia due to endarteritis Obliterans.
TREATMENT	The soft tissue most affected includes dermal soft tissue, the rectum, and proximal gastrointestinal tract, bladder, tissues of the head and neck, vaginal tissue, and cerebral cortex. Typical therapy includes HBOT at 2.4 ATA for 30-60 treatments. Patient should be revaluated after 30 days. Nutritional assessment and treatment.
RISK FACTORS	• Disruption of quality of life • Anemia • Gastrointestinal bleeding • Hemorrhagic cystitis • Bowel perforation • Bowel ulceration • Fistula formation • Chronic pain • Urinary frequency
DRESSING OPTIONS	• Keep the skin moisturized and lubricated to prevent itching and cracking of the skin. • Refer to SerenaGroup® Formulary.
ORDER TESTS	MRI/X-Ray Endoscopy
FOLLOW-UP	Must show clinical improvement during HBOT: • Reduction in Pain • Improvement in quality of life • Reduction of bloody stool or urine • Decreased urinary frequency • Wound healing Fistula closure.

Late Effects of Radiation Therapy Cont.

FOLLOW-UP CONT.	• Complete Radiation Cystitis questionnaire on initial consult, every 10 treatments, and on final treatment.

CODES RELATED	HBOT specific:
	• Primary
	  ◦ L59.8, N30.40, N30.41, M27.2, M27.8
	• Secondary
	  ◦ T66.XXA

Late Effects of Radiation Injury

TYPE OF ULCER	Late Effects of Radiation Injury (active ORN)
DEFINITION	The late effects of radiation to the bony tissue of the mandible and less frequently the maxilla, resulting in reabsorption of the bone.
CAUSE	Exposure to radiation of the head and neck. Symptoms: • Limited range of motion (ROM) • Pain, swelling • Bone exposure • Orocutaneous fistula • Dental carries • Dry mouth • Difficulty swallowing • Pathologic fracture
TREATMENT	Hyperbaric oxygen therapy (HBOT) at, typically, 2.4 ATA for 90 minutes for a total of 30 to 60 treatments in conjunction with surgical intervention.
RISK FACTORS	• Pathologic fracture • Loss of bony support of the jaw • Need for major surgical intervention • Disfigurement
ORDER TESTS	MRI/X-Ray
FOLLOW-UP	Demonstrate clinical improvement during HBOT: • Reduction in pain • Improvement in quality of life • Closure of fistula • Decrease in discharge
CODES RELATED	L59.8, M27.2, M27.8

Traumatic Wounds

TYPE OF ULCER	Traumatic Wounds
DEFINITION	• Traumatic Wound: a wound or laceration of traumatic origin with no evidence of contamination or signs of active infection. • Dirty Traumatic Wound: a wound or laceration of traumatic origin that is contaminated. The risk of infection is high. • Infected Traumatic Wound: a wound or laceration of traumatic origin with signs of infection (secretions).
CAUSE	Traumatic wounds are caused by external force applied to the body.
TREATMENT	• Follow the SerenaGroup® The Practice of Wound Care™. • Consider negative wound pressure therapy.
RISK FACTORS	Patients with multiple comorbidities are at higher risk for poor healing.
DRESSING OPTIONS	• Maintain proper moisture balance • Refer to SerenaGroup® Formulary
FOLLOW-UP	Weekly follow-up visits until healed
CODES RELATED	S08.111S-S08.89XS, S09.311S-S09.313S, S28.1XXS-S29.002S, S38.211S-S39.023S, T81.30XS-T81.89XS,T87.41-T87.89

Venus Leg Ulcer (VLU)

TYPE OF ULCER	Venus Leg Ulcer (VLU)
DEFINITION	Venous leg ulcers are one of the more common types of leg ulcers. These ulcers typically appear in the gaiter area of the leg, above the malleolus to one inch below the knee as shallow but large wounds with irregular borders.
CAUSE	VLUs develop when the valves inside the veins of the lower extremities do not work sufficiently, resulting in backflow. This process leads to blood pooling in the veins (venous hypertension) followed by edema and eventually the development of an ulcer. Individuals who have previously had a deep vein thrombosis (DVT), family history of venous disease, advanced age, female gender, lower extremity orthopedic procedures, paralysis, obesity, pregnancy, occupations requiring prolonged standing and taller than average patients are at higher risk for developing venous leg ulcers.
ASSESSMENT	The clinical diagnosis of VLUs is based on physical examination. In questionable ulcers, venous duplex can assist in making the diagnosis. In addition, ulcers in which the etiology is unclear, consider a biopsy. Consider May-Thurner Syndrome in female patients with unilateral left leg swelling who are unable to tolerate compression due to pain. The diagnosis is made with arterial duplex.
TREATMENT	Multilayer compression therapy is the gold standard for VLUs. Minimal compression of 20 mmHg is recommended although 40 mmHg is preferred. Prior to the application of any compression wrap, vascular screening must be performed. Standard compression wraps require an ABI > 0.8. Light wraps are available for use in patients with ABI as low as 0.6. Change compression wraps weekly or more frequently as necessary due to exudate. Evidence supports the use of CTPs in patients with VLUs that have failed to heal by 40% in 4 weeks.

Venous Leg Ulcer (VLU) Cont.

RISK FACTORS	• Pain • Disruption of quality of life • Infection • Sepsis • Amputation • Creasing movement to prevent
DRESSING OPTIONS	Multilayer compression therapy is the standard for venous leg ulcers. Patients may also wear compression stockings over their dressings and wraps. Consider absorptive dressing to control exudate or dressings that reduce odor and pain. Refer to SerenaGroup® Formulary.
ORDER TESTS	Vascular screening on all patients
FOLLOW-UP	Weekly follow-up visits until ulcer is healed
CODES RELATED	I70.231-I70.678, I83.011-I83.228

Ankle Brachial Index/Toe Brachial Index

Ankle Brachial Index /Toe Brachial Index

An ankle brachial (ABI) or to brachial (TBI) index is completed in patients with lower extremity ulcers before compression therapy is applied.
ABI/TBI's are performed by a trained staff member, either a nurse or technician, who has specific knowledge and training with the cast being utilized.

Supplies:
Appropriate size sphygmomanometer or toe cuff and a Doppler with a 5 to 7 MHz probe.

Ankle Brachial Index (ABI):

1. Place the patient in a supine position for at least 10 minutes before the test. Obtain the brachial pressure in each arm using a Doppler probe. Record the highest brachial pressure.
2. Place the blood pressure cuff on the patient's leg 3 cm above the medial malleolus. Apply acoustic gel over the dorsalis pedis and posterior tibial pulse. Place the Doppler probe at the pulse location.
3. Inflate the cuff to a level 20-30mHg above the point that the pulse is no longer audible. Do not exceed 220 mmHg. Obtain the systolic pressure reading. Repeat at the second pulse location.
4. Record the highest systolic reading of the two, dorsalis pedis or the posterior tibial pulse for the ankle pressure of the ABI.
5. Divide the systolic ankle pressure by the highest systolic brachial pressure.

Toe Brachial Index (TBI):

1. Place the patient supine and take the blood pressure in both arms. This is the brachial pressure. The higher of the two readings is used for the ratio.
2. Place the toe pressure cuff on the great or second toe. The Doppler probe is placed at the tip of the great toe or second toe. The pulse is obtained with the Doppler.
3. Inflate the cuff until the Doppler signal stops. Keep the Doppler over the toe tip, the cuff is slowly deflated until the Doppler signal returns. This number is the toe systolic pressure.
4. The TBI is calculated by dividing the toe systolic pressures by the higher brachial systolic pressure.

Ankle Brachial Index/Toe Brachial Index

ABI interpretations:

- 1.4 indicates non-compressible vessels
- ≥ 0.96 Normal
- 0.71-0.96 Abnormal, mild obstruction
- 0.31-0.71 Abnormal. Moderate obstruction
- ≤ 0.31 Severe obstruction.

TBI Interpretations:

- 0.64± 0.20 in asymptomatic limbs
- 0.52± 020 in claudicating limbs
- 0.23±0.20 in limbs with ischemic rest pain, nonhealing ulcers
- Absolute pressure >30mmHg associated with ulcer healing

Topical Anesthetics

PROCEDURE	Topical Anesthetics
DEFINATION	Topical anesthetics are used to reduce pain during debridement.
PROCEDURE DETAILS	1. Obtain provider order for topical anesthetic. 2. Verify patient's identity using Hospital-approved identifiers. 3. Wash hands and don clean gloves. 4. Remove old dressing and discard. 5. Cleanse wound as appropriate. 6. Dry peripheral skin. 7. Complete the wound assessment. 8. Remove gloves and discard. 9. Wash hands and assemble necessary supplies. 10. Put on clean gloves. 11. Apply topical anesthetic as ordered with a tongue blade, foam or alginate-tipped applicator, dressing, or a syringe to the wound bed. 12. Cover the wound with gauze or a transparent film dressing. 13. Refer to specific product information for recommendations and/or provider direction as application and pretreatment times may vary with the product being used. 14. Appropriately discard all materials, remove gloves and wash hands. 15. Document product used and method of application, education given and patient's pain level in the medical record. 16. Verify the level of anesthesia prior to the procedure.
RISK FACTORS	Inadequate pain control
SPECIAL CONSIDERATIONS	Check patient's medical record for allergies. Observe for allergic reactions.

Debridement

PROCEDURE	Debridement
DEFINATION	Removal of necrotic and nonviable tissue to promote wound healing
PROCEDURE DETAILS	1. Explain procedure to patient 2. Verify patient's identity using the hospital-approved patient identifiers and obtain consent 3. To ensure patient safety, the Universal Protocol for operative and invasive procedures will be followed per hospital policy 4. Gather equipment 5. Wash hands 6. Set-up work surface 7. Position patient 8. Apply gloves and remove old dressing and discard 9. Wash hands and apply clean gloves 10. Cleanse wound 11. Apply topical or local anesthetics as ordered by provider prior to procedure. Refer to specific product information for application and pretreatment times 12. Perform and document the time out 13. Remove nonviable tissue and apply pressure or other technique to achieve hemostasis 14. Label any tissue samples and send to lab as needed 15. Irrigate wound with normal saline 16. Dry peripheral skin 17. Measure wound post-debridement and record in medical record 18. Apply appropriate dressing 19. Assess pain 20. Discard materials and supplies as appropriate; remove gloves and discard 21. Wash hands 22. Provide education 23. Document appropriately in the medical record (e.g. application of local anesthetic, tissue samples, wound measurements, patient education)

Debridement Cont.

PROCEDURE	Debridement Cont.
RISK FACTORS	• Infection • Bleeding
SPECIAL CONSIDERATIONS	Care should be taken when debriding around vital structures such as major blood vessels. Dressing or devices designed for hemostasis should be available. Refer to SerenaGroup® Formulary.
FOLLOW-UP	Weekly

Clean (non-sterile) Wound Dressings and Wound Cleansing Protocol

PROCEDURE	Clean (Non-Sterile) Wound Dressings and Wound Cleansing Protocol
DEFINATION	A procedure to cleanse and dress the wound
PROCEDURE DETAILS	1. Review physician order for wound dressing. The physician order should contain the following elements: ◦ The wound location ◦ Cleansing solution ◦ Primary dressing ◦ Secondary dressing if applicable ◦ Frequency of dressing changes 2. Identify the patient using the patient identifiers. 3. Clean work surface with approved disinfectant and allow drying. 4. Assemble all equipment and supplies. Check that all items are current, and packaging is intact. 5. If there is a potential for splashing (e.g., during irrigation), don mask and fluid resistant gown. 6. Wash hands or use hand sanitizer and don clean gloves. 7. Place disposable, absorbent, protective under pads beneath area to be dressed. 8. Carefully remove old dressing and discard. ◦ Scissors used to remove old dressing materials are cleaned manually of surface debris prior to usage on each new patient. ◦ Remove and discard gloves. Don another set of gloves. 9. Assess wound(s) and notify physician of any concerns (e.g., odor, drainage). 10. If ordered, irrigate wound(s) with ordered solution and dry periwound skin. ◦ Be careful to prevent cross-contamination between multiple wounds. ◦ Non cytotoxic wound cleanser may also be used per instructions.

Clean (non-sterile) Wound Dressings and Wound Cleansing Protocol Cont.

PROCEDURE	Clean (Non-Sterile) Wound Dressings and Wound Cleansing Protocol Cont.
PROCEDURE DETAILS CONT.	11. Wound cleansing technique: ◦ Moisten a gauze pad with cleansing agent. ◦ Clean the wound in full or half circles beginning in the center and working toward the outside, then discard. ◦ Use a new gauze pad for each circle. 12. Repeat for each wound using a new moistened gauze pad. Be careful to prevent cross-contamination with multiple wounds. 13.Dry surrounding tissue. 14.Reassess wound(s). ◦ Notify physician of any concerns (e.g. odor, drainage). ◦ Measure wound and record in accordance with policy ◦ "Wound/Ulcer Measurement." ◦ Photograph wound and record in accordance with policy "Wound and Patient Photography." ◦ Determine whether wound regression or progression requires a change to the original dressing order. 15. Remove and discard gloves, wash hands and don another set of clean gloves. 16. Apply peri-wound skin protectant as needed. 17. Apply primary dressing per manufacturer's guidelines. ◦ If physician has ordered a topical medication to be applied to the wound, the application of the medication may only be done by licensed clinical staff in accordance with state nurse practice acts. ◦ Keep dressings within the wound margins and do not overlap onto intact skin unless recommended by the manufacturer. 18. Apply secondary dressing, if ordered by the physician, per manufacturer's guidelines. ◦ Attempt to avoid contact to skin with adhesives. When this cannot be avoided, utilize hypoallergenic tape and a protective film barrier.

Clean (non-sterile) Wound Dressings and Wound Cleansing Protocol Cont.

PROCEDURE	Clean (Non-Sterile) Wound Dressings and Wound Cleansing Protocol Cont.
PROCEDURE DETAILS CONT.	19. Discard all waste materials and single use supplies. 20. Remove and discard gloves. Wash hands. 21. Educate patient on dressing (primary and/or secondary) at initial application and as needed with subsequent dressing changes. 22. Document dressing change, wound assessment and patient education. 23. Clean work surface with approved disinfectant.
RISK FACTORS	• Infection • Bleeding
SPECIAL CONSIDERATION	If the patient is receiving HBOT, use hyperbaric safe dressing. Refer to SerenaGroup® Formulary
FOLLOW-UP	Per physician/provider order

Palliative Care

PROCEDURE	Palliative Care
DEFINATION	Palliative care must be designated by the provider once it is determined that the patient's wound does not respond to, or the patient cannot tolerate, ongoing wound care. Typically, the provider will see the patient less often in the clinic setting and will order Home Health to provide ongoing wound care.The patients or family members can also participate in the palliative care as well without Home Health. The main goal of palliative care is to ensure the comfort level of the patient, improve his/her overall quality of life and maintain an infection free wound.
PROCEDURE DETAILS	A nurse, technician, home health provider, family member or the patient can provide palliative care. Supplies Needed: • Dressings, wraps and other supplies will be designated by the provider to ensure that the patient remains comfortable, and that his/her wound remains free of infection. • Supplies will be ordered and delivered to the patient's home as needed • Home Health will provide supplies as needed. Steps: • Provider designates need for palliative care • Home Health can be ordered • Ongoing supplies can be ordered • Patient education will be provided.
RISK FACTORS	Infection
SPECIAL CONSIDERATION	Patient and caregiver education is provided to recognize and report any signs and symptoms of infection or worsening condition.
FOLLOW-UP	Per physician/provider order

Negative Pressure Wound Therapy

TOPIC	Negative Pressure Wound Therapy
WHO CAN PERFORM	Negative pressure wound therapy must be ordered by a provider. Negative pressure wound therapy (NPWT) utilizes suction applied to a wound bed to promote healing. Negative pressure wound therapy can be applied by a trained staff member, either a nurse or technician, who has specific knowledge and training on the device being used.
APPROPRIATE PATIENT	NPWT has been used to treat pressure ulcers, diabetic ulcers, vascular and arterial ulcers, traumatic wounds, chronic/nonhealing wounds, wounds with exposed bone, tendon and/or other subcutaneous tissues, burns and skin grafts/muscle flaps.
CONTRA-INDICATIONS	NPWT is contraindicated when the wound is necrotic, there is a malignancy underlying the wound, the patient has untreated osteomyelitis, there are exposed blood vessels, active bleeding, and infection.
STEPS	Follow manufacturer's guidelines. Refer to SerenaGroup® Formulary.

Total Contact Cast (TCC)

TOPIC	Total Contact Cast (TCC)
DEFINATION	Total contact casting is the gold standard for offloading plantar diabetic foot ulcers. The cast is applied to be in total contact with the foot and leg being treated. The cast distributes weight across the foot evenly, allowing for offloading of ulcers and bony prominences. The cast will limit movement as well and protects the patient from further injury to the ulcer.
WHO IS ABLE TO APPLY	• A cast must be ordered by the provider if there is adequate blood supply to the foot. • A cast can be applied by a trained staff member, either nurse or technician, who has specific knowledge and training on the cast being utilized.
SUPPLIES NEEDED	• Primary dressing • Cast kit has all necessary supplies for the cast application • Cast boot or shoe (if required)
STEPS	Follow manufacturer's guidelines
SPECIAL CONSIDERATIONS	• Contraindications to TCC include arterial insufficiency, infection, and highly exudative wounds. • Patients should be instructed to report any pain, swelling or discomfort they may experience while wearing the cast. • When first attempting to walk with the cast while in the clinic, have patient utilize crutches, a cane or some other type of stabilization device. Patients may need some time to become accustomed to walking with the cast. • Use care in patients with difficulty ambulating.

Wound Packing

TOPIC	Wound Packing
DEFINATION	When a wound is deep, or when it tunnels under the skin, packing the wound can help it heal. The packing material absorbs any drainage from the wound, which helps the tissues heal from the inside out. Without the packing, the wound might close at the top without healing at the deeper areas of the wound.
WHO CAN PERFORM THE DUTIES	A nurse can perform wound packing
SUPPLIES NEEDED	• Packing material specific to patient's needs • Sterile wetting solution as needed • Cover dressing • Tape
STEPS	It is crucial to maintain a clean environment when packing a wound to reduce the possibility of infection. It is also important to provide education to patient and family members involved in the care of the patient to ensure compliance with wound packing steps: • Utilize proper PPE and maintain sterile environment around preparation and application areas • Cut and prepare packing material per manufacturer's guidelines • Loosely pack wound. The packing should contact the wound base and edges. • Leave a "tail" of packing material to allow for easier retrieval in future. • Document if multiple packing materials are used. • Apply cover dressing. • Secure with tape as needed.
RISK FACTORS	Infection
SPECIAL CONSIDERATIONS	Instruct patients to report the following conditions: • Wound has a foul odor • Wound becomes larger

Wound Packing Cont.

TOPIC	Wound Packing Cont.
SPECIAL CONSIDERATIONS CONT.	• Swelling, soreness or redness around the wound • Increased drainage from wound • Wound tissue changes color from pink to white, yellow or black in color • Fever above 101 degrees F • Shaking chills.
FOLLOW-UP	• Change packing as ordered by physician/provider • Weekly follow-up with wound care

Appendix A

The Safety of Punch Biopsies in Large Multicenter Clinical Trial

Serena TE, Cole W, Coe S, Harrell K, Serena L, Yaakov R, Rennie MY. The Safety of Punch Biopsies in Large Multicenter Trial on Chronic Wounds. Journal of Wound Care. Submitted 2019. In Review

Appendix B

Suggested Best Practice Evidence Based Elements of Medical Necessity and Clinical Documentation for Debridement

The appropriate interval and frequency of debridement depends on the individual clinical characteristics of the patient and the extent of the wound. It is highly recommended that the treatment plan for a patient who requires frequent repeated debridement be reevaluated and the Plan of Care updated accordingly.

Rationale to Remember:
Debridement will be considered not reasonable and necessary for a wound that is clean and free of necrotic tissue/slough.
Debridement is considered selective or non-selective unless the medical record supports that a surgical excisional debridement was performed.
Debridement is best provided under an individualized plan of care.

Active Wound Care Management
Debridement may be indicated whenever necrotic tissue as well as cellular or proteinaceous debris is present on an open wound in order to keep the wound in an active state of healing. Debridement may also be indicated in cases of abnormal wound healing or repair. The routine application of a topical or local anesthetic does not elevate active wound care management to surgical debridement. Debridement may be categorized as selective or non-selective.

Wound Care Selective Debridement may include:
Removal of specific, targeted areas of devitalized or necrotic tissue from a wound along the margin of viable tissue by sharp dissection utilizing scissors, scalpel, curettes, and/or tweezers/forceps. This procedure typically requires no anesthesia and generally has no or minimal associated bleeding.

Wound Care Non-Selective Debridement may include:
Mechanical Debridement: This type of debridement is the removal of necrotic tissue by cleansing, or application of a wet–to-dry or dry-to-dry dressing technique. Wet-to-dry dressings should be used judiciously as maceration of surrounding tissue may hinder healing. Generally, dressing changes are not considered a skilled service.

Appendix B Cont.

Enzymatic Debridement: Debridement with topical enzymes is used when the necrotic substances to be removed from a wound are protein, fiber and collagen. The manufacturer's product insert contains indications, contraindications, precautions, dosage and administration guidelines; it is the clinician's responsibility to comply with those guidelines.

Autolytic Debridement: This type of debridement is indicated where manageable amounts of necrotic tissue are present, and there is no infection. Autolytic debridement occurs when the enzymes that are naturally found in wound fluids are sequestered under synthetic dressings.

Maggot / larvae therapy: Debridement with medical-grade maggots in wounds.

Wound Care Surgical Debridement:
Conditions that may require surgical debridement of large amounts of skin may include but are not limited to rapidly spreading necrotizing process (sometimes seen with aggressive streptococcal infections), severe eczema, extensive skin trauma, including large abraded areas with ground-in dirt, or autoimmune skin diseases.

Surgical debridement occurs only if material has been excised and is typically reported for the treatment of a wound to clear and maintain the site free of devitalized tissue including but not limited to necrosis, eschar, slough, infected tissue, biofilm, abnormal granulation tissue, etc., and should be accomplished to the margins of viable tissue.

These procedures can be very effective but represent extensive debridement. They may be complex in nature and may on occasion require the use of anesthesia.

Appendix C

International Wound Infection Institute. Wound Infection and Clinical Practice.

http://www.woundinfection-institute.com/wp-content/uploads/2017/03/IWII-Wound-infection-in-clinical-practice.pdf

Appendix D

The Role of Bacterial Fluorescence Imaging Technology in Diagnostic and Antimicrobial Stewardship: An Opinion Paper

Wang S, Serena TE, Yaakov R, DaCosta R. The Role of Bacterial Fluorescence Imaging Technology in Diagnostic and Antimicrobial Stewardship. Advances in Wound Care. Submitted 2020. In Review.

EMR Quality Metrics

MEASURE NUMBER(S)	TITLE
DFU001	Process Measure: Adequate off-loading of DFU each visit
DFU002	Outcome Measure: DFU healing or closure
DFU004	Diabetic Foot & Ankle Care: Comprehensive Diabetic Foot Examination
VLU001	Process Measure: Adequate compression at each visit for patients with venous leg ulcers (VLU)
VLU002	VLU Outcome Measure: Healing or closure
VLU003	Process Measure: Plan of care for VLU not achieving 30% closure at 4 weeks
HBO001	Appropriate Use of Hyperbaric Oxygen Therapy (HBOT) for Patients with DFU
CTP001	Appropriate Use of Cellular or Tissue Based Products (CTP) for Patients Aged 18 years or older with a DFU or VLU
GWM001	Process Measure: Vascular assessment of patients with chronic leg ulcers
GWM002	Process Measure: Wound bed preparation through debridement of necrotic or non-viable tissue
GWM003	Patient Reported Experience of Care: Wound related quality of life
PQRS MEASURE #1	Diabetes: Hemoglobin A1C Poor Control
PQRS MEASURE #126, NQF #0417	Diabetes Mellitus: Diabetic foot and ankle care, peripheral neuropathy - neurological evaluation
PQRS MEASURE #130	Documentation of Current Medications in the Medical Record
PQRS MEASURE #226	Preventive Care and Screening: Tobacco use: screening and cessation intervention

SerenaGroup Quality Dashboard

MEASURE	TITLE
OPERATIONAL MEASURES	# of Discharged Patients
	% of Show Rate for New Patients
	% of Show Rate for Wound Care Patients
	% of Show Rate for HBO Patients
	% of New/Active HBO Pts with Approved HBO Checklist Completed
FINANCIAL MEASURES	Advanced Wound Care Productivity
	% of Total Charges with Modifier 25 for all Wound Care Patients Seen
QUALITY METRICS	% of Off-Loaded New DFU Patients
	% of Compressed New VLU Patients
	% of Vascular Assessments for New Chronic Wound/Ulcer Lower Extremity Patients
	% of Nutritional Screening Completed on all New Patients
	% of New Patients participating in the Antimicrobial Stewardship Program

Aseptic versus Clean Technique

Aseptic technique, a method used to prevent contamination with microorganisms, is recommended by the evidence-based guidelines for all instances of insertion and case of central venous catheters.

ASPECT	ASEPTIC TECHNIQUE	CLEAN TECHNIQUE
Utilization of Barriers	Requires the use of various barriers to prevent the transfer of microorganisms for health care personnel and the environment to the patient during a procedures, such as the following: • Sterile gloves • Sterile gowns • Sterile drapes • Masks	Involves reducing the numbers of microorganisms to minimize the risk of transmission from the environment or health care personnel, using the following: • Appropriate hand hygiene • Clean gloves
Patient and Equipment Preparation	Involves procedures for patient and equipment preparation, such as the following: • Antiseptic skin preparation of the patient at the time of the procedure • Sterile instruments • Sterile equipment • Sterile devices	Efforts are made to prevent direct contamination of supplies and materials.
Environmental Controls	Includes environmental controls, such as the following: • Keeping doors closed during operative procedures • Minimizing traffic into and out of operating rooms • Excluding unnecessary personnel during procedures	Patient's environment undergoes routine cleaning.
Contact Guidelines	Only sterile-to-sterile contact is allowed; sterile-to-nonsterile contact must be avoided.	Sterile-to-sterile rule does not apply.

Note: Anytime a central venous catheter is inserted when adherence to aseptic technique cannot be ensured, as might occur during a medical emergency, it is essential that the catheter be placed as soon as possible, preferably within 48 hours (Infusion Nurses Society. Infusion Nursing Standards Practice. J inf Nurs. 2011 Jan-Feb; 34 Suppl 1:S1-110. O'Grady NP, et al.; Healthcare Infection Control Practices Advisory Committee [HICPAC]. Guidelines for the prevention of intravascular catheter-related infections. Clin Infect Dis. 2011 May;52[9]:e162-193. Epub 2011 Apr 1).

Appendix G

MNA Mini Nutritional Assessment

https://www.mna-elderly.com/mna_forms.html