Developed by the BC Provincial Nursing Skin and Wound Committee in collaboration with the Wound Clinicians from:

TITLE	**Guideline: Assessment and Treatment of Lower Leg Ulcers (Arterial, Venous & Mixed) in Adults**
Practice Level	• Nurses in accordance with health authority / agency policy. • Care of clients[1] with lower leg ulcers requires an interprofessional approach to provide comprehensive, evidence-based assessment and treatment. This clinical practice guideline focuses solely on the role of the nurse, as one member of the interprofessional team providing care to these clients.
Background	• Atherosclerosis causes a disruption to arterial blood flow and leads to moderate / severe tissue ischemia and potentially arterial ulcers. Arterial ulcers are often non-healable unless tissue perfusion can be improved. If untreated or poorly managed, these ulcers may progress to invasive infection or gangrene that may necessitate amputation. • Venous insufficiency occurs when blood flow is disrupted due to valve dysfunction, complete or partial blockage of the deep veins, and / or failure of the calf muscle pump. These cause sluggish circulation, poor venous return and eventual chronic venous hypertension which may result in venous ulcers. • Mixed ulcers are mostly seen in older clients and include signs and symptoms of both arterial & venous ulcers; this makes assessment and treatment challenging. The ankle brachial index (ABI) [2] with mixed ulcers is usually between 0.8 and 0.5. • It is necessary to carry out a general and a comprehensive lower leg assessment (basic and advanced) as well as a wound assessment to differentiate wound type, as treatment strategies for arterial, venous & mixed wounds differ. • Risk factors, such as poor nutrition and smoking, inhibit wound healing and must be addressed before healing can occur. • Management of arterial insufficiency and venous insufficiency requires client education and possibly lifestyle change to support healing. Note that the incidence of arterial insufficiency increases with age.
Indications / Contraindications	Use this guideline for adult clients who have a lower extremity ulcer due to arterial or venous insufficiency.
Definitions	**Ankle Brachial Index** (ABI) – A numerical figure that indicates the amount of arterial blood flow to the extremity; determined using a handheld or automatic Doppler ultrasound by comparing the ankle systolic pressure & the brachial systolic pressure with the ABI being a ratio of the two. **Aseptic Technique –** Technique used to limit the transfer of microorganisms from one person to another by minimizing the microbe count and preventing cross contamination; includes sterile technique, no touch technique and clean technique. The technique chosen is based on the clinical condition of the client, type and healability of the wound, invasiveness of the dressing procedure, goal of care and agency policy. ○ Sterile Technique – the use of sterile gloves, a sterile field, sterile dressing tray, sterile instruments, sterile solution and sterile dressings; only sterile gloved hands or instruments are used for direct contact with the wound. ○ No-Touch Technique – the use of clean gloves and a sterile field, sterile dressing tray, sterile instruments, sterile solution and sterile dressings; only sterile instruments are used for direct contact with the wound. ○ Clean Technique – the use of clean gloves (single use non sterile), a clean field, a clean or sterile dressing tray, clean dressings and instruments (single client use), clean solution (single client use); clean gloved hands are used for direct contact with the wound. **Arterial Compromise –** Insufficient arterial blood flow to the lower extremities; caused by occlusive atherosclerotic

[1] The term client includes recipients of care in the community (client), residential care (resident) and acute care (patient).

[2] Registered nurses must successfully complete additional education before carrying out ankle brachial pressure index testing. Agency / health authority policy and standards should be in place to support the practice.

plaques or emboli, damaged, diseased or weak arteries, arterio-venous fistulas, aneurysms, hypercoagulability states and heavy use of tobacco. Signs of arterial compromise include pale, cyanotic or mottled skin over the lower legs and feet, absent or decreased sensation, tingling, diminished sense of temperature, muscle pain, reduced or absent peripheral pulses, atrophy of the muscle in the lower legs and possibly arterial ulcers.

Arterial Ulcers – See Appendix A.

Atrophie Blanche – White areas of extremely thin, fragile skin dotted with tiny blood vessels; seen in clients with venous insufficiency; may be painful; these areas are at greater risk for breakdown.

Capillary Refill - Length of time taken for skin colour to return to normal after pressure applied to a toe or finger nail causes the area to blanche; normal capillary refill is affected by age, gender and ambient temperature. Normal refill time is ≤ 2 seconds in children and ≤ 3 seconds in adults, however normal refill times increase with age and is usually higher in adult women than men. Abnormal values may indicate dehydration or impaired peripheral perfusion.

Cellulitis - Infection of the skin often characterized with localized erythema, pain, swelling and warmth.

Conservative Sharp Wound Debridement [3] **–** The removal of nonviable tissue to the level of viable tissue, using a scalpel, scissors or curette to create a clean wound bed; involves minimal pain and bleeding, and does not require general anaesthesia; may require analgesics and/or local or topical anaesthesia.

Crepitus – Crackling, crinkly, or grating feeling or sound in the soft tissues. It may indicate gas gangrene and is considered a medical emergency requiring immediate physician / NP notification.

CWSM – Means "circulation, warmth, sensation, mobility" and is the standard test used to check vascular status.

Dependent Rubor – The lower leg turns red / blue when it is in a dependent position caused by blood rushing into ischemic tissue; occurs when peripheral vessels are severely damaged and remain dilated because they are no longer able to constrict; common in advanced arterial disease.

Dermatitis – Inflammation of the skin, due to either direct contact with an irritating substance, or to an allergic reaction. Symptoms include redness, itching, and in some cases blistering; may be eczematous or non-eczematous.

Dry Gangrene – Gangrene that develops in the presence of arterial obstruction and is characterized by dryness or mummification of the dead tissue without bacterial decomposition or infection; is a dark brown color.

Dysreflexia - A syndrome affecting persons with a spinal cord lesion above the mid-thoracic level; characterized by hypertension, bradycardia, severe headaches and convulsions as well as pallor below and flushing above the cord lesions. It is caused by simultaneous sympathetic and parasympathetic activity and may occur with bowel or bladder distension, pain or pressure ulcers.

Erythema – Redness of the skin caused by dilation and congestion of the capillaries; often a sign of inflammation or infection.

Eschar, dry stable – Firm, dry necrotic tissue with an absence of drainage, edema, erythema, fluctuance or separation from the wound edge; may be black or brown in color and is attached to the wound edges and wound base.

Eschar, soft boggy – Soft, boggy necrotic tissue; black, brown or gray in colour; may be firmly or loosely attached to the wound edges and wound base; fluctuance and drainage may be present.

Fluctuance – Occurs when the wound has a wave-like motion when it is palpated.

Gangrene – Death or decay of body tissues due to loss of blood supply to the affected area; it may be followed by bacterial infection; gangrene can be wet or dry.

Healable Wound – A wound that has an adequate blood supply, correctable risk factors and a cause, such as pressure that can be treated.

Hemosiderin Staining – Leakage of red blood cells in surrounding tissue due to venous hypertension in the lower leg; over time presents as reddish brown skin pigmentation.

Intermittent Claudication – Characterized by pain, cramping, burning and aching; caused by insufficient arterial blood flow to the extremities with activity; is often relieved by rest in 2 to 5 minutes; occurs when ABI is less than 0.9; may not be evident if client has peripheral neuropathy or walks slowly.

Lipodermatosclerosis – Woody, fibrous hardening of the soft tissue in the lower leg: often presents as a "champagne" shaped lower leg.

Maintenance Wound – A wound that is potentially healable but is impacted by client, wound and / or system barriers (lack of appropriate resources) that cannot be mitigated resulting in wound healing that is slow or stalled.

Mixed Arterial / Venous Ulcers – See Appendix A.

Non-healable Wound – Wound that is deemed non-healable due to inadequate blood supply, the inability to treat

[3] Registered nurses must successfully complete additional education and follow an established guideline when carrying out CSWD. Agency / health authority policy and standards should be in place to support this practice.

	the cause (malignant wounds) or wound exacerbating factors that cannot be corrected. **"Offloading" –** The elimination of pressure over an area of the foot with existing skin breakdown; examples include permanent or removable casts or therapeutic orthotics. **Patch test –** A method of testing used to determine if a specific substance is causing allergic inflammation (contact dermatitis) of the skin. **Peripheral Vascular Disease (PVD) –** A disease affecting the peripheral circulation rather than the cardiac circulation; includes diseases of both peripheral arteries and veins such as diabetes, Buerger's disease, hypertension, and Raynaud's disease. Intermittent claudication due to inadequate blood flow to the leg occurs in peripheral artery disease (PAD) while varicose veins, edema and spider veins occur in peripheral vein disease; smoking is a major risk factor. **Slough -** Soft, moist necrotic tissue which is brown, tan, yellow or green in colour. It may be thin or thick and the consistency may be fibrous, stringy or mucinous. It may be firmly or loosely attached to the wound edges and base. **Stasis Dermatitis** - Inflammatory reaction (eczema and edema) of the lower legs; caused by increased permeability of dermal capillaries; occurs with venous insufficiency. **Stemmer's Sign –** An inability to lift the edematous or thickened skin fold on the dorsal surface at the base of the second toe when pinched; a positive Stemmer's sign suggests lymphedema but the absence does not rule this out. **Varicosities** - Dilated and distended veins in the leg which become progressively larger and more painful. **Venous Insufficiency** – Occurs when the venous wall and/or valves in the leg are not working effectively making it difficult for blood to be pumped from the legs to the heart; symptoms include aching or tired legs, varicose veins, edema, skin changes on the lower leg, flaking or itching skin and possibly stasis ulcers due to blood pooling in the lower legs and feet. **Venous Ulcers** – See Appendix A. **Wet Gangrene** – Gangrene characterized by bacterial putrefaction that produces cellulitis adjacent to necrotic areas. May produce gas gangrene which is a type of wet gangrene commonly caused by bacteria and is characterized by the presence of gas in the affected tissue. **Woody Fibrosis** – See Lipodermatosclerosis above; deposits of fibrin and fat in the deep dermis that result in a woody induration of the gaiter area (mid-calf to just below the ankle).
Related Documents	Guideline Summary: Arterial Ulcers Guideline Summary: Venous Ulcers Guideline: Assessment and Treatment of Diabetic / Neuropathic Ulcers Guideline: Compression Therapy Procedure: Ankle Brachial Index using Handheld Doppler Procedure: Ankle Brachial Index using Automatic ABI System Procedure: Monofilament Testing for Loss of Protective Sensation Assessment Tool: Basic Lower Limb Assessment. Assessment Tool: Advanced Lower Limb Assessment.

Assessment and Determination of Treatment Goals

Assessment

To develop a comprehensive plan of care and determine treatment goals, assess the following:

1. Client Concerns:
    a. Clients level of understanding about the wound, healability and risk factors.
    b. Impact of the wound on client's daily life and body image.
    c. Social and financial concerns and availability of support systems to address these concerns.
    d. Emotional, cognitive, behavioural or mental health concerns and availability of support systems to address these concerns.
    e. Quality of life issues that could impact treatment.
    f. Impact of client's current environment on client care.
    g. Client and family preferences for treatment of the wound, risk factors and the goals of care.
    h. Client and family ability and motivation to understand and adhere to the treatment plan.

2. Risk Factors for Wound Healability
    a. Impaired nutritional status:
        i. Overweight, poor glycemic control, low body weight, low serum albumin or pre albumin [4], edema, appetite changes, cachexia, dehydration, restrictive diet and prolonged NPO.
        ii. Inadequate nutritional intake of protein, calories, or fluid as evidenced by % of meal intake or calorie counts.
        iii. Possible causes of poor intake including poor dentition, difficulty swallowing, positioning, inability to self-feed, GI symptoms, pain.
        iv. Assess renal function if increased protein intake is indicated for the client.
    b. Medical conditions (see Appendix A); previous leg surgery, autoimmune diseases, heart failure, trauma or history of DVT, lower limb ulcers or a family history of leg ulceration.
    c. Lifestyle factors such as cigarette and substance use and motivation to quit, foot care routines, use and style of footwear, and activity / exercise routines.
    d. History of compression therapy, adherence to therapy and ability to apply and remove compression stockings
    e. Oxygenation status of the skin and underlying tissues, e.g. COPD, heart failure, anemia.
    f. Medications that interfere with wound healing, e.g. NSAIDs, antineoplastics, systemic corticosteroids, anticoagulants, vasopressors.
    g. MRSA or VRE colonization.
    h. Ability to mobilize (strength, balance, gait) and degree of knee, ankle and toe mobility including flexion and extension.
    i. Allergies, especially latex allergies and sensitivities.
    j. Advanced age.

3. Pain
    a. Type, location, frequency and quality of pain in the ulcer or the lower extremities or as a result of treatment.
    b. Pain severity using client self-report, observation of non-verbal cues and/or a pain scale, e.g. Wong Baker FACES Scale, Visual Analog Scale.
    c. Onset & duration of pain, and precipitating / alleviating factors.
    d. Current pharmacological and non pharmacological interventions for pain and their effectiveness.
    e. Presence of intermittent claudication and nocturnal or resting pain.
    f. Autonomic dysreflexia and/or increased spasticity in clients with a spinal cord injury.
    g. Impact of pain on function, sleep and mood.

4. Basic Lower Limb Assessment – Compare both feet & lower legs when completing this assessment. (Link to Basic Lower Limb Assessment form).
    a. Note missing limbs or digits
    b. Skin colour of toes, feet / lower extremities.
    c. Warmth of toes / feet / lower extremities.
    d. Palpate pedal pulses (posterior tibial & dorsalis pedis); they are usually present with venous insufficiency but may be difficult to palpate due to edema.
    e. Capillary refill on the dorsum of the foot and toes.
    f. Edema
        i. Measure ankle circumference 10 cm. from the bottom of the heel and calf circumference 30 cm. from the bottom of the heel; measuring early in the morning or as soon as possible after removing a compression bandage provides the most accurate measurement.
        ii. Note the highest level of edema on the legs.
    g. Note time of day measurements are taken and degree of pitting edema.
    h. Sensation of both legs / feet, e.g. numbness, burning, tingling
    i. Evidence of healed ulcers and scars from previous lower leg surgery.

[4] Wound healing is impaired in clients with an albumin of < 35 g/l or a pre-albumin of < 180 mg / L (female) or < 215 mg / L (male). However, serum albumin and pre-albumin are poor indicators of nutritional status in acute illness as they are negative acute-phase reactants and may be decreased with infection and inflammation.

5. Advanced Lower Leg Assessment – If there are concerns arising from the basic assessment complete an advanced assessment. An advanced lower leg assessment is completed by a wound clinician or designate. (Link to Advanced Lower Limb Assessment form)
    a. Measure ABI on both legs or refer to a wound clinician for same; palpating peripheral pulses is not sufficient to rule out arterial disease.
    b. Toe Brachial Index, if indicated.
    c. Test for loss of protective sensation in both feet using monofilament [5] testing (Link to Monofilament DST).
    d. Assess Stemmer's sign.
    e. Determine lower leg contour noting irregularly shaped legs (e.g. champagne bottle shaped leg)
    f. Foot deformities (e.g., corns, hammer toes, acute and chronic Charcot foot).
    g. Assess the toe nails for abnormalities.
    h. Assess the skin over the foot and lower leg for the following:
        i. Venous or contact dermatitis / eczema with evidence of erythema, scaling, excoriation and pruritus.
        ii. Atrophie blanche or ankle flare and varicose veins.
        iii. Colour of feet and lower legs in elevated & dependent positions.

6. Wound Assessment:
    a. History of current & previous lower leg ulcers and date of onset.
    b. Location of wound on the lower extremity (See Appendix A).
    c. Wound measurements; check for undermining or sinus tracts and wounds probing to bone.
    d. Appearance of wound bed noting percentage of tissue type.
    e. Amount & type of exudate.
    f. Presence of odour after cleansing.
    g. Description of wound edges and peri-wound skin.

7. Wound Infection

Clinical Signs and Symptoms of Wound Infection

Increasing severity of infection

Increased Bacterial Bioburden	Localized Infection	Systemic Infection
Non-healing (minimal change in wound measurements after 3 weeks of care)	Onset of wound pain or increasing pain	General malaise (predominantly in elderly & immune compromised clients and children)
Non–granulation tissue (pink to bright red non-pebbly tissue)	Peri wound induration greater than /equal to 2cm	Fever (may be muted in clients who are elderly or immunocompromised)
Friable or hypergranulation tissue	Peri wound erythema ≥ 2 cm	Rigor / chills
New areas of necrotic slough	Increased peri wound warmth	Change in behaviour or cognition (especially in elderly clients)
Increased amount of exudate	Increased wound size and / or the development of sinus tracts and / or satellite wounds	Unexplained high blood sugar (in clients who are diabetic)
Change in characteristics of exudate from watery and serous to purulent	Purulent exudate	Septic shock potentially leading to multi organ failure
Odour after wound cleansing	Increased dysreflexia / spasticity in clients with spinal cord injury	
	Wound that probes to bone	
3 or more of the following S & S are sufficient for a clinical diagnosis of potential or actual wound infection.		

Adapted from: Sibbald, G., et al. (2006). Increased bacterial burden and infection: The story of NERDS and STONES. *Advances in Skin and Wound Care*, 19(8): 158.

[5] RNs carrying out monofilament testing must successfully complete additional education.

   a. Arterial Compromise
      i. Visible evidence of infection may be muted or non existent due to compromised arterial blood flow.
   b. Venous Insufficiency
      i. Evidence of peri-ulcer inflammation may be present caused by venous dermatitis, allergic contact dermatitis or irritant contact dermatitis; these present as erythema, scaling, erosions & excoriations.
   c. If 3 or more signs and symptoms of an infection are evident and the infection is not currently being treated, take a swab for culture and sensitivity.
   d. Refer to a physician / NP if C & S results are abnormal.

8. Investigations (where these are available), based on results from the client assessment could include:
   a. Albumin or pre-albumin testing for chronic wounds if nutritional concerns are present and the client is not acutely ill.
   b. HgA1c and blood glucose testing if client has diabetes.
   c. Patch testing if dermatitis and/or eczema are present.
   d. Radiology studies to r/o osteomyelitis if the wound probes to bone.
   e. If the ABI[6] is < 0.9 or > 1.3 or the client has absent or decreased pedal pulses refer to a physician / NP or wound clinician for a more in depth assessment of peripheral circulation, e.g. vascular studies. ABI values must always be considered in the context of a full lower leg assessment.

Determine Wound Treatment Goals

1. Wound treatment goals are determine following analysis of the overall assessment findings including:
   a. Client and family willingness and ability to participate in and adhere to the care plan.
   b. Client concerns and risk factors for wound healability.
   c. Whether the wound is arterial, venous or mixed – See Appendix A for description of wound and limb changes characteristic of arterial compromise and venous insufficiency.
   d. The effectiveness of peripheral circulation:
      i. An ABI between 0.91 and 1.30 indicates the absence of significant arterial disease and a wound that is healable.
      ii. An ABI between 0.41 and 0.90 indicates mild to severe arterial compromise and requires further assessment to determine healability.
      iii. An ABI greater than / equal to 1.31 indicates arterial calcification and requires further assessment to determine healability.
      iv. An ABI of less than/equal to 0.40 indicates critical leg ischemia with a very low probability of healing and requires immediate wound clinician or physician / NP notification if this is a new finding or reflects a change in condition.
      v. A palpable dorsalis pedis or posterior tibial pulse may indicate a systolic pressure of ≥80 mmHg and the potential to heal however palpating pedal pulses is not sufficient to rule out arterial disease.
   e. Available resources and supplies.

2. Chose the appropriate wound treatment goal based on an analysis of the information in #1:
   a. To heal the wound.
   b. To maintain the wound (wound has the potential to heal but is healing slowly or is stalled due to client, wound or system factors that cannot be mitigated).
   c. To monitor and manage the non-healable wound e.g. Kennedy Terminal Ulcer, dry gangrene.

[6] Registered nurses must successfully complete additional education before carrying out ankle brachial pressure index testing. Agency / health authority policy and standards must be in place to support practice.

Interventions

Develop a plan of care, in conjunction with the client / family that incorporates client care, treatment of risk factors, determining wound treatment goals, wound management, intended and unintended outcomes, client education and discharge plans.

Client Care Management

1. Client Concerns
    a. The plan of care should take into account client and family abilities, concerns, preferences and motivation for treatment.
    b. Refer to Social Work, if available for emotional support and counselling as needed.
    c. Refer to Social Work if there are psychosocial concerns or concerns about the ability to pay for the costs of health care.
    d. Refer the client to the appropriate professionals to support improved health and wound healing, e.g. improved diet, off-loading, exercise plans.
    e. Provide support to clients and families when ulcers develop at the end of life and incorporate client and family wishes into the care plan.

2. Treat Risk Factors for Wound Healability – All Lower Leg Ulcers
    a. Nutritional Care:
        i. Consult with a dietitian, if available if the wound is not healing and the client has one or more of the following:
            - Nutritional risk factors such as weight loss, poor glycemic control, poor intake, obesity, dehydration, TPN / tube feed.
            - Abnormal albumin or pre albumin values in non-acute clients with chronic wounds.
        ii. Maximize the client's nutritional status through adequate calorie and protein intake [7] if compatible with nutritional goals of care.
        iii. Reassess the need for protein supplements and additional fluids as the client's condition changes.
        iv. Encourage 1500 – 2000 ml of fluid daily or ≥ 30 ml / kg of body weight; offer fluids q2h for adult clients[8] with dehydration, fever, vomiting, profuse sweating, diarrhea or heavily draining wounds, unless contraindicated, e.g. heart failure, renal failure, low body weight elderly clients.
        v. Document the % of meal intake and record any issues with diet tolerance or acceptance.
        vi. Refer to the appropriate professional if client has difficulty swallowing or poor dentition
        vii. Weigh client every 1-2 weeks to identify weigh loss or gain.
    b. Foot Care
        i. Encourage client to avoid walking barefoot.
        ii. Refer client to an Occupational Therapy or orthotist / pedorthist, where available for appropriate foot wear.
        iii. Encourage client or family to carry out proper foot care including visual inspection, hygiene and moisturizing (ensure spaces between toes are dry) and get toenails trimmed and callus pared by a professional; client / family should access a podiatrist or foot care nurse if unable to provide their own foot care.
        iv. Encourage clients with diabetes to get a diabetic foot screen at least annually and more frequently for clients with multiple risk factors [9] (Link to Diabetic Ulcer DST).
    c. Based on client assessment, collaborate with a PT/ OT to assess and recommend the use of equipment and pressure redistribution devices and develop a mobilization plan if appropriate.
    d. Elevate heels off the surface of the bed using a pillow, a therapeutic pressure offloading device or a device specifically designed for the client that ensures all pressure is eliminated from the heels and feet when the client is in bed. Do not use rolled blankets, towels, incontinence pads or IV bags. Heel protectors may protect the heel from fiction and shear but they do not protect against pressure as they do not elevate the heel off of the bed.

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[7] Clients with chronic wounds should receive 35 kcal / kg of energy dense foods per day including 1.5 g of protein / kg [24]. Assess renal function if increased protein intake is indicated.

[8] Assess for renal or liver dysfunction and heart failure if increased fluid intake is indicated.

[9] Factors that place diabetic clients at high risk include decreased sensation in the foot, foot deformities, infection, previous amputation and previous ulceration.

e. Encourage clients to take medication as prescribed.
f. Encourage clients to monitor pre-existing illnesses such as stroke, heart failure, angina / MI & other cardiac problems, hypertension, renal problems and/or high lipid levels and consult a physician / NP if changes occur.
g. Support clients to stop smoking and discuss referral to a smoking cessation program; refer for harm reduction / substance use management if the client consents.

3. Risk Factors for Healability – **Arterial Compromise**
   a. Support the client to eliminate restrictive clothing.
   b. Protect extremities from cold, heat and trauma.
   c. Elevate head of bed 10-15 cms (4-6 inches) to maintain lower leg position below the level of the heart.
   d. Support client to access a supervised exercise program as tolerated; consult with a physiotherapist as needed.

4. Risk Factors for Healability – **Venous Insufficiency**
   a. Compression therapy is the treatment of choice for venous insufficiency if the ABI indicates sufficient arterial flow.
      i. Consult a wound clinician[10] or physician / NP to determine the appropriate level of compression based on the client's ABI and lower leg assessment. (Link to Compression Therapy DST)
      ii. Compression by any method is contraindicated with significant arterial compromise (ABI < 0.5), untreated DVT / phlebitis, cellulitis, uncontrolled heart failure or infection when the client is not on antibiotics.
   b. If cardiac and respiratory status is stable, encourage client to elevate legs above level of heart 2 - 3 times daily for up to 30 minutes and elevate the foot of bed on 5 cm (2 inch) blocks or bed risers if heart failure is ruled out.
   c. Be aware that certain products such as lanolin, latex, perfumes, cetylsteryl alcohol & topical antibiotics can cause sensitivities or allergies and avoid if possible; protect against insect bites.
   d. Support clients to eliminate restrictive clothing, sit without legs crossed and avoid sitting or standing for long periods to reduce constriction of the blood vessels.
   e. Encourage regular walking & active ROM of ankles to increase activity in the calf muscle pump which promotes venous return; refer to physiotherapy as needed.

5. Lower Leg Follow-Up Assessment (Link to Appendix A)
   a. For clients with lower leg ulcers, a repeat basic lower limb assessment (colour, warmth, circulation, movement & edema) is completed at least every 2 weeks.
   b. A comprehensive lower leg assessment (Basic Lower Limb and Advanced Lower Limb Assessments including an ABI) is completed:
      i. Every 6 months for clients with a healable lower leg or foot wound.
      ii. Every 6 months for clients receiving compression therapy.
      iii. When either of the following occur:
         - Increasing lower leg or foot pain unrelated to infection.
         - Increasing signs of arterial insufficiency, such as delayed capillary refill, cold skin temperature and absent or diminished peripheral pulses.

6. Pain Relief
   a. If client has wound pain or treatment-related pain, organize care to coordinate with analgesic administration allowing sufficient time for the analgesic to take effect.
   b. Administer analgesic medication regularly and in the appropriate dose to control pain; refer the client to a physician / NP if pain is not well controlled.
   c. Refer to physician / NP to determine need for topical analgesic (e.g. morphine) or anaesthetic (e.g. EMLA) if wound pain not well managed. Consult with a pharmacist regarding topical morphine dosage as guidelines are not available in standard drug information resources such as the CPS or LexiComp.
   d. Use appropriate medications to control neuropathic pain, if present.
   e. Encourage clients to request a "time-out" during painful procedures.

[10] Nurses *directing* compression therapy must first complete an advanced wound management program. Nurses *applying* compression dressings must have additional wound care education. Agency / health authority policy and standards must be in place to support practice.

f. Use dressings that are less likely to cause pain & trauma on removal (non-adherent dressings) or dressings that require less frequent changes.
g. Encourage repositioning as a means to reduce pain; use support surfaces to reduce pressure.
h. Reassess pain at regular intervals and note increase in severity.

7. Wound Infection
   a. Implement strategies to prevent infection, e.g. hand-washing, appropriated aseptic dressing technique.
   b. Refer to a wound clinician or physician / NP if signs and symptoms of infection are present and / or the wound probes to bone.
   c. Debride non viable tissue using a debridement method that is appropriate for the wound.
   d. For wounds with significant bioburden, use broad spectrum antimicrobial dressings that have a low potential for developing resistance.
   e. Normal saline or sterile water containers should be single client use only and **must be** discarded after 24 hours if there is solution left over. Dressing supplies must be for single client use only.

Wound Care Management – Arterial Compromise

1. A wound clinician and / or physician / NP is always involved in planning wound care for clients with arterial compromise and must be notified if the wound does not show signs of healing after 2-4 weeks of treatment or if the wound deteriorates.

2. Wound Treatment – **Non-Healable Dry Ulcer (Arterial)**
   a. If circulation is severely impaired, revascularization surgery is not possible or is unsuccessful and/or the wound is covered with hard, dry eschar, debridement and moist wound healing are contraindicated.
   b. Goal of Treatment – Maintain dry eschar and protect the wound.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Choose the appropriate aseptic technique (sterile, no touch or clean) based on the following considerations: the clinical condition of the client, type and healability of the wound, invasiveness of the dressing procedure, goal of care and agency policy.
      iii. **Keep the wound dry**; do not cleanse with normal saline or water as this may soften the eschar.
      iv. Cleanse with an antiseptic solution (povidone iodine or chlorhexidene) and pat dry to remove any excess solution. Paint wound with povidone iodine or chlorhexidene daily or every other day and ensure the wound remains dry.
      v. Apply a protective dry dressing such as gauze, if indicated. If a dry dressing is applied, allow the povidone iodine or chlorhexidene solution to dry before applying the dressing.
      vi. Apply moisturizer to the surrounding skin.
      vii. If dry eschar begins to lift or becomes moist / boggy, consult a wound clinician or physician / NP as this could indicate wet gangrene.
   c. Determine the dressing change frequency based upon the wound assessment including the client's risk for infection, the dressing product used to control the bacterial load and balance these with the need to minimize wound disturbance to allow for healing.
   d. Reassess the wound at every dressing change and do a full wound reassessment as per the client's care plan.

3. Wound Treatment – **Non-Healable Moist Ulcer (Arterial)**
   a. If circulation is severely impaired, revascularization surgery is not possible or is unsuccessful and/or the wound is covered with moist boggy slough, debridement and moist wound healing are contraindicated.
   b. Goal of Treatment – Dry the wound bed if possible and protect the wound.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Choose the type of aseptic technique (sterile, no touch or clean) based on the following considerations: the clinical condition of the client, type and healability of the wound, invasiveness of the dressing procedure, goal of care and agency policy.
      iii. Use an appropriate aseptic technique during dressing changes to prevent infection.
      iv. Cleanse with normal saline or water; pat dry to **remove excess moisture**.

v. Paint small wounds with an antiseptic solution (povidone iodine or chlorhexidene); consult a wound clinician or physician / NP for larger wounds or if the antiseptic is ineffective in drying the wound.
vi. Apply a protective dry wound dressing.
vii. Hydrate the surrounding skin with moisturizer.

c. Determine the dressing change frequency based upon the wound assessment including the client's risk for infection, the dressing product used to control the bacterial load, the effectiveness of the cover dressing to manage the anticipated drainage and balance these with the need to minimize wound disturbance to allow for healing.
d. Reassess the wound at every dressing change and do a full wound reassessment as per the client's care plan.

4. Wound Treatment – **Healable Dry Ulcer (Arterial)**
   a. Goal of Treatment – Maintain dry eschar and protect the wound.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Choose the type of aseptic technique (sterile, no-touch or clean) based on the following considerations: the clinical condition of the client, invasiveness of the dressing procedure, wound type and healability, goal of care and agency policy.
      iii. Use appropriate aseptic technique during dressing changes to prevent infection.
      iv. **Keep the wound dry**; do not cleanse with normal saline or water.
      v. Paint the wound with an antiseptic solution (povidone iodine or chlorhexidene) daily or every other day to ensure the wound remains dry.
      vi. Apply a protective dry dressing such as gauze, if indicated
      vii. Apply moisturizer to the surrounding skin.
      viii. If dry eschar begins to lift or becomes moist / boggy, consult a wound clinician or physician / NP as this could indicate wet gangrene.
   b. Determine the dressing change frequency based upon the wound assessment including the client's risk for infection, the dressing product used to control the bacterial load and balance these with the need to minimize wound disturbance to allow for healing.
   c. Reassess the wound at every dressing change and do a full wound reassessment as per the client's care plan.

5. Wound Treatment – **Healable Moist Ulcer (Arterial)**
   a. If circulation is adequate for healing, **debride** moist slough using autolytic debridement. If autolytic debridement is not effective within 1 week of treatment, refer to a wound clinician or physician / NP to determine the need for other methods of debridement.
   b. Goal of Treatment – Moist wound healing
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Choose the type of aseptic technique (sterile, no-touch or clean) based on the following considerations: clinical condition of the client, type and healability of the wound, invasiveness of the dressing procedure, goal of care and agency policy.
      iii. Cleanse with at least room temperature sterile normal saline or/ sterile water; foot soaks are contraindicated.
      iv. If irrigation is required to remove exudate and/ or slough from the wound, gently irrigate using a 30 – 35 mL syringe with a wound irrigation tip catheter or an 18 - 19 gauge device. For wounds that are clean use a squeezable 30 – 100 ml normal saline or water container designated for wound cleansing and held 10 – 15 cm (4-6 inches) from the wound.[11]
      v. When irrigating the wound, use personal protective equipment to protect from back-splash.
      vi. Loosely fill any dead space, if present; use caution when packing plantar ulcers as over packing will easily cause increased pressure and further tissue damage.
      vii. Keep the peri wound skin dry; use skin sealants, protectants or moisture barriers as needed.
      viii. Apply an appropriate dressing that will maintain moisture balance within the wound.
      ix. Apply moisturizer to the surrounding skin.

[11] These cleansing devices deliver 8 – 15 psi of pressure which is enough to remove necrotic tissue, slough, bacteria and debris without damaging granulation tissue.

c. Determine the dressing change frequency based upon the wound assessment including the client's risk for infection, the dressing product used to control the bacterial load, the effectiveness of the cover dressing to manage any drainage and balance these with the need to minimize wound disturbance to allow for healing.
d. Reassess the wound at every dressing change and do a full wound reassessment as per the client's care plan.

6. Notify a wound clinician or physician / NP if the following occur:
   a. If the limb becomes gangrenous, notify a physician / NP immediately.
   b. The client has an ABI less than 0.91 or greater than 1.30 if this is a new finding.
   c. If the client has an ABI less than 0.41, this requires immediate physician / NP notification if this is a new finding.
   d. An acute onset of pain or rest pain develops in the foot.
   e. The wound probes to bone if this is a new finding.

Wound Care Management – Venous Insufficiency

1. A wound clinician and / or physician / NP are always involved in care planning for clients with venous insufficiency and must be notified if the wound does not show signs of healing after 2-4 weeks of treatment or if the wound deteriorates.

2. Wound Treatment – **Healable Moist Ulcer (Venous)**
   a. If circulation is adequate for healing, **debride** moist slough using autolytic debridement. If autolytic debridement is not effective within 1 week of treatment, refer to a wound clinician or physician / NP to determine the need for other methods of debridement.
   b. Wound treatment should be done in conjunction with compression therapy for the best wound healing results (Link to Compression DST).
   c. Goal of Treatment – Moist wound healing.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Use appropriate aseptic technique based on clinical condition of the client, invasiveness of the dressing procedure, type and healability of the wound, goals of care and agency policy during the dressing change to prevent infection.
      iii. Cleanse with at least room temperature sterile normal saline or/ sterile water; foot soaks are contraindicated.
      iv. If irrigation is required to remove exudate and/ or slough from the wound, gently irrigate using a 30 – 35 mL syringe with a wound irrigation tip catheter or an 18 - 19 gauge device. For wounds that are clean use a squeezable 30 – 100 ml normal saline or water container[12] designated for wound cleansing and held 10 – 15 cm (4-6 inches) from the wound.
      v. When irrigating the wound, use personal protective equipment to protect from back-splash.
      vi. Loosely fill any dead space, if present.
      vii. Keep the peri wound skin dry; use skin sealants, protectants or moisture barriers as needed.
      viii. Apply appropriate dressing that will maintain moisture balance within the wound.
      ix. Apply moisturizer to the surrounding skin.
   d. Determine the dressing change frequency based upon the wound assessment including the client's risk for infection, the dressing product used to control the bacterial load, the effectiveness of the cover dressing to manage the anticipated drainage and balance these with the need to minimize wound disturbance to allow for healing.
   e. Reassess the wound at every dressing change and do a full wound reassessment as per the client's care plan.

2. Notify a wound clinician or physician / NP if the following occur:
   a. The client has an ABI less 0.41; this requires immediate physician notification.
   b. The client has an ABI less than 0.91 or greater than 1.30 if this is a new finding.
   c. There is an acute onset of pain or rest pain develops in the foot.
   d. The wound probes to bone if this is a new finding.
   e. The client develops dermatitis.

[12] This does not refer to individual 15 ml sterile NS or water containers.

Wound Care Management for Mixed Arterial/Venous Ulcers

1. The goal is to manage the limb according to the predominant etiology.
    a. See venous and arterial sections and treat based on client's individual needs.
    b. If mixed etiology is suspected, refer to a wound clinician or physician / NP.

Client Education and Resources

1. For all wounds, discuss the following with clients and families:
    a. Education concerning the disease and healing processes.
    b. How chronic disease affects the healing process and the importance of adhering to the treatment plan.
    c. Measures to maintain clean well moisturized skin and avoid all chemical and mechanical traumas to the lower extremities.
    d. The benefits of smoking cessation and support to find a smoking cessation program if the client is willing.
    e. Wound dressing technique if client / family doing dressings.
    f. Strategies for improving nutrition, especially increasing protein and fluid intake and weight reduction, if not contraindicated.
    g. Strategies for managing pain during and between dressing changes.
    h. Signs of complications including wound deterioration, infection, and increased pain and the need to liaise with a health professional when these occur.
    i. The need for ongoing follow-up with a health care provider at regular intervals.

2. For arterial wounds specifically, teach clients and families about:
    a. Strategies for controlling diabetes, hypertension and hyperlipidemia.
    b. Daily skin & foot inspection and the need to wear proper fitting footwear with socks.
    c. Using a neutral or dependent position for the legs and sitting without crossing the legs.
    d. Avoiding restrictive clothing.
    e. Providing pressure redistribution for heels, toes, and other bony prominences as necessary.
    f. Avoiding extremes of hot and cold.
    g. Having routine nail and foot care provided by a professional.

3. For venous wounds specifically, teach clients and family about:
    a. The benefits of compression therapy and daily leg elevation and the need for life long compression.
    b. Passive and active exercises to promote activation of the calf muscle pump
    c. Ankle flexion to improve function of the upper ankle joint.
    d. The care and application of compression stockings, including the need to replace stockings every 6 months if worn daily.
    e. The need for a repeat lower leg assessment and ABI with the purchase of new stockings.
    f. The signs of infection, cellulitis, DVT and joint contractures.
    g. Avoiding products containing common allergens such as perfumed cream and lanolin.

4. For Mixed Wounds
    a. Education is based on the predominant etiology (see above) and client / family needs for information.

5. Teach client / family about the roles of the interdisciplinary members of the wound care team.

6. Provide any written materials that will support / reinforce teaching.

Discharge Planning

1. Discharge planning, when discharge is anticipated, should be initiated during the initial client encounter and should support timely discharge and optimal client independence.

2. If the client's care is being transferred across sectors (acute care, community care or residential care), ensure that the receiving site is provided with a care plan that outlines the current client care and wound management strategies.

Client / Family Outcomes

1. Intended
    a. The ulcer heals, if healing is the goal.
    b. The ulcer is maintained and infection free if healing is not achievable.
    c. The client indicates that pain is resolved or manageable.
    d. The client and family understand their role in preventing further tissue damage and incorporate recommended activities and interventions to treat risk factors.

2. Unintended
    a. The ulcer does not heal when healing is the goal.
    b. If maintenance is the goal, the wound shows signs of infection and/or deteriorates.
    c. The client expresses concerns about poorly managed pain.
    d. The client and family do not understand and/or act on their role in preventing further tissue damage and do not incorporate recommended activities and interventions to treat risk factors.

Documentation

1. Document initial and ongoing assessments as per agency guidelines.

2. Document care plans, clinical outcomes and care plan revisions, as necessary as per agency guidelines.

Bibliography

1. Bonham, P., et al. (2009). What's new in lower-extremity arterial disease: WOCN's 2008 clinical practice guideline. *Journal of Wound Ostomy Continence Nursing*. 36(1): 37 – 44.
2. Browne, A., et al. (2001). Compression Therapies. In: Krasner DL, Rodeheaver GT, Sibbald RG (Eds). *Chronic Wound Care: A Clinical Source Book for Health Care Professionals*, Third Edition. Wayne, PA: HMP Communications, pp 517 – 524.
3. Bryant, R., et al. (2007). Acute and Chronic Wounds Current Management Concepts. (3rd Ed.). Mosby: St Louis.
4. Burrows, C., et al. (2006). Best practice recommendations for the prevention and treatment of venous leg ulcers: Update 2006. *Wound Care Canada*. 4(1): 45 – 55.
5. Clinical guidelines from Vancouver Island Health Authority (2007), Northern Health (2009), Vancouver Coastal Health / Providence Health Care (2008), Interior Health (2007).
6. Ghauri, A., et al. (1998). The diagnosis and management of mixed arterial/venous leg ulcers in community-based clinics. *European Journal of Vascular and Endovascular surgery*. 16(4): 350 – 355.
7. Harding, K., et al. (2008). International consensus document: Wound infection in clinical practice. *International Wound Journal*. 5(Suppl. 3): 1 – 11.
8. Hopf, H., et al. (2008). Guidelines for the prevention of lower extremity arterial ulcers. *Wound Repair and Regeneration*. 16: 175 – 188.
9. Hopf, H., et al. (2006). Guidelines for the treatment of arterial insufficiency ulcers. *Wound Repair and Regeneration*. 14: 693 – 710.
10. Kunimoto, B., et al. (2001) Best practices for the prevention and treatment of venous leg ulcers. *Ostomy Wound Management*. 47(2): 34 – 50.

11. Kunimoto, B. (2001) Assessment of venous leg ulcers: An in-depth discussion of a literature guided approach. *Ostomy Wound Management.* 47(5): 38 – 53.
12. Kunimoto, B. (2001) Management and prevention of venous leg ulcers: A literature guided approach. *Ostomy Wound Management.* 47(6): 36 – 49.
13. Langemo, D., et al. (2006). Nutritional considerations in wound care. *Advances in Skin and Wound Care*. 19(6): 297 – 298, 300, 303.
14. Moffatt, C. (2007). Compression Therapy in Practice. Cromwell Press: Trowbridge UK.
15. Peripheral Arterial Disease Coalition. ABI Clinic Directory: A cross Canada directory of ankle brachial index (ABI) clinics. Retrieved from www.ccvsn.ca
16. Phillips, E., (2003).Evidence-based practice: Pressure ulcer management guidelines for spinal cord injury. *Topics in Spinal Cord Injury Rehabilitation*, 9(2):16 – 19.
17. Pompeo, M., (2007). Misconceptions about protein requirements for wound healing: Results of a prospective study. *Ostomy / Wound Management.* 53(8): 19 – 23.
18. Posthauer, M., (2006). The role of nutrition in wound care. *Advances in Skin and Wound Care*. 19(1): 43 – 54.
19. Registered Nurses Association of Ontario. (2007) Best Practice Guideline: Assessment and management of venous leg ulcers. Toronto: Author.
20. Robson, M., et al. (2006). Guidelines for the treatment of venous ulcers. *Wound Repair and Regeneration*. 14: 649 – 662.
21. Scottish Intercollegiate Guideline Network. (2006). National Clinical Guideline: Diagnosis and management of peripheral arterial disease. pp 1- 34. Retrieved from http://www.sign.ac.uk
22. Scottish Intercollegiate Guideline Network. (1998). National Clinical Guideline: The care of clients with a chronic leg ulcer. pp 1- 27. Retrieved from http://www.sign.ac.uk
23. Sibbald, G., et al., (2006). Best practice recommendations for preparing the wound bed: Update 2006. *Wound Care Canada*. 4(1), p 15 – 29.
24. Stechmiller, J. (2012). Wound healing. In C. Mueller (Ed.), The A.S.P.E.N Adult Nutrition Support Core Curriculum (2nd Ed.). Silver Spring, MD: American Society for Parenteral and Enteral Nutrition.
25. Taber, C., (1985). Taber's Cyclopedic Medical Dictionary. F.A. Davis: Philadelphia.
26. Trans – Atlantic Inter-Society Consensus Document on the Management of Peripheral Arterial Disease (TASC II). (2000). Retrieved from www.tasc-2-pad.org
27. Vancouver Coastal Health (2009) Clinical practice guideline: Nutritional care for wound management. Vancouver: Author.
28. World Union of Wound Healing Specialists. Mixed Arterial and Venous Wounds: Recommendations. Accessed from http://woundpedia.com/index.php?page+stream&topic=15%docID=304&docLocation=woundpedia
29. Zagoren, A., (2001). Nutritional assessment and intervention in the person with a chronic wound. In: Frasner, D, RodeheaverG, Sibbald R, (eds). *Chronic Wound Care: A Source Book for Health Care Professionals*, Third Edition. Wayne, PAHMP Communications. pp. 117 - 126.

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APPENDIX A Characteristics of Arterial Compromise, Venous Insufficiency and Mixed Etiology

	Venous Insufficiency	Arterial compromise	Mixed Etiology
Risk Factors	• Advanced age / family history • Previous deep vein thrombosis • Diabetes • Post phlebotic syndrome • Varicosities / previous vein stripping • Obesity / immobility / prolonged standing • Acute / Chronic Heart failure • Multiple pregnancies • Traumatic leg injury • Previous vascular & orthopaedic (hip/knee) surgery, lower leg trauma or ulcers	• Advanced age / family history • Smoking • Diabetes • Arterial disease • Anemia • Hyperlipidemia, hypercholestremia • Obesity • CVA, angina, MI, HTN • Traumatic injury • Rheumatoid arthritis • Raynaud's Disease	Mixed wounds combine the S & S of both arterial and venous wounds. Although the lower leg and foot may initially appear as venous insufficiency all assessments must include an ABI especially before compression is started to determine of arterial compromise is present.
Location of Wound	Distal medial 1/3 of the lower leg (gaiter area), over the medial malleolus; may occur over scar from previous venous ulcer	Pressure points or areas of repetitive trauma, e.g. on / between toes, metatarsal heads, lateral malleolus, heels, tibia	See Arterial & Venous
Appearance of Wound	**Base**: shallow, ruddy, & / or yellow fibrin debris, granulation tissue frequently present, rarely necrotic. **Depth**: usually shallow **Margins**: Diffuse, irregular **Surrounding skin**: erythema, weeping dermatitis, eczema, hemosiderin staining of lower leg, woody fibrosis & thickening of skin, lower leg/ankle edema, occasionally cellulitis, atrophie blanche	**Base**: pale pink, or filled with yellow debris, may be necrotic / eschar is common; may involve tendon or bone **Depth**: shallow to deep **Margins**: Well defined, round "punched out" appearance **Surrounding skin**: thin, shiny, dry skin with hair loss, thickened toenails, calluses	**Base:** poor granulation tissue **Depth:** shallow to deep **Margins**: may be macerated; rolled wound edges **Surrounding Skin:** calluses eczema may be present
Pain	Heavy, aching pain associated with legs in dependent position. Generally not as painful as ischemic ulcers except over medial malleolus	Severe pain that worsens with activity or leg elevation. Intermittent claudication to resting pain. Pain worse at night.	See Arterial & Venous
Circulation	**Peripheral pulses** present & palpable, may be hard to find due to edema **Capillary refill** normal (less than/equal to 4 seconds) **Skin temperature** normal **Skin colour** may be cyanotic; reddish brown discolouration, red from inflammation / cellulitis/dermatitis **ABI** 0.9 1– 1.30	**Peripheral pulses** absent or diminished **Capillary refill** delayed (greater than 4 seconds.) **Skin temperature** cool / cold **Skin colour** pale on elevation & rubor when dependent Gangrene may be present **ABI** less than 0.91	See Arterial & Venous
Edema	Generalized dependent edema.	None to minimal localized edema.	Usually present.
Infection	Less common in wound, but may have bacterial burden or cellulitis	Frequent & signs of infection may be subtle due to impaired circulation	Can become easily infected
Exudate	Moderate to heavy serous exudate	Minimal serous or purulent exudate	May initially have large to moderate drainage.
Photos