Developed in collaboration with the Wound Care Clinicians from:

TITLE	**Guideline: Assessment & Treatment of Diabetic and Neuropathic Ulcers in Adults**
Practice Level	• Nurses in accordance with health authority / agency policy. • Clients with diabetic and neuropathic ulcers require 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	• While more than 1.8 million Canadians currently have diabetes, this number is predicted to increase to 2.4 million by 2016 [6]. Of these, 15% will develop foot ulcers during the course of the disease [11, 19] and of these, 14 – 24% will undergo a lower extremity amputation[17]. This means that health care professionals will treat approximately 360,000 diabetic foot ulcers in the future. • Approximately 45% to 60% of all diabetic ulcers are purely neuropathic, while up to 45% have neuropathic and ischemic components. • Neuropathy occurs primarily as a result of diabetes mellitus but other causes include alcoholism, renal failure, HIV, late stage syphilis, trauma and surgery. • Poor glycemic control, elevated triglycerides, high body mass index, smoking and hypertension are risk factors for neuropathy. • Foot neuropathy presents as sensory loss, autonomic changes and motor changes in one or both feet. • Loss of protective sensation (LOPS) in the foot, combined with structural changes and repetitive traumas / pressure is the main cause of most neuropathic foot ulcers. • Motor neuropathy resulting in muscle atrophy or intrinsic muscle wasting can lead to foot deformities, such as hammertoe, and prominent plantar metatarsal heads. • Neuropathic ulcers are typically located on weight bearing surfaces, such as the metatarsal heads of the foot and on the heels, both of which are sites of painless and repetitive minor trauma. • Neuropathic ulcers are usually painless unless there is arterial involvement (ischemia) or infection. • People with neuropathic ulcers, especially those with diabetes, often have an altered gait, orthopaedic deformities and infection at the ulcer site. In order for healing to occur, pressure over the ulcer must be reduced or eliminated. • Neuropathic ulcers have well defined wound edges, usually measurable depth and may present with or without undermining; plantar ulcers often have callus present at the wound edge which interferes with the healing process. • Clients with diabetes who have infected foot ulcers have a higher risk of lower limb amputation. • A client with poorly controlled diabetes may have a more subtle response to local wound and systemic infection due to reduced blood flow and diminished sensation. • Some of the factors that place diabetic clients at high risk for poor healing include poor glycemic control, decreased sensation in the foot, foot deformities, infection, previous ulceration, and previous amputation. • Good glycemic control is the most important factor for primary prevention or a secondary intervention for neuropathy in people with type 1 diabetes; lower blood glucose levels are associated with reduced frequency of neuropathy in people with type 2 diabetes. • Early education and ongoing assessment and treatment of clients with diabetes can help prevent the development of foot / lower leg complications, such as neuropathic ulcers, and reduce the risk of amputation.
Indications / Contraindications	Use this guideline for adult clients who are diagnosed with diabetes mellitus or foot neuropathy who present with a lower limb ulcer.
Definitions	**Ankle Brachial Index** (ABI) – A numeric value that indicates the amount of arterial blood flow to the extremity; determined by using a Doppler ultrasound to compare the ankle systolic pressure and the higher of the two

brachial systolic pressures with the ABI being a ratio of the two.

Aseptic Technique - the purposeful prevention of the transfer of microorganisms from one person to another by keeping the microbe count to a minimum and for assuring that cross-contamination does not occur. The technique chosen is based on dressing procedure, client setting and agency policy:

- Sterile Technique – the use of sterile gloves, field, tray, instruments solutions and dressings
- No Touch Technique – the use of clean gloves and sterile field, tray, instruments, solutions; sterile instruments are used for direct contact with the wound; dressings are to be sterile
- Clean Technique – the use of sterile solutions, clean gloves and clean dressings

Bunions (hallux valgus) – A bump that forms when the great toe turns inward toward the second toe; the joint at the base of the great toe is pushed to the side or in severe cases moves under the second toe.

Calluses – Horny layer of skin caused by pressure or friction; located on the ball of the foot or along the edge of the heel or great toe; may develop a central core or plug of tissue where the pressure is greatest.

Charcot Foot (Acute) – Progressive, degenerative disease of the foot joints characterized by edema, pain, hemorrhage, heat, bony deformities, bone fragmentation & joint instability; requires immediate treatment.

Charcot Foot (Chronic) – Reconstruction& healing of foot joints and bones after acute Charcot foot is treated; remodelling & fusion of damaged structures decreases joint mobility and rounds the large bone fragments.

Claw toe – The joint at the base of the toe (closest to the foot) is bent up while the middle joint is bent down.

Corns – Conical, horny induration & thickening of the skin caused by friction or pressure; develops on the tops or tips of the toes; soft corns may develop between the toes.

Debridement – The removal of non-viable tissue using a variety of methods; this supports the development of granulation tissue which is necessary for healing to occur.

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, pallor below and flushing above the cord lesions, and convulsions; is caused by simultaneous sympathetic and parasympathetic activity; may occur with bowel or bladder distension, pain or pressure ulcers.

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/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.

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

Hallux limitus – Restricted dorsiflexion of the hallux at the first metatarsal joint which limits motion of the great toe; 60 degrees of dorsiflexion is required for normal gait.

Hallux rigidus – Progression of hallux limitus to point where toe motion becomes rigid or frozen; causes pain especially when the big toe is extended or pushed up.

Hammer toe – The joint in the middle of the toe is bent down.

Neuropathy – Causes a loss of protective sensation, increasing the risk of skin breakdown over the weight bearing surfaces of the feet.

Non - Occlusive Dressings – Dressings that promote the transfer of oxygen and water vapour between the wound and the air.

Orthotist – Provides a range of splints, braces and special footwear, including orthotics to aid movement, correct foot deformity and alleviate pain.

"Offloading" –The elimination of pressure from an area of the foot that is at risk for skin breakdown or has existing skin breakdown; examples include therapeutic orthotics, heel protective devices or removable casts.

Pedorthist – Manufactures, fits and modifies foot appliances, including orthotics and special footwear to alleviate pain, treat foot deformities assist with mobility.

Podiatrist – Is a foot doctor who can treat foot deformities such as hammer toes, corns and bunions; can pare calluses and cut toe nails as well as fit orthotics.

Slough - Soft, moist necrotic tissue; brown, tan, yellow or green in colour; may be thin or thick and the consistency may be fibrous, stringy or mucinous; may be firmly or loosely attached to the wound edges and base.

Toe Pressures - Are measured with a fitted occluding cuff placed around the base of the first toe; is a more accurate measure of arterial circulation when arteries are calcified as a result of diabetes; although a toe pressure of greater than 45 mmHg is necessary for optimal healing, evidence suggests a cut-off of 30 mmHg of pressure as a predictor of wound healing.

	Wet Gangrene – Gangrene that is characterized by bacterial putrefaction, producing cellulitis adjacent to the necrotic areas; may produce gas gangrene which is a type of wet gangrene commonly caused by infection with bacteria of the genus *Clostridium* and characterized by the presence of gas in the affected tissue.
Related Documents	Guideline Summary: Assessment and Treatment of Diabetic and Neuropathic Ulcers in Adults Guideline: Assessment and Treatment of Lower Limb Ulcers (Arterial, Venous, Mixed) in Adults Procedure: Ankle Brachial Index (ABI) in Adults Procedure: Monofilament Testing

Assessment and Determination of Treatment Goals

Assessment

To develop a comprehensive plan of care and determine the treatment goal; assess the following:

1. Client Concerns
    a. Client / family 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 concerns, e.g. podiatry and some orthotics / custom footwear may not be covered by health benefits.
    d. Emotional, cognitive, behavioural or mental health concerns and availability of support systems to address concerns.
    e. Quality of life issues that could impact treatment.
    f. Impact of client's current environment on client care.
    g. Client / family preferences for treatment of the wound / risk factors and the goals of care.
    h. Client / family ability and motivation to comprehend and adhere to the treatment plan.

2. Pain:
    a. Type, location, frequency and quality of pain occurring in either the ulcer, 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, NOPPAIN.
    c. Onset & duration of pain, and precipitating / alleviating factors.
    d. Presence of intermittent claudication and nocturnal or resting pain.
    e. Impact of pain on function, sleep and mood.
    f. Pain in an otherwise insensate foot.
    g. Autonomic dysreflexia and/or increased spasticity in clients with a spinal cord injury
    h. Current analgesic regimen and effectiveness.

3. Risk Factors for Wound Healability
    a. Impaired nutritional status:
        i. Poor gylcemic control, overweight, low body weight, low serum albumin or prealbumin[1], unintentional weight loss, appetite changes, cachexia, dehydration, restrictive diet and prolonged NPO.
        ii. Inadequate nutritional intake of protein, calories, or fluid as evidenced by % of intake at meals or calorie counts.
        iii. Possible causes of poor intake, e.g. poor dentition, difficulty swallowing, positioning, inability to self-feed, GI symptoms, pain.

[1] 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 indicator of nutrition status in acute illness as they are negative acute-phase reactants and will be down-regulated during infection and inflammation

b. History of surgery, ulceration or trauma to lower extremities and feet.
c. Medical conditions, e.g. diabetes, vascular disease, stroke, impaired visual acuity, previous DVT, angina / MI & other cardiac problems, hypertension, renal problems, autoimmune disease, high lipid levels.
d. Advanced age.
e. Ability to assess feet and lower extremities e.g. decreased vision.
f. Poor oxygenation status of skin and underlying tissue, e.g. COPD, anemia, cardiac disease.
g. Lifestyle factors such as smoking history (& motivation to quit), substance use, foot care routines, use and style of footwear, and activity / exercise routines.
h. Medications that interfere with wound healing, e.g. NSAIDs, antineoplastics, systemic corticosteroids, anticoagulants.

4. Diabetic Control
   a. Recent HgA1c and recorded daily blood glucose.
   b. Co-morbidities such as impaired vision, renal failure, GI disturbances.
   c. Diabetic medication regimen.

5. Wound Assessment
   a. History of current foot wound(s).
   b. Location of wound(s); commonly found on the plantar surface of the hallux and the 1st and 2nd metatarsal joints and for the client with Charcot Foot, on the tarsus region.
   c. Wound measurements; check for undermining and sinus tracts.
   d. Wound(s) probing to bone.
   e. Presence of wet or dry gangrene.
   f. Appearance of wound bed, noting percentage of tissue type.
   g. Amount & type of exudate.
   h. Presence of odour, after cleansing.
   i. Description of wound edge and peri-wound skin, including calluses.

6. Lower Limb Assessment: (Link to Lower Limb DST)
   a. Amputated limb, foot or toes.
   b. Skin colour of both legs, feet and toes (in elevated and dependent positions), compare left and right extremities.
   c. Temperature difference between leg, foot and toes, compare left and right extremities.
   d. Peripheral pulses: posterior tibial & dorsalis pedis.
   e. Capillary refill on the dorsum of the foot and the toes (normal capillary refill is ≤ 4 seconds).
   f. Measure ABI[2] or refer to a wound care clinician for same. However ABI readings may be unreliable [3] in clients with diabetes. If the readings, in conjunction with other S & S are questionable, refer to a wound care clinician or physician / NP for further assessment, such as toe pressures, to determine healability (Link to ABI DST).
   g. Ability to mobilize and transfer.

7. Foot Assessment
   a. Areas of dry gangrene e.g. dry black tissue.
   b. Appearance of skin, toe nails, corns, bunions (hallux valgus), hammer toe, claw toe, acute & chronic Charcot Foot changes (joint deformities, collapsed mid-foot, localized heat, & swelling), and calluses.
   c. Foot deformities that contribute to excessive pressure, e.g. hallux limitus / rigidus, dropped transverse arches / metatarsal heads & digit deformities e.g. claw toes.
   d. Joint mobility in the ankle, foot and toes, especially in the large toe.

[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 practice.
[3] Approximately 30% of clients with diabetes have incompressible (calcified) vessels in the ankle; a small number have incompressible (calcified) vessels in the toes as well. Suspect calcified vessels if (1) ankle pressures are ≥ 200 mmHg, (2) ankle pressure is ≥ 80 mmHg higher than brachial pressure or (3) ABI is greater than 1.30.

e. Presence of pressure points on the feet and ankles.
f. Client's indoor and outdoor footwear
g. Neuropathy:
    i. Test for diminished sensation using monofilament testing over 10 points on the foot (Link to Monofilament Testing DST).
    ii. Ask the client the following questions:
        1. Are your feet ever numb?
        2. Do your feet ever tingle?
        3. Do your feet ever burn?
        4. Do your feet feel like insects are crawling over them?
    iii. Note white powdery skin changes & decreased sweating over the plantar surface of the feet.
    iv. Note muscle weakness, gait alterations & foot deformities.

8. 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 clients who are elderly, immunocompromised & 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 greater than/equal to 2cm	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 above 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.

a. Signs of localized or systemic infection especially if the wound probes to bone [4] are potentially limb or life threatening and require immediate medical attention.
b. Areas of wet gangrene are potentially limb or life threatening and require immediate medical attention.
c. In client with diabetes, visible evidence of localized infection may be muted or non existent due to compromised arterial blood flow, blunting of the inflammatory process, and diminished sensation.

[4] Wounds probing to bone present an increased risk for infection and indicate that osteomyelitis is likely present.

d. If 3 or more signs and symptoms of an infection are evident and the infection is not currently being treated, notify the physician / NP and take a swab for C & S.
e. Notify the physician / NP if C & S results are abnormal.

9. Investigations, where these are available:
    a. Refer to a wound care clinician for toe pressures, if available or to the physician / NP for further investigation, e.g. toe pressures or vascular studies, if the client has lower extremity ulcers, absent or decreased pulses or an ABI of less than 0.91 or greater than 1.30.
    b. Refer to a wound care clinician or physician / NP for suspected Charcot Foot or for a wound probing to bone if these are new findings.
    c. If results of monofilament testing indicate that the client has LOPS and this is a new finding, refer to a wound care clinician or physician / NP.
    d. Albumin or pre albumin testing if nutritional concerns are present.

Determination of Treatment Goal

1. Determine the treatment goal based on:
    a. The client and family willingness and ability to participate in and adhere to the care plan.
    b. The overall assessment findings.
    c. The client's potential for healing:
        i. A palpable dorsalis pedis or posterior tibial pulse may indicate a systolic pressure of greater than/ equal to 80 mmHg and the potential to heal
        ii. An ABI between 0.91 and 1.30 indicates the absence of arterial disease and a wound that is healable.
        iii. An ABI between 0.41 and 0.90 indicates arterial compromise and requires further assessment to determine healability.
        iv. An ABI greater than / equal to 1.31indicates arterial calcification and requires further assessment to determine healability.
        v. An ABI of less than/equal to 0.40 indicates critical limb ischemia with a very low probability of healing and requires immediate wound care clinician or physician / NP notification if this is a new finding or reflects a change in condition.
        vi. If the ABI and/or vascular assessment indicate that the wound is not healable, debridement and moist wound healing are contraindicated unless initiated by a wound care clinician or physician / NP.
    d. Available resources and supplies.

2. Chose the appropriate treatment goal:
    a. To Heal
    b. To Maintain/Non-healable (wound is non-healable but is in a stable state; little or no deterioration)
    c. To Maintain/Palliative

Interventions

Develop a plan of care, in conjunction with the client / family that incorporates client care, treatment of risk factors, 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 / family abilities, concerns, preferences and motivation for treatment.

b. Refer to Social Work, if available for financial or psychosocial concerns and for emotional support and counselling as needed.
c. Refer clients to Physiotherapy to determine an appropriate exercise plan that includes non-impact activities such as biking.
d. Refer to Occupational Therapy for modifications to activities of daily living (ADLs). [5]
e. Facilitate referral to a Diabetic Education Program, if necessary and where available.

2. Pain Relief
   a. Teach client that new onset or worsening pain is a sign of infection and requires immediate medical attention.
   b. For the client who is cognitively impaired/unable to communicate, observe for behaviours that identify signs and symptoms of pain and monitor changes in behaviour following analgesic to ensure effectiveness of medication.
   c. 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.
   d. 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.
   e. Use appropriate medications to control neuropathic pain, if present.
   f. Refer to wound care clinician or physician / NP to determine the need for topical analgesic (e.g. morphine) or anaesthetic (e.g. Eutectic Mixture of Local Anaesthetics, EMLA) if wound pain is not well controlled.
   g. Encourage clients to request a "time-out" during painful procedures.
   h. Use dressings that require less frequent changes and are less likely to cause pain and trauma on removal, e.g. non adherent dressings.
   i. Encourage repositioning as a means to reduce pain; use pressure redistribution devices or surfaces to reduce pressure.
   j. When appropriate, use reassurance, music, distraction, conversation, or guided imagery to reduce pain during dressing changes.
   k. Reassess pain at regular intervals and note any increase in severity.

3. Risk Factors for Wound Healability
   a. Nutritional Care:
      i. Maximize the client's nutritional status through adequate protein [6] and calorie intake if compatible with goals of care.
      ii. Encourage a minimum1500 – 2000mL of fluid daily (offer fluids q 2h) for all clients[7] but especially those with dehydration, fever, vomiting, profuse sweating, diarrhea or heavily draining wounds.
      iii. Document the % intakes of meals and record any issues with diet tolerance or acceptance
      iv. Refer to a dietitian:
         1. For dietary management of poor glycemic control, obesity, inadequate protein / calorie intake, malnourishment and/or renal failure.
         2. If the wound is not healing or the albumin / pre-albumin values are abnormal to determine the need for nutritional supplements and vitamin / mineral preparations.
      v. Refer to the appropriate professional (Dietitian, Occupational Therapist, Speech Language Pathologist) if client has difficulty with swallowing, physically managing meals or poor dentition.
   b. Encourage clients to take medication as prescribed.
   c. Refer to the appropriate health care professional for visual problems.
   d. Refer client to a physician / NP to have HgA1c done every 3 months or more frequently if blood glucose control is unstable if this is not already being done.
   e. Encourage client to monitor any pre-existing illnesses such as stroke, visual disturbances, angina / MI & other cardiac problems, hypertension, renal problems and/or high lipid levels and consult a physician / NP if changes occur.

[5] Activities of daily living include bathing, dressing, eating, toileting, walking or wheeling a chair, and transferring into and out of bed.
[6]. Assess renal function if increased protein intake is indicated.
[7] Assess for renal or liver dysfunction and CHF if increased fluid intake is indicated.

f. Refer clients to Physiotherapy to develop a mobility / exercise plan or if impaired mobility, altered gait or limited ankle range of motion are evident.
g. Support clients to stop smoking and discuss referral to a smoking cessation program; refer for harm reduction / substance use management if client consents.

4. Foot care
    a. Refer high risk clients to a Podiatrist or foot care specialist where available for ongoing foot care management, including toenail trimming and callus paring.
    b. Encourage the client to have a diabetic foot screen including foot wear done by a health care professional at least annually and more frequently for clients with a high level of risk [8].
    c. Refer client with loss of protective sensation to an Occupational Therapist, Podiatrist, Pedorthist or Orthotist for appropriate foot wear.
    d. Encourage client to protect their feet from heat and cold.
    e. Encourage client to wear clean, dry socks at all times.
    f. Encourage client to wear shoes at all times except when in bed.
    g. Encourage client or family to carry out proper foot care including visual inspection of feet and footwear, 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 / foot care nurse if unable to provide own foot care.
    h. Feet are to be washed and moisturized (soaking feet is contraindicated); ensure spaces between toes are dry after feet are washed / moisturized.

5. Off-Loading Pressure
    a. When the client is in bed, float both heels off the surface of the bed using a pillow, a commercial pressure offloading device or a device specifically designed for the client that ensures all pressure is eliminated from healable and non healable heel ulcers.
    b. Encourage clients with plantar surface ulcers to be non weight bearing as much as possible.
    c. Refer to a Podiatrist, Orthotist / Pedorthist or OT / PT, where available for off loading footwear or appliances for clients with plantar surface ulcers (may require a physician referral).
    d. Monitor the weight-bearing foot for areas of pressure or open areas.

Wound Care Management

1. A wound care clinician and / or physician / NP are always involved in care planning for clients with diabetic ulcers 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. The wound care clinician or physician / NP may consider other therapies including but not limited to negative pressure wound therapy, biodebridement (maggot) therapy or electrical stimulation if the wound is not healing or is deteriorating.

3. Wound Treatment – **Non-Healable Dry Ulcer**
    a. If circulation is severely impaired, revascularization surgery is not possible or is unsuccessful and/or the wound is covered with stable hard, dry eschar or dry gangrene, **do not debride** the wound.
    b. Goal of Treatment – Maintain dry eschar / gangrene
        i. Adhere rigidly to hand washing prior to any contact with the wound.
        ii. **Keep the wound dry**; do not cleanse with normal saline or water as this may soften the eschar. Cleanse with an antiseptic solution (povidone iodine or chlorhexidine) and pat dry to remove any excess solution.
        iii. Paint the wound with povidone iodine or chlorhexidine daily or every other day to ensure the wound remains dry.

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

iv. Apply a protective dry dressing such as gauze, if indicated. If dry dressing is applied, allow the povidone iodine or chlorhexidine solution to air-dry before applying the dressing.
v. Apply moisturizer to the surrounding skin.
vi. If dry eschar begins to lift or becomes moist / boggy, consult a wound care clinician and / 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, the effectiveness of the cover dressing to manage the amount of drainage anticipated and balanced 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 – **Non-Healable Moist Ulcer**
   a. If circulation is severely impaired, revascularization surgery is not possible or is unsuccessful and/or the wound is covered with moist, boggy slough or wet gangrene, **do not debride** the wound
   b. Goal of Treatment – Protect the wound and dry the wound if possible.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. Cleanse with normal saline or water; pat dry to **remove excess moisture**.
      iii. Paint small wounds with an antiseptic solution (povidone iodine or chlorhexidine); consult a wound care clinician or physician / NP for larger wounds or if the antiseptic is ineffective in drying the wound.
      iv. Apply a protective, dry wound dressing.
      v. Hydrate the surrounding skin with moisturizer.
      vi. If moist slough/eschar does not dry out, consult a wound care clinician and / or physician / NP to determine if debridement is required to prevent infection.
   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 amount of drainage anticipated and balanced 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.

5. Wound Treatment – **Healable Dry Ulcer**
   a. If circulation is adequate and the wound is covered with dry, stable eschar, protect but **do not debride** the wound.
   b. Goal of Treatment – Maintain dry eschar and protect the wound to promote healing.
      i. Adhere rigidly to hand washing prior to any contact with the wound.
      ii. **Keep the wound dry**; do not cleanse with normal saline or water.
      iii. Paint the wound with an antiseptic solution (povidone iodine or chlorhexidine) daily or every other day to ensure the wound remains dry.
      iv. Apply a protective, dry dressing such as gauze, if indicated.
      v. Apply moisturizer to the surrounding skin.
      vi. If dry eschar begins to lift or becomes moist / boggy, consult a wound care clinician or physician / NP.
   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 amount of drainage anticipated and balanced 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. Wound Treatment – **Healable Moist Ulcer**
   a. If circulation is adequate for healing, **debride** moist slough using autolytic debridement (the use of gels and moisture retentive dressings to soften/liquefy necrotic tissue). If autolytic debridement is not effective within 1 week of treatment, refer to a wound care 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. Use appropriate aseptic technique (based on dressing procedure, care setting and agency policy) during the dressing change to prevent infection.
      iii. Cleanse with room temperature sterile normal saline / sterile water; foot soaks are contraindicated.

iv. If irrigation is required, irrigate with full pressure using a 30 – 35 mL syringe with a wound irrigation tip catheter or a 18 - 19 gauge device or use a squeezable sterile normal saline or sterile water container held 10 – 15 cm (4-6inches) 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.; 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 appropriate dressing that will maintain moisture balance within the wound.
ix. Apply moisturizer to the surrounding skin.
x. Fully occlusive dressings are not recommended for diabetic/neuropathic ulcers unless initiated by a wound care clinician or physician / NP.

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 amount of drainage anticipated and balanced 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.

7. Wound Infection
   a. Implement strategies to prevent infection, e.g. hand-washing, aseptic dressing technique.
   b. Refer to a wound care clinician or physician / NP if signs and symptoms of infection are present and / or the wound probes to bone if these are new findings; any infection in a diabetic foot must be treated aggressively.
   c. Use non-sensitizing broad spectrum antimicrobial dressings for wounds with significant bioburden.
   d. Teach the client/family that new onset of increasing pain/or change in behaviour in the elderly client or an unexplained spike in blood glucose can be a sign of infection and **requires immediate medical attention**.

8. Notify a wound care clinician or physician / NP if the following occur:
   a. Acute onset of pain or increasing pain.
   b. Wound probes to bone if this is a new finding.
   c. Gangrene develops or worsens.
   d. Rest pain develops in the foot.
   e. Previously palpable peripheral pulses are diminished or absent.
   f. ABI less than 0.91 if this is a new finding.
   g. Signs of localized and/or systemic infection develop.

Client Education and Resources

1. If the client has not participated previously, discuss participation in a Diabetic Education Program, if available and refer to the program if the client consents. If client has attended a Diabetic Education Program previously but has not attended recently or needs updated information, re-refer client.

2. Based on client's level of knowledge, understanding and ability, their individual needs and level of risk regarding diabetes, ensure client has a good understanding of the following in relation to wound healing:
   a. Glucose control through appropriate diet, exercise and medication management.
   b. Benefits of regular exercise, such as daily walking and of optimizing weight.
   c. The benefits of smoking cessation.
   d. Meaning of high & low blood glucose levels & the impact of uncontrolled blood glucose on potential complications such as poor wound healing.
   e. The need to have blood lipid levels (LDL, HDL) monitored on a regular basis.
   f. Affects of acute illness, ulcers and infections on blood glucose levels.

g. Foot care
    i. The relationship between high glycemic levels and future complications, especially complications with feet and vision.
    ii. Appropriate nail and skin care for feet and the need for a daily foot inspection by the client or family / caregiver.
    iii. Injury prevention & proper footwear.
    iv. Protect feet from extremes of heat and cold.
    v. The need to have calluses professionally debrided; clients should not debride their calluses or cut their nails.
    vi. When to seek help.
h. The importance of ongoing medical supervision and at least annual foot examinations by a professional.

3. Teach client / family about the roles of the interdisciplinary health team members in wound care.

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

Discharge Planning

1. Discharge planning, if discharge is anticipated, should be initiated during the initial client encounter and 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 / facility 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 and family understand and act on the need for daily foot inspection and appropriate foot care, accurate dietary and glycemic control and pressure redistribution.

2. Unintended:
    a. The ulcer does not heal when healing is the goal.
    b. The ulcer becomes infected.
    c. Client develops gangrene
    d. Client requires an amputation.
    e. Clients / families do not understand the need for daily foot inspection and other measures needed to decrease the risk of future tissue damage and diabetic complications.
    f. Clients / families do not show evidence of understanding and acting on educational information received.

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. Apelqvist, J., et al. (2008). Practical guidelines on the management and prevention of the diabetic foot. *Diabetes Metabolic Research Review*, 24(Supplement 1): S181-S187.
2. 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.
3. Boulton, A. (2004). The diabetic foot: From art to science. The 18th Camillo Golgi lecture. *Diabetologia*. 47: 1343 – 1353
4. Boulton, A.J., et al. (2004). Clinical practice. Neuropathic diabetic foot ulcers. *New England Journal of Medicine*. 35(1): 48-55.
5. Bowering, K., et al. (2008). Canadian Diabetes Association clinical practice guidelines: Foot care. *Canadian Journal of Diabetes*, 32 (Supplement 1): S143 – 146, S201.
6. Bril, V., et al. (2008). Canadian Diabetes Association clinical practice guidelines: Neuropathy. *Canadian Journal of Diabetes*, 32 (Supplement 1): S140 - 142.
7. Chernecky, C., et al. (2001). Laboratory Tests and Diagnostic Procedures (3rd ed.). Philadelphia: WB Saunders.
8. Clinical guidelines from Vancouver Island Health Authority (2007), Providence Health Care / Vancouver Coastal Health (2008), Northern Health (2009), and Interior Health (2007)
9. Consortium for Spinal Cord Medicine. (1997). Autonomic dysreflexia: What you should know. Retrieved from www.scicpg.org.
10. Fraser, C. (2007). The importance of investigating the presence of hyperglycemia in individuals with wounds. *Wound Care Canada.* 5(2) :20 –21.
11. Frykberg, R., et al. (2006). Diabetic foot disorders: A clinical practice guideline. *The Journal of Ankle and Foot Surgery*. 45(5 suppl): 1 – 66.
12. Inlow, S et al (2000) Best practices for the prevention, diagnosis and treatment of diabetic foot ulcers. *Ostomy / Wound Management* 46(11): 55 – 68
13. Inlow, S., (2004). The 60-second foot exam for people with diabetes. *Wound Care Canada*. 2(2): 10-11. Retrieved from http://www.cawc.net/open/wcc/2-2/inlow.pdf .
14. International Diabetic Federation / International Working Group on the Diabetic Foot. (2007). International consensus on the diabetic foot and practical guidelines on the management and prevention of the diabetic foot. Available on DVD from the IDF.
15. Jude, E., et al. (2001). Assessment of the diabetic foot. In: Krasner, D.L., Rodeheaver, G.T., & Sibbald, R.G., (eds.), Chronic Wound Care: A Clinical Source Book for Healthcare Professionals, (3rd ed.) Wayne, PA., HMP Communications, 591 – 596.
16. Langemo, D., et al. (2006). Nutritional considerations in wound care. *Advances in Skin and Wound Care*. 19(6): 297 – 298, 300, 303.
17. Orsted, H.L., et al. (2007). The team approach to treating ulcers in people with diabetes. In: Krasner, D.L., Rodeheaver, G.T., & Sibbald, R.G., (eds.), Chronic Wound Care: A Clinical Source Book for Healthcare Professionals. (4th ed.) Wayne, Pa: HMP Communications, 557-574.
18. Orsted, H., et al. (2006). Best practice recommendations for the prevention, diagnosis and treatment of diabetic foot ulcers: Update 2006. *Wound Care Canada*. 4(1): 57 – 71.
19. Peripheral Arterial Disease Coalition. ABI Clinic Directory: A cross Canada directory of ankle brachial index (ABI) clinics. Retrieved from www.ccvsn.ca
20. Phillips, E., (2003). Evidence-based practice: Pressure ulcer management guidelines for spinal cord injury. *Topics in Spinal Cord Injury Rehabilitation*, 9(2):16 – 19.
21. Pompeo, M., (2007). Misconceptions about protein requirements for wound healing: Results of a prospective study. *Ostomy / Wound Management.* 53(8): 19 – 23.
22. Posthauer, M., (2006). The role of nutrition in wound care. *Advances in Skin and Wound Care*. 19(1): 43 – 54.
23. Registered Nurses Association of Ontario (2005). Assessment and management of foot ulcers for people with diabetes, Toronto: Registered Nurses Association of Ontario. Retrieved from http://www.rnao.org/Storage/11/536_BPG_Assessment_Foot_Ulcer.pdf
24. Registered Nurses Association of Ontario (2007). Reducing foot complications for people diabetes. Toronto: Registered Nurses Association of Ontario. Retrieved from http://www.rnao.org/Storage/33/2735_Reducing_foot_complications_-_final.pdf
25. Rogers, L.C., Driver, V.R., & Armstrong, D.G., (2007). Assessment of the diabetic foot. In: Krasner, D.L., Rodeheaver, G.T., & Sibbald, R.G., eds., *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals. 4th ed.* Wayne, Pa: HMP Communications, 549-556.
26. Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N): Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient. *JPEN J Parenter Enteral Nutr* 2009; 33 277. Retrieved from http://pen.sagepub.com
27. Trans – Atlantic Inter-Society Consensus Document on the Management of Peripheral Arterial Disease (TASC II). (2000). Retrieved from www.tasc-2-pad.org
28. U.S. Department of Health and Human Services, Health Resources and Service Administration. *Lower Extremity Amputation Prevention: How to use the LEAP monofilament*. Retrieved from http://www.hrsa.gov/leap/monofilament.htm .
29. Vancouver Coastal Health (2009) Clinical practice guideline: Nutritional care for wound management. Vancouver: Author.
30. Wound, Ostomy and Continence Nurses Society. (2004). Guideline for management of wounds in patients with lower extremity neuropathic disease. Glenview Il: Author. Retrieved from www.guideline.gov/summary

31. 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.

Document Creation/Review

Created By	British Columbia Provincial Nursing Skin and Wound Committee in collaboration with the Wound Care Clinicians from across all Health Authorities
Publication Date	May 2011
Revision Date(s)	October 2011 May 2011
Review Date (s)	May 2014