

REGIONAL WOUND CARE CLINICAL PRACTICE GUIDELINES

Venous, Arterial, and Mixed Lower Leg Ulcers



Winnipeg Regional
Health Authority
Caring for Health

Office régional de la
santé de Winnipeg
À l'écoute de notre santé

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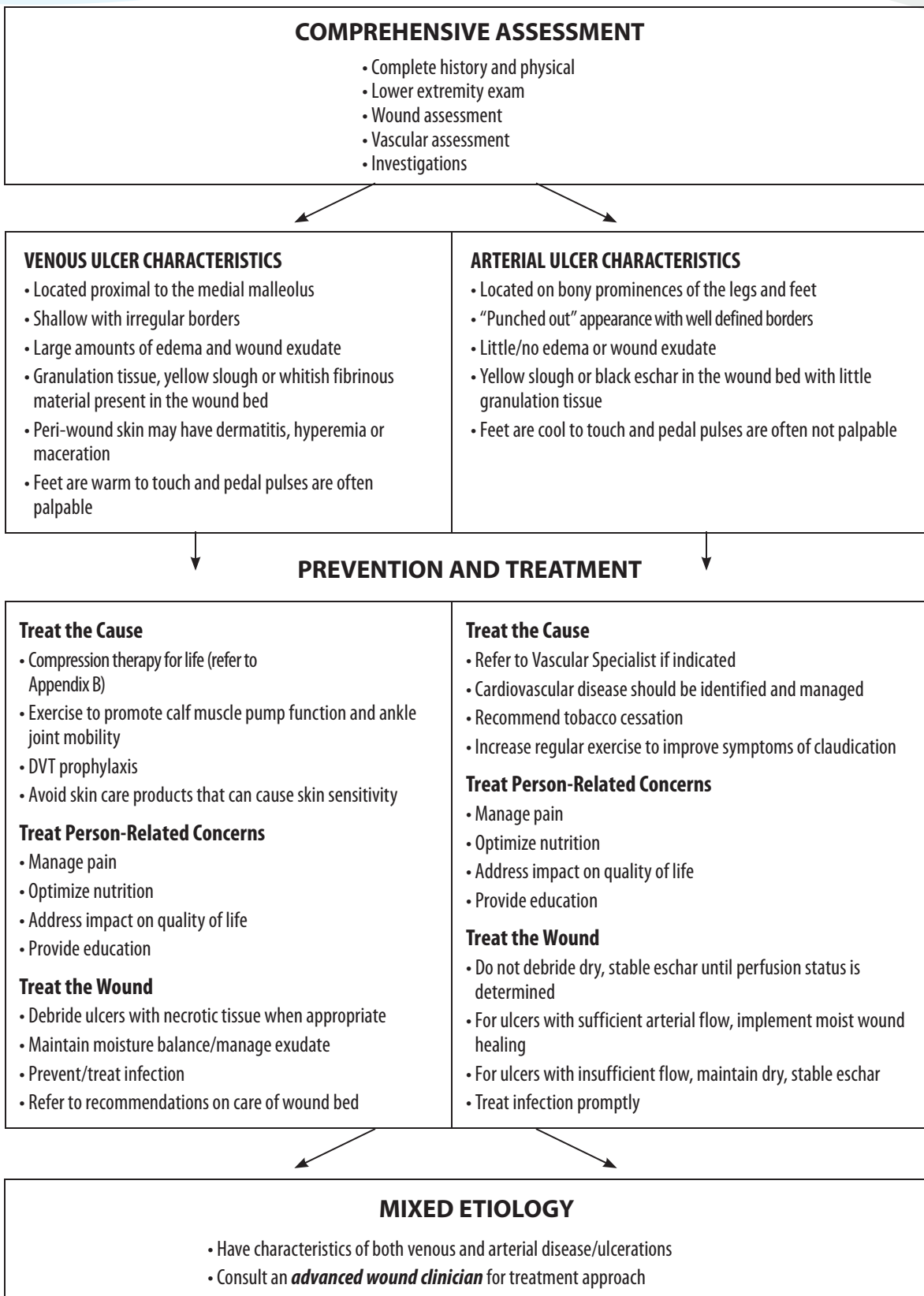
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VENOUS AND ARTERIAL LOWER LEG ULCER ASSESSMENT AND MANAGEMENT ALGORITHM



SUMMARY OF RECOMMENDATIONS

VENOUS LOWER LEG ULCER	
Recommendation	Level of Evidence Guideline Reference
1. Assessment and clinical investigations should be undertaken by health care professionals trained and experienced in leg ulcer management.	Level C (RNAO 2007)
2. A complete clinical history and physical examination should be completed.	Level C (RNAO 2007)
3. A comprehensive assessment of an ulcer should be completed.	Level C (RNAO 2007)
4. Regular ulcer assessment is essential to monitor treatment effectiveness and healing goals.	Level C (RNAO 2007)
5. Apparent venous ulcers that have been open continuously without signs of healing for 3 months or that do not demonstrate any response to treatment after 6 weeks should be biopsied for histological diagnosis.	Level III (WHS 2006 ¹)
6. An ABPI measurement should be performed by a trained practitioner to rule out the presence of peripheral arterial disease, particularly prior to application of compression therapy.	Level B (RNAO 2007)
7. An ABPI >1.2 or <0.8 warrants further assessment and should be referred to an Advanced Wound Clinician.	Level B (RNAO 2007)
8. Doppler ultrasound to measure ABPI should be repeated as clinically indicated or as per program/facility policy.	WRHA Expert Opinion
9. Individuals with signs of increased ambulatory pressure (venous hypertension) and/or post-phlebotic syndrome should use compression stockings daily.	Level I (WHS 2008 ¹)
10. Venous surgery followed by graduated compression hosiery is an option for consideration in people with superficial venous insufficiency.	Level A (RNAO 2007)
11. Exercises to increase calf muscle pump function have been demonstrated to be helpful in long-term maintenance in venous ulcer prevention.	Level II (WHS 2008 ¹)
12. Providing venous thromboembolism prophylaxis after DVT decreases recurrent DVT and post-phlebotic syndrome and complications including venous ulceration.	Level II (WHS 2008 ¹)
13. Avoid products that are known to cause skin sensitivity, such as those containing lanolin, phenol alcohol or some topical antibiotic and antibacterial preparations.	Level C (RNAO 2007)
14. Refer persons with suspected sensitivity reactions to a dermatologist for patch testing. Following patch testing, identified allergens must be avoided and medical advice regarding treatment should be sought.	Level B (RNAO 2007)
15. The treatment of choice for venous ulceration uncomplicated by other factors is graduated compression bandaging, properly applied and combined with exercise.	Level A (RNAO 2007)
16. Although the different bandaging modalities are similar in effectiveness, they can differ significantly in comfort and cost.	Level I (WHS 2006 ¹)
17. Intermittent pneumatic compression can be used with or without compression bandages and can provide another option in persons who cannot or will not use adequate compression bandaging systems.	Level A (RNAO 2007); Level I (WHS 2006 ¹)
18. Pain may be a feature of both venous and arterial disease and should be addressed.	Level B (RNAO 2007)
19. Optimal nutrition facilitates wound healing, maintains immune competence and decreases the risk of infection.	Level B (RNAO 2007)

Recommendation	Level of Evidence Guideline Reference
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20. Provide a multiple vitamin/mineral supplement when dietary intake is poor, to meet the Recommended Dietary Allowance or the Adequate Intake.	WRHA Expert Opinion
21. There is no evidence that oral zinc supplementation improves the healing of venous leg ulcers.	Level III (RCN 2006)
22. Provide adequate intake of protein and calories to promote wound healing and prevent malnutrition.	WRHA Expert Opinion
23. Provide 30-35 mL/kg/day of fluid to provide adequate blood flow to the area of altered skin integrity.	WRHA Expert Opinion
24. The client's estimate of the quality of life should be included in the initial discussion of the treatment plan, throughout the course of the treatment and when the ulcer has healed.	Level C (RNAO 2004)
25. Assess the functional, cognitive and emotional status of the client and family to manage self-care.	Level C (RNAO 2004)
26. Develop treatment goals mutually agreed upon by the person and health care professionals based on clinical findings, current evidence, expert opinion and the person's preference.	Level C (RNAO 2007)
27. Local wound bed preparation includes debridement when appropriate, moisture balance and bacteria balance.	Level C (RNAO 2007)
28. First-line and uncomplicated dressings must be simple, low-adherent, acceptable to the client and should be cost effective.	Level A (RNAO 2007)
29. Assess for signs and symptoms of infection.	Level A (RNAO 2007)
30. Manage wound infection with cleansing and debridement as appropriate. Where there is evidence of cellulitis, treatment of infection involves systemic antibiotics.	Level B (RNAO 2007)
31. Pentoxifylline used in conjunction with compression therapy improves healing of venous ulcers.	Level I (WHS 2006 ¹)
32. If signs of healing are not evident, a comprehensive assessment and re-evaluation of the treatment plan should be carried out at 3 month intervals or sooner if clinical condition deteriorates.	Level C (RNAO 2007)
33. Inform the client/family of measures to prevent recurrence after healing.	Level C (RNAO 2007)

ARTERIAL LOWER LEG ULCER

Recommendation	Level of Evidence Guideline Reference
34. All persons with lower extremity ulcers should be assessed for arterial disease.	Level I (WHS 2006 ²)
35. Persons presenting with risk factors for atherosclerosis (smoking, diabetes, hypertension, hypercholesterolemia, advanced age, obesity, hypothyroidism, family history, gender and race) who have ulcers are more likely to have arterial ulcers and should be carefully and broadly evaluated. Discuss a more complete workup with the primary care provider.	Level I (WHS 2006 ²)
36. Review pertinent labs to identify risk markers for arterial disease such as elevated total cholesterol and triglycerides and reduced high density cholesterol (HDL).	Level B (WOCN 2008); WRHA Expert Opinion
37. Conduct a comprehensive lower extremity examination.	Level B (WOCN 2008)
38. An ABPI measurement should be performed by a trained practitioner to rule out the presence of peripheral arterial disease.	Level I (WHS 2006 ²); Level B (WOCN 2008)
39. An ABPI >1.2 or <0.8 warrants further assessment and should be referred to an Advanced Wound Clinician.	Level B (RNAO 2007)
40. Doppler ultrasound to measure ABPI or toe pressure should be repeated as clinically indicated or as per program/facility policy.	WRHA Expert Opinion

Recommendation **Level of Evidence**
Guideline Reference

41. A referral to a vascular specialist should be considered in the following presentations; a. Rest pain or gangrene b. Non-healing lower extremity ulcer in the presence of arterial insufficiency c. ABPI <0.5 or toe pressure <30 mmHg d. A decrease in ABPI of ≥ 0.15 within a 3-12 month reassessment period e. Any observed significant clinical change	Level I WHS 2006 ² Level C WOCN 2008 Level C WOCN 2008 Level III WHS 2008 ² ; Level B TASC 2007 WRHA Expert Opinion
42. A comprehensive assessment of an ulcer should be completed.	Level C (WOCN 2008)
43. Cardiovascular disease should be identified and managed with an interdisciplinary, evidence-based approach. Standard treatment guidelines for medical therapy (including B-blockers, statins, ACE-inhibitors and anti-platelet therapy) will improve outcomes not only for coronary artery disease but also for ischemic arterial ulcers.	Level III (WHS 2008 ²)
44. Teach people with arterial disease about chronic disease management and measures to maintain intact skin and prevent trauma.	Level C (WOCN 2008)
45. If applicable, recommend tobacco cessation which slows progression of atherosclerosis, decreases risk of cardiovascular events and death and may decrease the overall risk of arterial disease after long term cessation.	Level B (WOCN 2008); Level I (WHS 2008 ²)
46. Increase regular exercise and physical activity to improve symptoms of claudication.	Level A (WOCN 2008); Level II (WHS 2008 ²)
47. Refer to a vascular surgeon to determine if re-vascularization is possible and appropriate.	Level A (WOCN 2008)
48. An approach to control pain in people with peripheral arterial ulcers should address the cause and use local, regional and/or systemic measures.	Level III (WHS 2006 ²)
49. It is paramount to evaluate the person as a whole, which includes a nutritional assessment.	Level III (WHS 2006 ²)
50. Provide adequate intake of protein and calories to promote wound healing and prevent malnutrition.	WRHA Expert Opinion
51. Provide a multiple vitamin/mineral supplement when dietary intake is poor, to meet the Recommended Dietary Allowance or the Adequate Intake.	WRHA Expert Opinion
52. Provide 30-35 mL/kg/day of fluid to provide adequate blood flow to the area of altered skin integrity.	WRHA Expert Opinion
53. The client's estimate of the quality of life should be included in the initial discussion of the treatment plan, throughout the course of the treatment and when the ulcer has healed.	Level C (RNAO 2007)
54. Assess the functional, cognitive and emotional status of the client and family to manage self-care.	Level C (RNAO 2007)
55. Do not debride stable, black eschar until perfusion status is determined. Debridement <u>may be contraindicated</u> in lower extremity arterial disease wounds.	Level C (RNAO 2007)
56. If perfusion status is adequate or if revascularization has occurred, debridement may be beneficial in certain circumstances.	Level II (WHS 2006 ²) WRHA Expert Opinion
57. In arterial ulcers with sufficient arterial inflow to support healing, use a dressing that will maintain a moist wound healing environment.	Level II (WHS 2006 ²)
58. Select a dressing that is cost effective and appropriate to the clinical situation	Level II (WHS 2006 ²)
59. In arterial ulcers with insufficient arterial inflow, maintain dry stable eschar or dry gangrene until revascularization potential is established.	Level II (WHS 2006 ²)
60. Monitor lower extremity arterial wound closely for signs and symptoms of infection, which can be subtle because of reduced blood flow.	Level C (WOCN 2008)

Recommendation	Level of Evidence Guideline Reference
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61. Refer infected lower extremity arterial wounds, which are limb-threatening for immediate evaluation, culture-guided antibiotic therapy, assessment of perfusion status or need for surgical intervention to an advanced wound clinician, vascular specialist or infectious diseases specialist.	Level C (WOCN 2008)
62. Topical antimicrobial dressings may be beneficial in management of chronically/heavily colonized ulcers, decreasing their bacterial load and aiding wound healing.	Level III (WHS 2006 ²)
63. Do not rely on topical antibiotics to treat infected, ischemic wounds.	Level C (WOCN 2008)
64. Institute systemic antibiotics and referral to vascular surgeon/specialist promptly for critical limb ischemia and evidence of limb infection or cellulitis and/or infected wounds.	Level C (WOCN 2008)
65. Intermittent pneumatic leg compression (IPC) increases blood flow and may be beneficial in limbs with impaired distal perfusion, either before or after revascularization.	Level II (WHS 2006 ²)
66. Pentoxifylline does not improve arterial ulcer healing and is not a recommended treatment for arterial ulcers.	Level I (WHS 2006 ²)
67. If signs of healing are not evident, a comprehensive assessment and re-evaluation of the treatment plan should be carried out at 2 week intervals or sooner if clinical condition deteriorates.	WRHA Expert Opinion
68. Teach clients with lower extremity arterial disease and their family members about chronic disease management and measures to maintain intact skin and prevent trauma	Level C (WOCN 2008)
MIXED LOWER LEG ULCER	
69. Compression therapy may be beneficial in ulcers of mixed etiology (venous and arterial).	Level III (WHS 2006 ²)

INTRODUCTION

The editorial process began in 2010 with a literature search for existing, current guidelines for the prevention and management of venous, arterial and mixed lower leg ulcers (see Appendix C for the search methodology). This information was shared with the Lower leg Ulcer Editorial Group membership and reviewed.

As there was not an existing guideline in the literature on the prevention and management of venous, arterial and mixed lower leg ulcers that could be adopted for use in the region, it was determined that a number of clinical guidelines would need to be combined to produce a comprehensive set of guidelines. This document is a result of a compilation of a number of published guidelines (listed on pages 7-8). In clinical areas where no guideline statement existed, a search of recent literature was conducted, summarized and referenced in the body of the document.

A draft document was developed by the Editorial Group co-chairs and circulated to the Editorial Group membership. After revisions were made based on the group's feedback, the final draft document was circulated widely to stakeholders within the WRHA. Additional feedback was incorporated which resulted in the completion of the finalized WRHA guidelines document.

DEFINITIONS OF LEVELS OF EVIDENCE - VENOUS LOWER LEG ULCER SECTION

Registered Nurses Association of Ontario (RNAO). (2004).	<i>Assessment and management of venous leg ulcers.</i> Toronto, ON: Registered Nurses Association of Ontario (RNAO). (Referred to as RNAO 2004) and;
Registered Nurses Association of Ontario (RNAO). (2007).	<i>Assessment and management of venous leg ulcers – Guideline Supplement.</i> Toronto, ON: Registered Nurses Association of Ontario (RNAO). (Referred to as RNAO 2007)
LEVEL A:	Evidence obtained from at least one randomized controlled trial or meta-analysis of randomized controlled trials.
LEVEL B:	Evidence from well-designed clinical studies but no randomized controlled trials.
LEVEL C:	Evidence from expert committee reports or opinion and/or clinical experience or respected authorities. Indicates absence of directly applicable studies of good quality.
Wound Healing Society Guidelines for the Prevention of Venous Ulcers	Robson, M. C., Cooper, D. M., Aslam, R., Gould, L. J., Harding, K. G., Margolis, D. J., et al. (2008). Guidelines for the prevention of venous ulcers. <i>Wound Repair and Regeneration</i> , 16(2), 147-150. (Referred to as WHS 2008') and;
Wound Healing Society Guidelines for the Treatment of Venous Ulcers	Robson, M. C., Cooper, D. M., Aslam, R., Gould, L. J., Harding, K. G., Margolis, D. J., et al. (2006). Guidelines for the treatment of venous ulcers. <i>Wound Repair and Regeneration</i> , 14, 649-662. (Referred to as WHS 2006')
Level I:	Meta-analysis of multiple RCTs or at least two RCTs support the intervention of the guideline. Another route would be multiple laboratory or animal experiments with at least two clinical series supporting the laboratory results.
Level II:	Less than Level 1, but at least one RCT and at least two significant clinical series or expert opinion papers with literature reviews supporting the intervention. Experimental evidence that is quite convincing, but not yet supported by adequate human experience is included.
Level III:	Suggestive data of proof of principle, but lacking sufficient data such as meta-analysis, RCT, or multiple clinical series.
NB:	The suggestion in the guideline can be positive or negative at the proposed level (e.g., meta-analysis and two RCTs stating intervention is not of use in treating venous ulcers).
Royal College of Nursing. (2006).	The nursing management of patients with venous leg ulcers, <i>Clinical Practice Guidelines</i> , Publication code: 003 020, ISBN 1-904114-22-9, 1-38. (Referred to as RCN 2006)
I:	Generally consistent finding in a majority of multiple acceptable studies
II:	Either based on a single acceptable study, or a weak or inconsistent finding in multiple, acceptable studies
III:	Limited scientific evidence that does not meet all the criteria of acceptable studies or absence of directly applicable studies of good quality. This includes published or unpublished, expert opinion.
WRHA EXPERT OPINION	Consensus of Lower Leg Editorial Group comprised of Vascular Surgeons, Vascular Medicine Specialist, Physiotherapist, Registered Dietitian, Vascular Nurses, Clinical Nurse Specialists and an Enterstomal Therapist.

DEFINITIONS OF LEVELS OF EVIDENCE – ARTERIAL LOWER LEG ULCER SECTION

Wound Healing Society Guidelines for the Prevention of Lower Extremity Arterial Ulcers	Hopf, H., Ueno, C., Aslam, R., Dardik, A., Fife, C., Grant, L., Holloway, A., lafrati, M., Rosen, N., Shapshak, D., Slade, J.B., West, J., & Barbul, A. (2006). Guidelines for the treatment of arterial insufficiency ulcers, <i>Wound Repair and Regeneration</i> , 14, 693-710. (Referred to as <i>WHS 2008²</i>) and
Wound Healing Society Guidelines for the Treatment of Lower Extremity Arterial Ulcers	Hopf, H., Ueno, C., Aslam, R., Dardik, A., Fife, C., Grant, L., Holloway, A., lafrati, M., Rosen, N., Shapshak, D., Slade, J.B., West, J., & Barbul, A. (2008). Guidelines for the prevention of lower extremity arterial insufficiency ulcers, <i>Wound Repair and Regeneration</i> , 16, 175-188. (Referred to as <i>WHS 2006²</i>)
Level I:	Meta-analysis of multiple RCTs or at least two RCTs support the intervention of the guideline. Another route would be multiple laboratory or animal experiments with at least two clinical series supporting the laboratory results.
Level II:	Less than Level 1, but at least one RCT and at least two significant clinical series or expert opinion papers with literature reviews supporting the intervention. Experimental evidence that is quite convincing, but not yet supported by adequate human experience is included.
Level III:	Suggestive data of proof of principle, but lacking sufficient data such as meta-analysis, RCT, or multiple clinical series.
NB:	The suggestion in the guideline can be positive or negative at the proposed level (e.g., meta-analysis and two RCTs stating intervention is not of use in treating venous ulcers).
Wound, Ostomy and Continence Nurses Society Guideline for the Management of Wounds in Patients with Lower-Extremity Arterial Disease	Bonham, P. A., & Flemister, B. G. (2008). Guideline for management of wounds in patients with lower-extremity arterial disease. No. 1). Mount Laurel, NJ: Wound, Ostomy and Continence Nurses Society (WOCN). (Referred to as <i>WOCN 2008</i>)
Level A:	Two or more supporting RCTs of at least 10 humans with lower-extremity arterial disease (LEAD), a meta-analysis of RCTs or a Cochrane Systematic Review of RCTs.
Level B:	One or more supporting controlled trials of at least 10 humans with LEAD or two or more supporting non-randomized trials of at least 10 humans with LEAD.
Level C:	Two supporting case series of at least 10 humans with LEAD or expert opinion.
Trans-Atlantic Intersociety Consensus Guidelines for the Management of Peripheral Arterial Disease	Norgren, L., Hiatt, W. R., Dormandy, J. A., Nehler, M. R., Harris, K. A., & Fowkes, F. G. R. (2007). Inter-society consensus for the management of peripheral arterial disease (TASC II). <i>European Journal of Vascular and Endovascular Surgery</i> , 33(1 SUPPL.), S1-S75. (Referred to as <i>TASC II 2007</i>)
A:	Based on the criterion of at least one randomized, controlled clinical trial as part of the body of literature of overall good quality and consistency addressing the specific recommendation.
B:	Based on well-conducted clinical studies but no good quality randomized clinical trials on the topic of recommendation.
C:	Based on evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities (i.e. no applicable studies of good quality).
WRHA EXPERT OPINION	Consensus of Lower Leg Editorial Group comprised of Vascular Surgeons, Vascular Medicine Specialist, Physiotherapist, Registered Dietitian, Vascular Nurses, Clinical Nurse Specialists and an Enterostomal Therapist.

VENOUS LOWER LEG ULCERS

Introduction

Venous leg ulcers are ulcerations of the skin on the lower legs which can be attributed to venous insufficiency. They often have the following characteristics or associated clinical findings;

- They are classically located proximal to the medial **malleolus**.
- Shallow with irregular borders, some may appear deeper.
- Associated with large amounts of edema and wound **exudate**, granulation tissue, yellow slough, or whitish **fibrinous** material present in the wound bed.
- Peri-wound skin may have **dermatitis**, **hyperemia** or **maceration**, brown or dark pigmentation (**hemosiderin staining**), atrophie blanche (white pigmentation) and/or fibrosis.
- **Pedal pulses** are generally palpable but edema and **lipodermatosclerosis** (woody fibrosis) may make pulses non-palpable.
- Presence of prominent veins or **varicose veins**.

Venous leg ulcer



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Venous leg ulcer with slough



Hemosiderin Staining



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Atrophie blanche



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Dermatitis



Used with permission from the Canadian Association of Wound Care

Lipodermatosclerosis



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Varicose Veins



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- **Lymphedema**, also known as lymphatic obstruction, is a condition of localized fluid retention and tissue swelling caused by a compromised lymphatic system.
- Symptoms may include severe fatigue, a heavy swollen limb or localized fluid accumulation in other body areas, including the head or neck, discoloration of the skin overlying the lymphedema, and eventually deformity (elephantiasis).
- Lymphedema should not be confused with edema arising from venous insufficiency, which is **not** lymphedema. However, untreated venous insufficiency can progress into a combined venous/lymphatic disorder which is treated the same way as lymphedema
- This guideline does not address management of lymphedema - refer to an **advanced wound clinician**

Localized lymphedema



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Elephantiasis



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COMPREHENSIVE ASSESSMENT

RECOMMENDATION #1

LEVEL C (RNAO 2007)

Assessment and clinical investigations should be undertaken by health care professionals trained and experienced in leg ulcer management.

RECOMMENDATION #2

LEVEL C (RNAO 2007)

A complete clinical history and physical examination should be completed and includes:

- ◆ Health history
 - Blood pressure
 - Height, weight at regularly scheduled intervals and BMI
 - Blood glucose level
 - Doppler measurement of ankle brachial pressure index (ABPI) or toe pressure
 - Any other tests relevant to presenting condition
 - Medications
 - Allergies
- ◆ History associated with venous disease
 - Swelling (edema) increases throughout the day with legs dependent
 - Edema tends to be bilateral rather than unilateral
 - Previous deep vein thrombosis (DVT)
 - Varicose veins/varicose vein stripping
 - Pregnancy
 - Previous ulcerations/treatments
 - Lower leg trauma
 - **Cellulitis**
 - Obesity
 - Family history of venous leg ulcerations
 - Previous occupation involving long periods of standing or sitting
- ◆ Bilateral Limb Assessment
- ◆ Ulcer history
- ◆ Ulcer Treatment History
- ◆ Pain Assessment
- ◆ Nutrition
 - Refer clients to a Registered Dietician for nutrition assessment
 - See section on treat person-related concerns for referral criteria
 - Obtain serial measurements of albumin, to determine protein status beyond 2-3 weeks, or pre-albumin, to evaluate the effectiveness of nutrition intervention after two days. Readings will also help determine adequacy for wound healing (where opportunity to improve nutritional status exists), and
 - CBC, if indicated.
- ◆ Psychosocial status including quality of life
- ◆ Functional, cognitive, emotional status and ability for self care

The above should be documented in a structured format for a client presenting with either their first or recurrent leg ulcer and should be ongoing thereafter (refer to Appendix A - Sample Lower Leg Assessment Tool).

RECOMMENDATION #3

LEVEL C (RNAO 2007)

A comprehensive assessment of an ulcer should include:

- Measurement of the wound and undermining
- Amount and quality of exudates
- Wound bed appearance: Venous leg ulcers may present with granulation tissue, yellow slough, or whitish **fibrinous** material in the wound bed.
- Condition of the wound edge.
- Infection
- Condition of the peri-wound skin: Brown or dark stained pigmentation (hemosiderin staining), maceration due to large amounts of **exudate**, and/ or **dermatitis** may exist.
- Presence or absence of suffering
- Re-evaluation
- Refer to WRHA Regional Wound Recommendations - Care of the Wound Bed

RECOMMENDATION #4

LEVEL C (RNAO 2007)

Regular ulcer assessment is essential to monitor treatment effectiveness and healing goals.

RECOMMENDATION #5

LEVEL III (WHS 2006¹)

Apparent venous ulcers that have been open continuously without signs of healing for 3 months or that do not demonstrate any response to treatment after 6 weeks should be biopsied for histological diagnosis (i.e. malignancy, inflammatory condition, etc.).

RECOMMENDATION #6

LEVEL B (RNAO 2007)

An ABPI measurement should be performed by a trained practitioner (as determined by the program/site) to rule out the presence of peripheral arterial disease, particularly prior to application of compression therapy.

Assessment of Ankle Brachial Pressure Index using hand held Doppler Ultrasound



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Owing to vascular calcification, people with long-standing diabetes and renal failure can develop incompressible tibial arteries resulting in falsely elevated systolic pressures. Elevated ankle pressures and ABPI measurements are commonly observed in people with incompressible tibial arteries (Norgren et al, 2007).

The above individuals and or any person with ABPI result of >1.2 should be referred to an advanced wound clinician or vascular lab for toe pressure measurement.

RECOMMENDATION #7

LEVEL B (RNAO 2007)

An ABPI >1.2 or <0.8 warrants further assessment and should be referred to an *advanced wound clinician*.

Guidelines for Interpretation of ABPI and Toe pressure results.

Ankle Brachial Pressure Index	Toe Pressure (mmHg)	Potential For Healing
0.9 - <1.2	> 55 mmHg	Good
0.80 – 0.89	> 55 mm Hg	Good
0.5 - 0.79	> 40 mm Hg	Adequate
0.35 - 0.49	< 30 mm Hg	Poor
<0.35	< 20 mm Hg	Minimal

(Burrows et al, 2006, Kunimoto et al, 2001 & WRHA Expert Opinion)

For recommendations regarding levels of compression to corresponding ABPI values, refer to the table in Appendix B.

RECOMMENDATION #8

WRHA EXPERT OPINION

Doppler ultrasound to measure ABPI should be repeated as clinically indicated or as per program/facility policy.

Arterial disease may develop in people with venous disease and significant reductions in ABPI can occur over relatively short periods of time.

TREAT THE CAUSE: PREVENTION OF VENOUS ULCERS**RECOMMENDATION #9**LEVEL I (WHS 2008¹)**Individuals with signs of increased ambulatory pressure (venous hypertension) and/or *post-phlebotic syndrome* should use compression stockings daily.**

Antiembotic stockings (i.e., TED® stockings) are used for post-surgical DVT prophylaxis and are not considered to be graduated compression therapy for the prevention and treatment of venous leg ulcers.

Refer to Appendix B for information on compression stockings.

RECOMMENDATION #10

LEVEL A (RNAO 2007)

Venous surgery followed by graduated compression hosiery is an option for consideration in people with superficial venous insufficiency.**RECOMMENDATION #11**LEVEL II (WHS 2008¹)**Exercises to increase calf muscle pump function have been demonstrated to be helpful in long-term maintenance in venous ulcer prevention.**

- Walking exercises may be appropriate for ambulatory clients once in appropriate compression therapy (encourages ankle mobility).
- Consult physiotherapist/occupational therapist if indicated.

RECOMMENDATION #12LEVEL II (WHS 2008¹)**Providing venous thromboembolism prophylaxis after DVT decreases recurrent DVT and post-phlebotic syndrome and complications including venous ulceration.****RECOMMENDATION #13**

LEVEL C (RNAO 2007)

Avoid products that are known to cause skin sensitivity, such as those containing lanolin, phenol alcohol or some topical antibiotic and antibacterial preparations.

RECOMMENDATION #14**LEVEL B (RNAO 2007)**

Refer persons with suspected sensitivity reactions to a dermatologist for patch testing. Following patch testing, identified allergens must be avoided and medical advice regarding treatment should be sought.

The suspected source of sensitivity should be identified and then removed or minimized.

TREAT THE CAUSE: COMPRESSION THERAPY FOR VENOUS ULCERS**RECOMMENDATION #15****LEVEL A (RNAO 2007)**

The treatment of choice for venous ulceration uncomplicated by other factors is graduated compression bandaging, properly applied and combined with exercise.

- In venous ulceration, high compression achieves better healing than low compression (Level A).
- Compression bandages should only be applied by a suitably trained and experienced practitioner (Level B). An outcome of The Canadian Bandaging Trial suggested that when trained RNs applied compression using an evidenced-based protocol, the type of bandage was less important than the training and use of an evidence-based approach (Harrison, 2010).
- The concepts, practice and hazards of graduated compression should be fully understood by those prescribing and fitting compression stockings (Level B).
- Ankle circumference should be measured at a distance of 2.5cm above the medial malleolus (Level C).

RECOMMENDATION #16**LEVEL I (WHS 2006¹)**

Although the different bandaging modalities are similar in effectiveness, they can differ significantly in comfort and cost.

Consider client preference, resources available and clinical knowledge of application.

Refer to Appendix B – Therapeutic Compression.

RECOMMENDATION #17**LEVEL A (RNAO 2007); LEVEL I (WHS 2006¹)**

Intermittent pneumatic compression can be used with or without compression bandages and can provide another option in persons who cannot or will not use adequate compression bandaging systems.

Consult the Physiotherapy Department at the Health Sciences Centre for intermittent pneumatic compression therapy.

TREAT PERSON-RELATED CONCERNS: PAIN ASSESSMENT AND MANAGEMENT**RECOMMENDATION #18****LEVEL B (RNAO 2007)**

Pain may be a feature of both venous and arterial disease and should be addressed.

A comprehensive approach to pain is beyond the scope of these Recommendations. Refer to the WRHA Regional Pain Assessment and Management Clinical Practice Guideline (2008) at http://www.wrha.mb.ca/professionals/ebpt/files/PAM_CPG.pdf

TREAT PERSON-RELATED CONCERNS: NUTRITION**RECOMMENDATION #19****LEVEL B (RNAO 2007)**

Optimal nutrition facilitates wound healing, maintains immune competence and decreases the risk of infection.

Consultation to a Registered Dietician should be considered to assess the extent of nutrition risk or deficiency which may impact wound healing of venous leg ulcers.

When to refer a client to a Registered Dietician (based on WRHA Expert Opinion and RNAO 2004):

- Reported poor oral food intake or changes in usual eating pattern
- Significant weight loss (1-2% in one week, 5% in one month; 7.5% in 3 months or 10% in 6 months)
- Low serum albumin (less than 33 g/L) or pre-albumin (less than 0.17 g/L)
- HgbA1C value above 7%
- Co-existent medical problems such as diabetes, autoimmune diseases, etc.
- Poor psychological status or social isolation
- Lack of nutrition knowledge
- Inadequate cooking skills
- Limited finances
- Mobility limitations
- Obese BMI >30

RECOMMENDATION #20

WRHA EXPERT OPINION

Provide a multiple vitamin/mineral supplement when dietary intake is poor, to meet the Recommended Dietary Allowance or the Adequate Intake.

Given the consensus in the literature that specific nutrients like vitamin C, vitamin A and zinc are involved in wound healing, clients suffering from venous leg ulcers could benefit from a daily multivitamin/mineral supplement to promote wound healing. However, evidence does not support supplementation of individual micronutrients such as omega-3 fatty acids, vitamin A, vitamin E, vitamin C or B vitamins. For clients with renal disease, health care professionals should discuss the safety of a daily multiple vitamin/mineral supplement with the renal health care team.

RECOMMENDATION #21

LEVEL III (RCN 2006)

There is no evidence that oral zinc supplementation improves the healing of venous leg ulcers.

RECOMMENDATION #22

WRHA EXPERT OPINION

Provide adequate intake of protein and calories to promote wound healing and prevent malnutrition.

An increased intake of dietary protein may assist in the wound healing process, particularly in malnourished individuals, however, specific amounts for protein in the wound healing process of venous leg ulcers have not been determined.

Plasma proteins may be used to measure the protein needs of clients with lower leg ulcers. Individuals who are underweight or who have had significant unintentional weight loss, may need additional calories, to cease weight loss and regain lost weight. However, specific caloric requirements have not been set to promote the healing of venous leg ulcers.

Clinical judgment must be considered when establishing protein and energy requirements. For instance, it may not be appropriate to recommend high levels of protein for clients with renal disease.

RECOMMENDATION #23

WRHA EXPERT OPINION

Provide 30-35 mL/kg/day of fluid to provide adequate blood flow to the area of altered skin integrity.

Typically, fluid is recommended in amounts of 30-35 mL/kg of body weight or a minimum of 1500mL per day. Clients with heart failure or renal disease may not tolerate this level of intake.

TREAT THE PERSON-RELATED CONCERNS: QUALITY OF LIFE

RECOMMENDATION #24

LEVEL C (RNAO 2004)

The client's estimate of the quality of life should be included in the initial discussion of the treatment plan, throughout the course of the treatment and when the ulcer has healed.

Increased sensitivity to, and understanding of the impact of painful venous ulcers on quality of life may lead to more effective intervention strategies and improved outcomes for these clients. Healing the ulcer and normalizing the client's life can and should form the basis of care. A variety of quality of life assessment tools are available. If applicable, the Social Worker or chaplain team member should be consulted and involved in the client's care.

RECOMMENDATION #25

LEVEL C (RNAO 2004)

Assess the functional, cognitive and emotional status of the client and family to manage self-care.

Communicate with the client, family and care-givers to establish realistic expectations for the healability of the venous leg ulcer. The basis for a treatment plan begins with the client when the individual aims of the overall treatment are defined and agreed upon.

TREAT THE WOUND: VENOUS ULCER CARE

RECOMMENDATION #26

LEVEL C (RNAO 2007)

Develop treatment goals mutually agreed upon by the person and health care professionals based on clinical findings, current evidence, expert opinion and the person's preference.

Prior to commencing wound care, a treatment plan must be developed based on the goals of care for the particular person. The healing potential of the wound is one factor that may impact on the goals of care. Potential for healing is affected by local, host and environmental factors.

RECOMMENDATION #27

LEVEL C (RNAO 2007)

Local wound bed preparation includes debridement when appropriate, moisture balance and bacteria balance.

Refer to WRHA Wound Care Recommendations Section – Care of the Wound Bed.

RECOMMENDATION #28

LEVEL A (RNAO 2007)

First-line and uncomplicated dressings must be simple, low-adherent, acceptable to the client and should be cost effective.

A recent systematic review found insufficient evidence to support the use of any particular first-line and uncomplicated dressing type (beneath compression therapy) for the treatment of venous leg ulcers. Decisions regarding dressings should be based on local costs and practitioner or client preferences.

TREAT THE WOUND: INFECTION

RECOMMENDATION #29

LEVEL A (RNAO 2007)

Assess for signs and symptoms of infection.

Refer to WRHA Wound Care Recommendations Section – Care of the Wound Bed.

RECOMMENDATION #30

LEVEL B (RNAO 2007)

Manage wound infection with cleansing and debridement as appropriate. Where there is evidence of cellulitis, treatment of infection involves systemic antibiotics.

Refer to physician/nurse practitioner and/or *advanced wound clinician*.

Evidence regarding the use of *topical antimicrobial* wound therapy is ongoing. Expert opinion in this area is mixed and consensus has not been achieved. Wounds that have failed to improve with conventional therapy despite optimal care (debridement, compression therapy and optimal peripheral perfusion) may benefit from a *topical antimicrobial*. Refer to the Care of the Wound Bed section for further direction on use of *topical antimicrobial* therapy.

TREAT THE WOUND: COMPLEMENTARY THERAPIES

Some wounds may respond to complementary therapies. These interventions should be considered for wounds that have been non-responsive to usual best practice wound care and once conventional options have been exhausted.

RECOMMENDATION #31

LEVEL I (WHS 2006¹)

Pentoxifylline used in conjunction with compression therapy improves healing of venous ulcers.

Improvement of the microcirculation of the leg aids the healing process of venous ulcers.

TREAT THE WOUND: REASSESSMENT

RECOMMENDATION #32

LEVEL C (RNAO 2007)

If signs of healing are not evident, a comprehensive assessment and re-evaluation of the treatment plan should be carried out at 3 month intervals or sooner if clinical condition deteriorates.

If no healing is evidenced within 2 weeks with optimal patient and wound management or if wound deteriorates, consult an *advanced wound clinician*.

CLIENT AND FAMILY EDUCATION

RECOMMENDATION #33

LEVEL C (RNAO 2007)

Inform the client/family of measures to prevent recurrence after healing.

- Daily wear of compression stockings (cared for as per manufacturer's instruction and replaced every 6 months,
- Discouragement of self-treatment with over-the-counter preparations,
- Avoidance of accidents or trauma to legs,
- Rest periods throughout the day with elevation of affected limb above level of heart,
- Early referral at first sign of breakdown or trauma to limb,
- Need for exercise and ankle joint mobility,
- Perform appropriate skin care to maintain clean, well lubricated skin; avoid sensitizing products,
- Compression therapy for life with re-assessment based on symptoms,
- Foot hygiene and proper footwear. If ulcer is on weight-bearing surface of foot, encourage client to be assessed for orthotics by a certified pedorthist,
- Smoking cessation,
- Discourage standing for long periods of time,
- Exercise, walk regularly, and
- Maintain or work towards ideal body weight.

ARTERIAL LOWER LEG ULCERS

INTRODUCTION

- ◆ Arterial ulcers are ulcerations of the skin on the lower legs, feet and toes that can be attributed to arterial insufficiency. They are classically located on bony prominences of the legs and feet.
- ◆ Characteristics of arterial ulcers may include;
 - "Punched out" appearance with well defined borders.
 - May involve deeper structures (ie. tendon, bone).
 - Associated with little or no edema or wound **exudate**.
 - Often have yellow slough or black **eschar** in the wound bed and little granulation tissue. If granulation tissue is present, it is often pale in colour.
 - Peri-wound skin may appear pale, shiny and taut with no hair on legs/feet and dystrophic nails.
 - Feet are cool to touch and **pedal pulses** are usually not palpable.
 - Ischemic areas may appear as dry gangrene

Arterial ulcers



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Dry gangrene



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COMPREHENSIVE ASSESSMENT

RECOMMENDATION #34

LEVEL I (WHS 2006²)

All persons with lower extremity ulcers should be assessed for arterial disease.

Arterial insufficiency frequently contributes to poor healing in ulcers with another primary etiology such as diabetic neuropathy or venous insufficiency. Ulcers of mixed venous and arterial etiologies are common in the clinical setting especially in older adults and require a referral to an **advanced wound clinician** for treatment recommendations. Other differential diagnoses that require further referral may include vasculitis, pyoderma gangrenosum or neuropathic diabetic ulcers (see WRHA Regional Wound Recommendations section on Diabetic Foot Ulcers).

RECOMMENDATION #35

LEVEL I (WHS 2006²)

Persons presenting with risk factors for atherosclerosis (smoking, diabetes, hypertension, hypercholesterolemia, advanced age, obesity, hypothyroidism, family history, gender and race) who have ulcers are more likely to have arterial ulcers and should be carefully and broadly evaluated. Discuss a more complete workup with the primary care provider.

A detailed evaluation may include;

- ◆ Health history
 - Blood pressure
 - Height, weight at regularly scheduled intervals, and BMI
 - Blood glucose level
 - Doppler measurement of ankle brachial pressure index (ABPI) or toe pressures
 - TcPO₂ (assessment available through the vascular labs)
 - Any other tests relevant to presenting condition
 - Medications
 - Allergies
- ◆ History associated with arterial disease
 - **Claudication**
 - **Nocturnal pain** and/or restlessness
 - Ulcer pain
 - Smoking
 - Cardiovascular disease
 - Hypercholesteremia
 - Diabetes
 - Dependent rubor and elevation pallor
- ◆ Bilateral Limb Assessment
- ◆ Ulcer history
- ◆ Ulcer Treatment History
- ◆ Pain Assessment
- ◆ Nutrition
 - Refer clients to a Registered Dietician for nutrition assessment
 - See section on treat person related concerns for referral criteria
 - Obtain serial measurements of albumin, to determine protein status beyond 2-3 weeks, or pre-albumin, to evaluate the effectiveness of nutrition intervention after two days. Readings will also help determine adequacy for wound healing (where opportunity to improve nutrition status exists), and
 - CBC, if indicated.
- ◆ Psychosocial status including quality of life
- ◆ Functional, cognitive, emotional status and ability for self care

The above should be documented in a structured format for a client presenting with either their first or recurrent leg ulcer and should be ongoing thereafter (refer to Appendix A - Sample Lower leg Assessment Tool).

RECOMMENDATION #36**LEVEL B (WOCN 2008) AND WRHA EXPERT OPINION**

Review pertinent labs to identify risk markers for arterial disease such as elevated total cholesterol and triglycerides and reduced high density cholesterol (HDL).

RECOMMENDATION #37**LEVEL B (WOCN 2008)****Conduct a comprehensive lower extremity examination:**

- Assess functional ability.
- Determine perfusion status by assessing skin temperature, skin colour changes and paresthesias.
- Determine presence or absence of pedal pulses. Palpate both dorsalis pedis and posterior tibial pulses. Presence of palpable pulses does not rule out arterial disease.
- Measure ABPI or toe pressure to assess arterial blood flow in the lower extremities and determine level of ischemia (see below).
- Observe for signs of neuropathy, which can cause impaired muscle function.
- Determine neurosensory status by screening both feet for loss of protective sensation with a monofilament.

RECOMMENDATION #38**LEVEL I (WHS 2006²); LEVEL B (WOCN 2008)**

An ABPI measurement should be performed by a trained practitioner (as determined by the program/site) to rule out the presence of peripheral arterial disease.

Assessment of Ankle Brachial Pressure Index using hand held Doppler Ultrasound

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Owing to vascular calcification, people with long-standing diabetes and renal failure can develop incompressible tibial arteries resulting in falsely elevated systolic pressures. Elevated ankle pressures and ABPI measurements are commonly observed in people with incompressible tibial arterials (TASC II, 2007).

The above individuals and or any person with ABPI result of >1.2 should be referred to an **advanced wound clinician** or vascular lab for toe pressure measurement.

RECOMMENDATION #39**LEVEL B (RNAO 2007)****An ABPI >1.2 or <0.8 warrants further assessment and should be referred to an *advanced wound clinician*.**

Guidelines for Interpretation of ABPI and Toe pressure results.

Ankle Brachial Pressure Index	Toe Pressure (mmHg)	Potential For Healing
0.9 - <1.2	> 55 mmHg	Good
0.80 – 0.89	> 55 mm Hg	Good
0.5 - 0.79	> 40 mm Hg	Adequate
0.35 - 0.49	< 30 mm Hg	Poor
<0.35	< 20 mm Hg	Minimal

(Burrows et al, 2006, Kunimoto et al, 2001 & WRHA Expert Opinion)

For recommendations regarding levels of compression to corresponding ABPI values, refer to the table in Appendix B.

RECOMMENDATION #40**WRHA EXPERT OPINION****Doppler ultrasound to measure ABPI should be repeated as clinically indicated or as per by the program/facility policy.**

Arterial disease may develop in people with venous disease and significant reductions in ABPI can occur over relatively short periods of time.

RECOMMENDATION #41**A referral to a vascular specialist should be considered in the following presentations;**

- Rest pain or gangrene (Level 1 WHS 2006²)
- Non-healing lower extremity ulcer in the presence of arterial insufficiency (Level C WOCN 2008)
- ABPI <0.5 or toe pressure <30 mmHg (Level C WOCN 2008)
- A decrease in ABPI of ≥ 0.15 within a 3-12 month reassessment period (Level III WHS 2008² and Level B TASC II 2007).
- Any observed significant clinical change (WRHA Expert Opinion).

RECOMMENDATION #42**LEVEL C (WOCN 2008)****A comprehensive assessment of an ulcer should include:**

- Assessment of wound characteristics: location, pain, shape, size, colour of wound base, tissue type, wound edges, peri-wound skin, exudate and presence/absence of odour or necrosis (or both).
- Assessment for wound complications: cellulitis, gangrene or **osteomyelitis**.
- Refer to an **advanced wound specialist** wounds that are atypical in appearance or unresponsive to 2 to 4 weeks of appropriate therapy for further vascular evaluation or biopsy.
- Presence or absence of pain and/or suffering
- Re-evaluation at regular intervals
- Refer to WRHA Regional Wound Recommendations - Care of the Wound Bed

TREAT THE CAUSE: PREVENTION AND TREATMENT

RECOMMENDATION #43

LEVEL II (WHS 2008²)

Cardiovascular disease should be identified and managed with an interdisciplinary, evidence-based approach. Standard treatment guidelines for medical therapy (including B-blockers, statins, ACE-inhibitors and anti-platelet therapy) will improve outcomes not only for coronary artery disease but also for ischemic arterial ulcers.

In regards to the use of anti-platelet therapy in peripheral arterial disease, refer to the TASC II document (Norgren et al, 2007).

RECOMMENDATION #44

LEVEL C (WOCN 2008)

Teach people with arterial disease about chronic disease management and measures to maintain intact skin and prevent trauma;

- Control diabetes, hypertension and hyperlipidemia,
- Adhere to medication regime,
- Use neutral or dependent position for legs,
- Avoid chemical, thermal and mechanical trauma,
- Have routine nail and foot care provided by a professional,
- Wear proper fitting shoes/foot ware with socks or hose,
- Provide pressure redistribution for heels, toes and other boney prominences and,
- Seek follow-up with a health care provider.

RECOMMENDATION #45

LEVEL B (WOCN 2008); LEVEL I (WHS 2008²)

If applicable, recommend tobacco cessation which slows progression of atherosclerosis, decreases risk of cardiovascular events and death and may decrease the overall risk of arterial disease after long term cessation.

RECOMMENDATION #46

LEVEL A (WOCN 2008); LEVEL II (WHS 2008²)

Increase regular exercise and physical activity to improve symptoms of claudication.

Institute a regular exercise program for medically stable people with intermittent claudication. Supervised exercise sessions three times per week of 30-60 minutes of treadmill or track walking to the point of pain followed by rest has increased pain-free walking and walking distance. Consult physiotherapist if indicated.

RECOMMENDATION #47

Refer to a vascular surgeon to determine if re-vascularization is possible and appropriate.

In people with arterial insufficiency ulcers, restoration of blood flow with re-vascularization is the intervention that will most likely lead to healing. The goal of re-vascularization is the restore in-line arterial blood flow to the ulcer, which may be manifested by a pulse in the foot or improved ABPI. Approximately 10-20% of people with arterial disease will need re-vascularization surgery. In the presence of arterial ulceration, that natural history is one of disease progression and eventual limb loss, and the treatment options are re-vascularization or amputation (WHS, 2006).

Carefully assess risk versus short-term and long-term benefits of bypass surgery or endovascular lower leg procedure. Short-term surgical benefits may not be sustained long term (Level A WOCN 2008).

TREAT PERSON-RELATED CONCERNS: PAIN

RECOMMENDATION #48

LEVEL III (WHS 2006²)

An approach to control pain in people with peripheral arterial ulcers should address the cause and use local, regional and/or systemic measures.

A comprehensive approach to pain is beyond the scope of these Recommendations. Refer to the WRHA Regional Pain Assessment and Management Clinical Practice Guideline (2008) at http://www.wrha.mb.ca/professionals/ebpt/files/PAM_CPG.pdf

A regular exercise program may increase pain-free walking and total walking distance. Refer to Recommendation #46.

Spinal cord stimulation may be an option to assist in the management of pain relating to arterial disease or ulcers (Level B WOCN 2008; Level II WHS 2006²). Refer to the Pain Management Centre at Health Sciences Centre for further information or appropriateness for the clinical situation.

TREAT PERSON-RELATED CONCERNS: NUTRITION

RECOMMENDATION #49

LEVEL III (WHS 2006²)

It is paramount to evaluate the person as a whole, which includes a nutritional assessment.

Unintended weight loss, dehydration and inadequate nutrition impair wound healing.

When to refer a client to Registered Dietician:

- Reported poor oral food intake or changes in usual eating pattern
- Significant weight loss (1-2% in one week, 5% in one month; 7.5% in 3 months or 10% in 6 months)
- Low serum albumin (less than 33 g/L) or pre-albumin (less than 0.17 g/L)
- HgbH1C value above 7%
- Co-existent medical problems such as diabetes, autoimmune diseases, etc.
- Poor psychological status or social isolation
- Lack of nutrition knowledge
- Inadequate cooking skills
- Limited finances
- Mobility limitations
- Obese BMI >30

In addition to optimal nutritional intake to promote wound healing, this is an opportune time for the dietician to discuss ideal body weight, caloric intake, diabetes control, sodium and fat intake (cholesterol and trans fat).

RECOMMENDATION #50**WRHA EXPERT OPINION****Provide adequate intake of protein and calories to promote wound healing and prevent malnutrition.**

Plasma proteins may be used to measure the protein needs of clients with lower leg ulcers. Specific amounts of protein have not been determined for arterial leg ulcers. However, nitrogen balance is required in order for wound healing to occur.

Individuals who are underweight or who have had significant unintentional weight loss, may need additional calories, to cease weight loss and regain lost weight. However, specific caloric requirements have not been set to promote the healing of arterial leg ulcers.

Clinical judgment must be considered when establishing protein and energy requirements. For instance, it may not be appropriate to recommend high levels of protein for clients with renal disease.

RECOMMENDATION # 51**WRHA EXPERT OPINION****Provide a multiple vitamin/mineral supplement when dietary intake is poor, to meet the Recommended Dietary Allowance or the Adequate Intake.**

Vitamin A, vitamin C and vitamin E can enhance wound healing. Correction of nutritional deficiencies can also improve the wound healing process. However, research does not support the supplementation of individual micronutrients such as zinc, vitamin E, vitamin A, vitamin K, most B vitamins, fish oil, L-arginine in the treatment of arterial ulcers.

For clients with renal disease, health care professionals should discuss the safety of a daily multiple vitamin/mineral supplement with the renal health care team.

RECOMMENDATION # 52**WRHA EXPERT OPINION****Provide 30-35 mL/kg/day of fluid to provide adequate blood flow to the area of altered skin integrity.**

Typically, fluid is recommended in amounts of 30-35 mL/kg of body weight or a minimum of 1500mL per day. Clients with heart failure or renal disease may not tolerate this level of intake.

TREAT PERSON-RELATED CONCERNS: QUALITY OF LIFE**RECOMMENDATION #53****LEVEL C (RNAO 2007)****The client's estimate of the quality of life should be included in the initial discussion of the treatment plan, throughout the course of the treatment and when the ulcer has healed.**

Increased sensitivity to, and understanding of the impact of painful arterial ulcers on quality of life may lead to more effective intervention strategies and improved outcomes for these clients. Healing the ulcer and normalizing the client's life can and should form the basis of care. A variety of quality of life assessment tools are available. If applicable, the Social Worker or chaplain team member should be consulted and involved in the client's care.

RECOMMENDATION #54**LEVEL C (RNAO 2007)****Assess the functional, cognitive and emotional status of the client and family to manage self-care.**

Communicate with the client, family and care-givers to establish realistic expectations for the healability of the venous leg ulcer. The basis for a treatment plan begins with the client when the individual aims of the overall treatment are defined and agreed upon.

TREAT THE WOUND: ARTERIAL ULCER CARE

RECOMMENDATION #55

LEVEL C (WOCN 2008)

Do not debride stable, black eschar until perfusion status is determined. Debridement may be contraindicated in lower extremity arterial disease wounds.

Debridement of an ulcer in the absence of adequate arterial inflow enlarges an ulcer when resources for healing are not available and may worsen ischemia by increasing metabolic demand.

RECOMMENDATION #56

LEVEL II (WHS 2006²); WRHA EXPERT OPINION

If perfusion status is adequate or if revascularization has occurred, debridement may be beneficial.

Request an assessment by an *advanced wound clinician*.

RECOMMENDATION #57

LEVEL II (WHS 2006²)

In arterial ulcers with sufficient arterial inflow to support healing, use a dressing that will maintain a moist wound healing environment.

RECOMMENDATION #58

LEVEL II (WHS 2006²)

Select a dressing that is cost effective and appropriate to the clinical situation.

Refer to the Care of the Wound Bed section for information on dressings that promote moist wound healing.

RECOMMENDATION #59

LEVEL II (WHS 2006²)

In arterial ulcers with insufficient arterial inflow, maintain dry stable eschar or dry gangrene until revascularization potential is established.

Paint dry stable eschar or dry gangrene with povidone-iodine daily. Limit povidone-iodine application to peri-wound skin as much as possible. Generally, cleansing a dry non-healing arterial ulcer with normal saline before painting daily with povidone-iodine is not recommended. However, if there is a build-up of crusted povidone-iodine on the ulcer or peri-wound skin, or if areas of wet gangrene or drainage from edges of eschar is present, it may be appropriate to periodically cleanse with normal saline using clinical judgment to ensure the area does not remain too wet following cleansing.

TREAT THE WOUND: INFECTION

RECOMMENDATION #60

LEVEL C (WOCN 2008)

Monitor lower extremity arterial wound closely for signs and symptoms of infection, which can be subtle because of reduced blood flow.

RECOMMENDATION #61

LEVEL C (WOCN 2008)

Refer infected lower extremity arterial wounds, which are limb-threatening for immediate evaluation, culture-guided antibiotic therapy, assessment of perfusion status or need for surgical intervention to an *advanced wound clinician*, vascular specialist or infectious diseases specialist.

RECOMMENDATION #62

LEVEL III (WHS 2006²)

Topical antimicrobial dressings may be beneficial in management of chronically/heavily colonized ulcers, decreasing their bacterial load and aiding wound healing.

Refer to an *advanced wound clinician*.

Evidence regarding the use of *topical antimicrobial* wound therapy is ongoing. Expert opinion in this area is mixed and consensus has not been achieved. Wounds that have failed to improve with conventional therapy despite optimal care (debridement and optimal peripheral perfusion) may benefit from a *topical antimicrobial*. Refer to the Care of the Wound Bed section for further direction on use of *topical antimicrobial* therapy.

RECOMMENDATION #63

LEVEL C (WOCN 2008)

Do not rely on *topical antibiotics* to treat infected, ischemic wounds.

RECOMMENDATION #64

LEVEL C (WOCN 2008)

Institute systemic antibiotics and referral to vascular surgeon/specialist promptly for critical limb ischemia and evidence of limb infection or cellulitis and/or infected wounds.

TREAT THE WOUND: COMPLEMENTARY THERAPIES

RECOMMENDATION #65

LEVEL II (WHS 2006²)

Intermittent pneumatic leg compression (IPC) increases blood flow and may be beneficial in limbs with impaired distal perfusion, either before or after revascularization.

Refer to a vascular medicine specialist.

RECOMMENDATION #66

LEVEL I (WHS 2006²)

Pentoxifylline does not improve arterial ulcer healing and is not a recommended treatment for arterial ulcers.

TREAT THE WOUND: REASSESSMENT

RECOMMENDATION #67

WRHA EXPERT OPINION

If signs of healing are not evident, a comprehensive assessment and re-evaluation of the treatment plan should be carried out at 2 week intervals or sooner if clinical condition deteriorates.

CLIENT AND FAMILY EDUCATION

RECOMMENDATION #68

LEVEL C (WOCN 2008)

Teach clients with lower extremity arterial disease and their family members about chronic disease management and measures to maintain intact skin and prevent trauma:

- Control diabetes, hypertension and hyperlipidemia,
- Adhere to medication regime,
- Use neutral or dependant position for legs,
- Avoid chemical, thermal and mechanical trauma,
- Have routine nail and foot care provided by a professional,
- Wear proper-fitting shoes and footwear with sock or hose,
- Provide pressure redistribution for heels, toes and other bony parts, and
- Seek follow-up with health care provider.

MIXED LOWER LEG ULCERS

Arterial insufficiency frequently contributes to poor healing in ulcers with another primary etiology such as diabetic neuropathy or venous insufficiency. Ulcerations of mixed etiology are difficult to identify as they present with combinations of signs and symptoms of both venous and arterial ulcerations and may require a combination or modification of therapies.

RECOMMENDATION #69

LEVEL III (WHS 2006²)

Compression therapy may be beneficial in ulcers of mixed etiology (venous and arterial).

In cases of peripheral arterial ulcers associated with venous ulcers, with close supervision, compression can be helpful. However, excessive compression may be harmful in people with arterial disease and more research is required to establish guidelines for compression in people with mixed venous-arterial ulcers. Refer to an **advanced wound clinician** or vascular medicine specialist for treatment options and decisions related to compression therapy.

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APPENDIX A – SAMPLE LOWER LEG ASSESSMENT TOOL

Client Surname:	
Given Name:	
DOB:	
Address:	
Phone:	
PHIN:	
Sex:	
MHSC:	

Lower Leg Assessment Tool						
	Venous S & S		Arterial S & S			
		Leg		Leg		
		RT	LT		RT	LT
Temperature	Warm	<input type="checkbox"/>	<input type="checkbox"/>	Cool in a warm environment	<input type="checkbox"/>	<input type="checkbox"/>
Colour	Hyperpigmentaion (brown staining)	<input type="checkbox"/>	<input type="checkbox"/>	Dependent Rubor	<input type="checkbox"/>	<input type="checkbox"/>
Pain	Aching, heavy legs	<input type="checkbox"/>	<input type="checkbox"/>	Calf pain with walking (intermittent claudication)	<input type="checkbox"/>	<input type="checkbox"/>
				Pain at rest	<input type="checkbox"/>	<input type="checkbox"/>
				Nocturnal pain	<input type="checkbox"/>	<input type="checkbox"/>
Skin /Nail Changes	Thickening	<input type="checkbox"/>	<input type="checkbox"/>	Shiny, taut skin	<input type="checkbox"/>	<input type="checkbox"/>
	Lipodermatosclerosis	<input type="checkbox"/>	<input type="checkbox"/>	Hairless	<input type="checkbox"/>	<input type="checkbox"/>
	Atrophie Blanche	<input type="checkbox"/>	<input type="checkbox"/>	Fungal nails	<input type="checkbox"/>	<input type="checkbox"/>
	Stasis dermatitis	<input type="checkbox"/>	<input type="checkbox"/>	Gangrene	<input type="checkbox"/>	<input type="checkbox"/>
			<ul style="list-style-type: none"> • Wet • Dry 	<input type="checkbox"/>	<input type="checkbox"/>	
Capillary Refill	Less than 3 seconds	<input type="checkbox"/>	<input type="checkbox"/>	Greater than 3 seconds	<input type="checkbox"/>	<input type="checkbox"/>
Peripheral Pulses	Palpable pulses	<input type="checkbox"/>	<input type="checkbox"/>	Diminished or absent pulses	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> • Dorsalis Pedis (DP) • Posterior tibial (PT) 	<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> • DP • PT 	<input type="checkbox"/>	<input type="checkbox"/>
Location of Ulcers	Gaiter Region	<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> • Over bony prominences 	<input type="checkbox"/>	<input type="checkbox"/>
Edema	<input type="checkbox"/> Pitting	<input type="checkbox"/>	<input type="checkbox"/>	<u>Edema</u>		
	<input type="checkbox"/> Non-pitting	<input type="checkbox"/>	<input type="checkbox"/>	Minimal Edema	<input type="checkbox"/>	<input type="checkbox"/>
Other Characteristics	Varicose veins	<input type="checkbox"/>	<input type="checkbox"/>	No edema	<input type="checkbox"/>	<input type="checkbox"/>
	Fixed ankle joint	<input type="checkbox"/>	<input type="checkbox"/>			
Unusual Presentation	Describe:					
Probable Etiology	<input type="checkbox"/> venous <input type="checkbox"/> mixed <input type="checkbox"/> arterial					

Lower Leg Assessment Tool

HEALTH HISTORY	History Associated with Venous Disease		History Associated with Non Venous Disease			
	<input type="checkbox"/>	Family history of leg ulcers	<input type="checkbox"/>	Lower Extremity Arterial Disease	<input type="checkbox"/>	Rheumatoid Arthritis
<input type="checkbox"/>	Varicose Veins	<input type="checkbox"/>	Intermittent Claudication	<input type="checkbox"/>	Renal Disease	
<input type="checkbox"/>	DVT	<input type="checkbox"/>	Vascular Surgery lower limbs	<input type="checkbox"/>	Vasculitis	
<input type="checkbox"/>	• Affected Leg	<input type="checkbox"/>	Rest Pain/night pain	<input type="checkbox"/>	Hypercholesterolemia	
<input type="checkbox"/>	• Unaffected Leg	<input type="checkbox"/>	Hypertension	<input type="checkbox"/>	Ulcerative Colitis/IBD/Crohn's	
<input type="checkbox"/>	Venous surgery	<input type="checkbox"/>	CHF	<input type="checkbox"/>	Current Smoker:	
<input type="checkbox"/>	Injection Sclerotherapy	<input type="checkbox"/>	MI	<input type="checkbox"/>	#cigarettes/day _____	
<input type="checkbox"/>	Trauma/Fracture of leg(s)	<input type="checkbox"/>	Angina	<input type="checkbox"/>	Past Smoker	
<input type="checkbox"/>	Pulmonary embolism	<input type="checkbox"/>	CVA/TIAS	<input type="checkbox"/>	Quit When? _____	
<input type="checkbox"/>	Pregnancies # _____	<input type="checkbox"/>	Diabetes	<input type="checkbox"/>	Previous vascular procedure	
<input type="checkbox"/>	Osteoarthritis	<input type="checkbox"/>	Family History of Atherosclerosis	<input type="checkbox"/>	Obesity	
<input type="checkbox"/>	Phlebitis	<input type="checkbox"/>	None of the above	<input type="checkbox"/>	None of the above	
<input type="checkbox"/>	None of the above	<input type="checkbox"/>				
History of Leg Ulcers	Have you had leg ulcers before this one? <input type="checkbox"/> Yes <input type="checkbox"/> No Year of first occurrence _____ Have you been treated with compression bandaging before? <input type="checkbox"/> Yes <input type="checkbox"/> No					

Recommendations:

I will do a follow up visit with the client in _____ weeks time.

I will connect with you in _____ weeks to check on client's progress _____

Signature: _____ Date: _____

APPENDIX B

THERAPEUTIC COMPRESSION

Compression can be provided through a variety of different ways including compression bandages, compression stockings and intermittent pneumatic compression. Compression systems are considered to be either active or passive. Active compression functions continuously regardless of activity, while passive compression only provides compression when the calf muscle pump is active.

TYPES OF COMPRESSION

Compression

Bandages:

Are multi-layer bandage systems that are applied to the lower leg and typically left in place for up to 7 days. Are available in a variety of materials and compression levels (mmHg pressure – see table below). Requires specific training to apply safely and effectively. Typically used to treat lower leg ulcers and/or manage lower leg edema prior to fitting for compression stockings. (When leg ulcer is healed, compression stockings are required for life to prevent recurrence.)

Compression

Stockings:

Are available in various styles, such as open vs. closed toe, knee high, thigh high and full pantyhose.
Are typically used to manage venous hypertension and prevent recurrence of venous leg ulcers and are required for life.
Stockings should be applied in the morning before the person rises from bed and removed at hs.
Level of compression must be prescribed by physician/Nurse Practitioner (see table below).
Replacement time for compression stocking is six months, as gradual loss of elasticity causes decreased compression ability.
Custom fitting, use of rubber gloves or special devices will facilitate application and promote adherence with use.

Intermittent Pneumatic Compression:

Pneumatically (air) operated full-length sleeves.
Mimics calf muscle pump.
Effective method to reduce gross edema/ lymphedema when unable to fit for a compression stocking.
May be used as an adjunct for compression bandaging.
Consult an **advanced wound clinician** or physiotherapist.

SPECIAL CONSIDERATIONS FOR COMPRESSION

- ◆ Compression system bandaging application is a specialized skill that requires training and competency must be demonstrated and maintained
- ◆ Within first day of initiation of compression, assess:
 - Comfort (tolerance to therapy)
 - Signs of impaired arterial circulation (CWCM and pain)
 - Adherence to compression system
 - Need for reapplication due to decreased edema
- ◆ Specifics of bandage application are determined by product design, or by the user if specific adjustments are desired
- ◆ Frequency of bandage changes are determined by product specifications and volume of **exudate**
- ◆ Withhold high levels of compression during acute phase of **cellulitis** and congestive heart failure. Consult an **advanced wound clinician** for advice and input.

TYPES OF COMPRESSION STOCKINGS AND BANDAGES

COMPRESSION STOCKINGS

Compression Type	Level of Compression	Wearing & Replacement Instructions	Considerations
<p>Compression Stockings:</p> <p>Sigvaris (standard and custom sizes)</p> <p>Jobst (standard and custom sizes) (Beirsdorf-Jobst)</p> <p>Juzo – Stockings + pantyhose (standard and custom) (Julius Zorn Inc.)</p> <p>Various other brand names available</p>	<p>FOR ALL BRANDS</p> <p>20-30-mm Hg Mild superficial effect</p> <p>30-40 mm Hg Moderate superficial effect</p> <p>40-50 mm Hg Superficial and deep effect</p> <p>50-60 mm Hg Strong deep effect</p>	<p>Apply daily (on in am off at hs)</p> <p>Replace q 6 months as stockings lose elasticity and effectiveness over time</p>	<ul style="list-style-type: none"> • Prior to initiation of compression stockings, client must have a vascular assessment including ABPIs or toe pressures • Requires a physician's order for level of compression (mm Hg). • Must be pre-measured (annual re-measurement is recommended). For proper fit ensure client is seen by a certified fitter • Use of compression bandaging may be required initially to reduce edema prior to fitting for a stocking • Client may require assistance to apply • Devices are available to assist in application e.g. Easy Slide, rubber Gloves • Success heavily dependant on adherence • Remove at hs, bathe and moisturize skin to allow to absorb prior to re-applying stocking next am (petroleum based products directly on stocking can cause breakdown and loss of elasticity) • Ensure manufacturer's instructions are followed for care and cleaning
<p>Support Stockings</p> <p>Various brand names available</p>	<p>15-20 mm Hg</p>	<p>As above</p>	<ul style="list-style-type: none"> • Can be used as an alternative in individuals who are not able to tolerate higher levels of compression • Available over the counter without a prescription at pharmacies or department stores

COMPRESSION BANDAGES

Level of Compression	Bandage Name	Type of Compression	Wear Time	Considerations
<p>High 30-50 mm Hg</p> <p>Sustained</p> <p><u>ABPI</u> 0.8 – 1.2</p> <p><u>Initiation</u></p> <ul style="list-style-type: none"> • Physician's order required <p><u>Application</u></p> <ul style="list-style-type: none"> • Demonstrated Competency 	3M Coban 2	<ul style="list-style-type: none"> • Active Graduated • Various bandage applications 	3-7 days	<ul style="list-style-type: none"> • 2 layer bandage system (comfort layer plus compression layer) • See package instructions • Bandage is not bulky & most clients able to wear normal footwear • Cannot be re-used • During initial treatment phase, large amounts of exudate may necessitate bandage replacement before 7 days
<p>High 35-40 mm Hg</p> <p>Sustained</p> <p><u>ABPI</u> 0.8 – 1.2</p> <p><u>Initiation</u></p> <ul style="list-style-type: none"> • Physician's order required <p><u>Application</u></p> <ul style="list-style-type: none"> • Demonstrated Competency 	Profore (Smith & Nephew)	<ul style="list-style-type: none"> • Active Graduated • Varied bandage applications 	Minimum 3-4 days up to 7 days	<ul style="list-style-type: none"> • Four layer bandage system • Level of compression is increased by each layer of bandage applied • See package instructions • Bandage is highly absorbent and comfortable • Bandage is bulky, requiring modification to footwear • Cannot be re-used • During initial treatment phase, large amounts of exudate may necessitate bandage replacement before 7 days
<p>High 35-40 mm Hg</p> <p><u>ABPI</u> 0.8 – 1.2</p> <p><u>Initiation</u></p> <ul style="list-style-type: none"> • Physician's order required <p><u>Application</u></p> <ul style="list-style-type: none"> • Demonstrated Competency 	Comprilan (Beirsdorf-Jobst)	<ul style="list-style-type: none"> • Passive Graduated • Spiral application • Short stretch 	Re-wrap daily	<ul style="list-style-type: none"> • Not recommended for non ambulatory patients as requires calf muscle pump • Various methods to wrap • Absorbent dressing necessary for highly exudative wounds • Can be washed 20 times

COMPRESSION BANDAGES (continued)

Level of Compression	Bandage Name	Type of Compression	Wear Time	Considerations
High 35–40 mm Hg Sustained ABPI 0.8 – 1.2 <u>Initiation</u> • Physician’s order required <u>Application</u> • Demonstrated Competency	SurePress (Convatec)	<ul style="list-style-type: none"> • Active • Graduated • Spiral application 	3-7 days but can be re-wrapped daily if wound requires daily assessment or if using to reduce large edema or increase client tolerance	<ul style="list-style-type: none"> • Two layers of bandage • Inner flannel wrap provides absorption, comfort, protection (friction/shear) and helps create normal leg shape • Markings ensure correct tension and overlap for large or small legs • Outer bandage can be washed and re-used up to 20 times with no loss of compression ability • Minimally bulky
High 30 mm Hg Sustained ABPI 0.8 – 1.2 <u>Initiation</u> • Physician’s order required <u>Application</u> • Demonstrated Competency	Duke Boot: Viscopaste with overlay of CoPlus (3M) or Rolflex (Smith & Nephew)	<ul style="list-style-type: none"> • Active due to outer layer Graduated • Fan fold (Viscopaste) and spiral wrap (CoPlus/ Rolflex) 	Up to 1 week	<ul style="list-style-type: none"> • Initial layer of Viscopaste maintains a rigid shape once dry • The addition of the CoPlus or Rolflex overlay increases compression from moderate to high • See following box for further information on viscopaste fanfold wrapping technique
Moderate 20–30 mm Hg Sustained ABPI ≥0.5 <u>Initiation</u> • Physician’s order required <u>Application</u> • Demonstrated competency	3M Coban2 Lite	<ul style="list-style-type: none"> • Active Graduated • Various bandage applications 	3-7 days	• Similar in appearance & application to Coban2 but provides less compression (see Coban2 for further details)
Moderate 23 mm Hg Sustained ABPI 0.6 – 0.8 <u>Initiation</u> • Physician’s order required <u>Application</u> • Demonstrated Competency	Profore Light (Smith & Nephew)	<ul style="list-style-type: none"> • Active Graduated • Spiral application 	Up to 1 week	• Can be purchased or made by removing Layer 3 (figure 8 layer) from Profore kit

COMPRESSION BANDAGES (continued)

Level of Compression	Bandage Name	Type of Compression	Wear Time	Considerations
<p>Moderate 15 mm Hg</p> <p>Sustained ABPI 0.6 – 0.8</p> <p><u>Initiation</u> • Physician's order required</p> <p><u>Application</u> • Demonstrated competency</p>	<p>Viscopaste (Smith & Nephew)</p>	<ul style="list-style-type: none"> • If client non-ambulatory, becomes active only with calf muscle pump activated • Passive Graduated, if limb contour is normal • Fan fold application 	<p>2-7 days</p>	<ul style="list-style-type: none"> • Zinc impregnated paste bandage, applied with no tension, dries to a rigid shape. Requires outer wrap to protect clothing from moist dressing. For increased compression see Duke Boot (above) • Not recommended for non ambulatory patients. Requires calf muscle pump. • Wear time determined by the amount of drainage (additional ABD pads may be added on the outside to absorb increased exudate). Change prn • Sensitivities may occur • Consider for stasis dermatitis when compression needed
<p>Moderate 15-20 mm Hg Not sustained</p>	<p>Tensor/ACE bandage</p> <p>NOTE: Level of compression may vary due to application technique and brand of product (other forms of compression are recommended/preferred in the Region)</p>	<ul style="list-style-type: none"> • Active Graduated • Figure of 8 • Application 	<p>1-2 days Rewrap prn</p>	<ul style="list-style-type: none"> • Apply from toes to knee including heel • Avoid excess pressure to tibial crest • Alert: shear and friction is possible. Protective padding may be necessary
<p>Mild 10-12 mm Hg Not sustained</p>	<p>Tensor/ACE bandage</p> <p>NOTE: Level of compression may vary due to application technique and brand of product (other forms of latex free compression are recommended/preferred in the Region)</p>	<ul style="list-style-type: none"> • Active Graduated • Spiral application 	<p>1 day Rewrap prn</p>	<ul style="list-style-type: none"> • Apply from toes to knee including heel • Thin materials are less effective • Replace frequently, as worn bandages lose compression • Alert: shear and friction is possible. Protective padding may be necessary
<p>Mild 10-12 mm Hg</p>	<p>Elastogrip (Smith & Nephew) Tensogrip (contains latex) (Convatec)</p>	<ul style="list-style-type: none"> • Active • Not graduated 	<p>1 day On in a.m. Off in p.m.</p> <p>Replace q 3-4 weeks</p>	<ul style="list-style-type: none"> • May be used initially to decrease edema prior to introducing higher levels of compression or to increase tolerance to compression • Multiple layers (tripled directly over the ulcer) will increase compression to moderate • One layer – can be used while awaiting ABPI Vascular Studies if NO clinical signs of arterial disease. Apply from toes to knee • Two layers – ABPI required. Apply only under direction of an advanced wound care clinician • Three layers – ABPI required. Can be used to determine tolerance to higher levels of compression. Apply only under direction of an advanced wound care clinician.

APPENDIX C: SEARCH METHODOLOGY

Search Strategy for PubMed, SCOPUS, CINAHL, Cochrane Library, Google, National Guidelines Clearinghouse, Joanna Briggs

((“lower leg” OR “lower extremity” OR leg) **AND** (ulcer OR ulcers OR “venous leg” OR “venous ulcer” OR “venous ulcers” OR “venous ulceration” OR “arterial ulcer” OR “arterial ulcers” OR “mixed venous”) **AND** (“practice guideline” OR guideline* OR pathway* OR “best practice” OR “best practices” OR “best evidence” OR “evidence-based” OR “systematic review” OR “meta-analysis” OR “cochrane review” OR review)) **NOT** “diabetic foot”

((“lower leg” OR “lower extremity” OR leg) **AND** (ulcer OR ulcers OR “venous leg” OR “venous ulcer” OR “venous ulcers” OR “venous ulceration” OR “arterial ulcer” OR “arterial ulcers”) **AND** (zinc OR “vitamin c” OR nutrition OR “fluid intake” OR calorie* OR micronutrient* OR protein OR “weight loss” OR folate OR “vitamin b6” OR niacin OR “high cholesterol”) **AND** (“practice guideline” OR guideline* OR pathway* OR “best practice” OR “best practices” OR “best evidence” OR “evidence-based” OR “systematic review” OR “meta-analysis” OR “cochrane review” OR review)) **NOT** “diabetic foot”