

# Best Practice Recommendations for the Prevention and Treatment of Venous Leg Ulcers: Update 2006

by Cathy Burrows, RN, BScN; Rob Miller, MD, FRCP (c); Debbie Townsend, RN; Ritchie Bellefontaine BSc, RVT; Gerald MacKean, MD, FRCS (c), Heather L. Orsted, RN, BN, ET, MSc; and David H. Keast, MSc, MD, FCFP

## Abstract

Venous ulcers remain the most common type of lower limb ulceration and their incidence rises with aging. The gold standard for the management of venous ulcers continues to be compression therapy. However, there are new approaches to management that augment healing.

In 2001, the Canadian Association of Wound Care developed Best Practice Recommendations for the Prevention and Treatment of Venous Leg Ulcers. These recommendations were presented as a consensus of expert opinion, applying the available evidence to the management of venous leg ulcers. The recommendations were to serve as a practice enabler for wound-care clinicians.

Today, combining this paper with the Registered Nurses' Association of Ontario (RNAO) *Nursing Best Practice Guideline: Assessment and Management of Venous Ulcers* (2004),<sup>1</sup> the Canadian Association of Wound Care is able to link their recommendations to the evidence. As well, the revised Best Practice Recommendations for the Prevention and Treatment of Venous Leg Ulcers will discuss a recent review of the literature to identify any new changes to practice and provide the evidence as identified by the aforementioned Registered Nurses' Association of Ontario guideline to support each recommendation.

## Introduction

**V**enous leg ulcers (VLU) are a chronic and recurring problem that can be very costly to the health-care system and can significantly impair the quality of life of those who suffer from them. Lower limb ulcers occur in one to two per cent of adults, with 70 per cent of leg ulcers being of venous etiology.<sup>1,2,3,4</sup> The Medical Advisory Secretariat (MAS) reported that the prevalence of lower limb ulcers ranged from 0.12 per cent to 0.32 per cent in the general population, which translates to approximately 50,000 to 500,000 Canadians. In one large Canadian region it is reported as 1.8 per 1,000 for the population over the age of 25. Harrison et al. (2005), in their study on the implementation of an evidenced-based protocol in the community setting, identified that most patients were over 65 years in age and nearly three-quarters had three or more other conditions. Over two-thirds had experienced leg ulcers for many months. Half of the

affected population had a leg-ulcer history spanning five to 10 years; a third exceeding 10 years.<sup>5</sup> Profile information revealed a population complex in terms of health problems and care challenges. A four-week costing study estimated that 192 people receiving care would annually consume \$1 million in nursing-care services and \$260,000 in wound-care supplies.<sup>5</sup> In a study by Harrison et al., three-month healing rates more than doubled between the year before implementation (23 per cent) and the year afterward (56 per cent). The number of nursing visits per case declined from a median of 37 to 25; the median supply cost per case was reduced from \$1,923 to \$406.<sup>5</sup> These staggering statistics represent venous disease as a significant and costly concern to the health-care system. Clinicians caring for this patient population must be aware of, and knowledgeable about, the best practices for the management and treatment of patients with venous ulcer disease.

The purpose of this article is to provide clinicians with an enabler for the management and treatment of venous ulcers by updating the Canadian Association of Wound Care (CAWC) Best Practices for the Prevention and Treatment of Venous Leg Ulcers article<sup>2</sup> supported by the evidence presented in Registered Nurses' Association of Ontario (RNAO) *Nursing Best Practice Guideline: Assessment and Management of Venous Ulcers 2004* (RNAO guideline).<sup>1</sup> This document will focus on a systematic and multidisciplinary approach to both the assessment and treatment of venous leg ulcers (Figure 1).

To retrieve relevant material after the year 2001, databases were searched using the following search engines: Medline, Medscape, Pub Med, CINAHL, Cochrane Library, and Google. Key words included *venous ulcers, wound care, lower limb ulcers, best practice guidelines, evidenced-based guidelines, and clinical practice guidelines*. The RNAO guideline panel conducted an extensive review of the literature as identified in Appendix A of the RNAO guideline, and their guideline is the primary source of evidence for this article:

1. Registered Nurses' Association of Ontario (RNAO). *Nursing Best Practice Guideline: Assessment and Management of Venous Ulcers* (2004). Available online at [www.rnao.org/bestpractices/](http://www.rnao.org/bestpractices/).

### Levels of Evidence

Levels of Evidence, as defined by the RNAO, will be assigned to the

current recommendations with ratings of A, B or C (Table 2).

### Recommendation 1: (Level of Evidence: C)

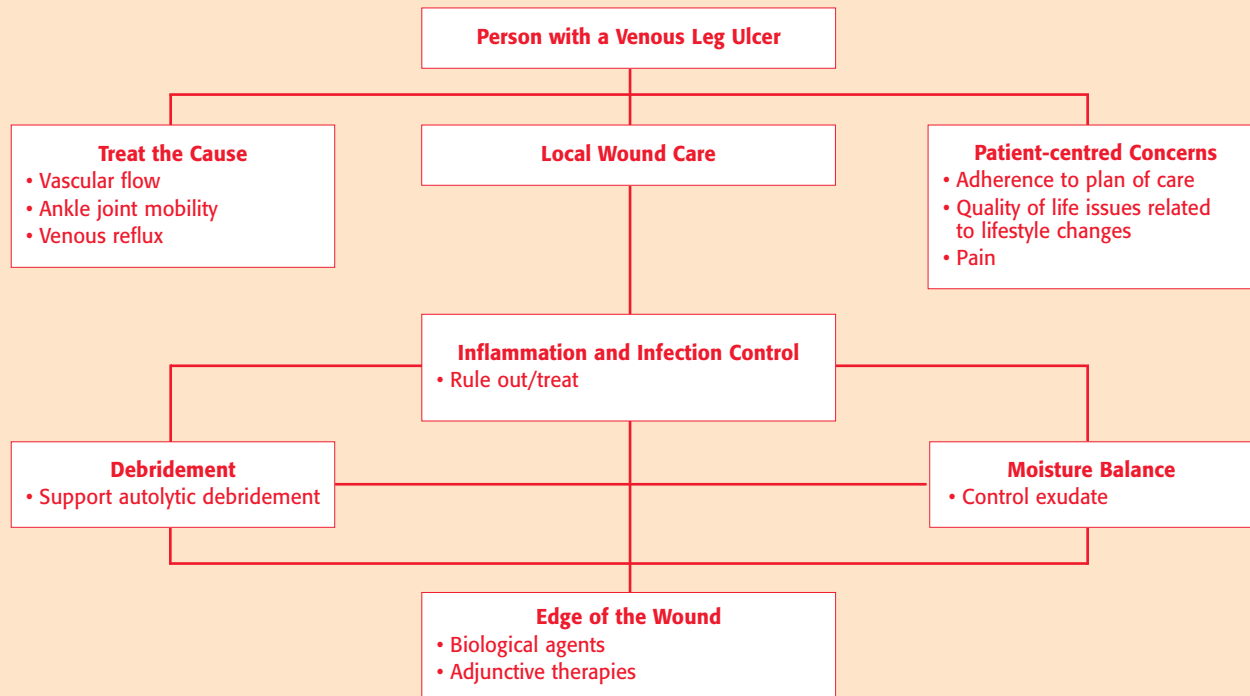
Obtain a careful history to determine the venous characteristics and to rule out other diagnoses; assess pain and identify the systemic and local factors that may impair wound healing.

### Discussion

A thorough history and physical examination are critical in determining the diagnosis of venous leg ulcers. Assessment by trained and experienced health-care professionals is required to determine the etiology. A history will identify risk factors that are associated with venous disease: age, sex, family history, smoking, obesity, pregnancies, an occupation that requires long periods of standing or sitting, trauma, arthroscopic surgery that would cause fixation of the hip, knee or ankle leading to loss of calf-muscle pump, DVT, and congenital anomalies of the venous system.<sup>1,2</sup> Determine if there is pain, its quality, and onset. Pain may indicate the presence of arterial disease. Patients who experience pain with ambulation or while supine are likely to have peripheral arterial disease (PAD). Pain with venous disease is often associated with a heavy, tired feeling mostly at the end of a day. Elevation of the lower limb will induce pain with arterial disease. Pain in venous disease is relieved with elevation. Systemic factors can include malnutrition and vitamin

FIGURE 1

## Pathway to Assessment/Treatment of Persons with Venous Leg Ulcers



Adapted from Sibbald RG, Orsted HL, Schultz GS, et al.<sup>6</sup>

TABLE 1

## Quick Reference Guide

No.	Recommendations	RNAO Guidelines	Level of Evidence
<b>Identify and Treat the Cause</b>			
1	Obtain a careful history to determine the venous characteristics and to rule out other diagnoses; assess pain and identify the systemic and local factors that may impair wound healing.	1–7, 13–14	C
2	Perform a physical assessment. This will include a bilateral lower limb assessment as well as an ankle-brachial pressure index (ABPI) test on all patients with venous ulcers to help rule out the presence of arterial disease.	9–12	A
3	Determine the cause(s) of chronic venous insufficiency based on etiology: abnormal valves (reflux), obstruction, or calf-muscle-pump failure.	1–4	C
4	Implement appropriate compression therapy.	48	A
5	Implement medical therapy if indicated for chronic venous insufficiency (superficial and deep thrombosis, woody fibrosis).	Not Available	C
6	Consider surgical management if significant superficial or perforator vein disease exists in the absence of extensive deep disease.	Not Available	A
<b>Address Patient-centred Concerns</b>			
7	Communicate with the patients, the family and the caregivers to establish realistic expectations for healing and provide information for care and management of venous disease. The presence or absence of a social support system is important for treatment and prevention of venous leg ulcers.	6, 7	C
<b>Provide Local Wound Care</b>			
8	Assess the wound.	5	B
9	Provide local wound care. Optimize the local wound-healing environment through debridement, bacterial balance, and moisture balance. Consider appropriate adjunctive therapies.	44–47	A
<b>Provide Organizational Support</b>			
10	Consult appropriate disciplines to maximize and individualize the treatment plan to address factors and co-factors that may affect healing (e.g., mobility and nutrition).	49–52	A

deficiencies, diabetes, collagen disorders and medical therapies such as glucocorticosteroids and chemotherapy.<sup>2</sup> Diagnostic testing should consist of CBC, electrolytes, BUN, Creatinine, C-reactive protein, Complement 3 and 4, serum albumin, HgbA1C, and ANA.<sup>2</sup>

The RNAO guideline recommendations 1-7, 13, 14 identify the components of the history and physical and pain assessment. See Appendix G for examples of pain management tools.<sup>1</sup>

### Recommendation 2: (Level of Evidence: C)

Perform a physical assessment. This will include a bilateral lower limb assessment as well as an ankle-brachial pressure index (ABPI) test on all patients with venous ulcers to help rule out the presence of arterial disease.

### Discussion

Physical assessment should begin with taking the patient's blood pressure and pulse. Monitor for pulse irregularities that may indicate cardiac abnormalities. Assess both limbs for edema, temperature, and presence of hair. Cooler temperatures to the limb and feet as

well as loss of hair over the foot may indicate arterial insufficiency. Further clinical signs of venous disease include varicosities, hyperpigmentation or hemosiderin staining, atrophie blanche, dermatitis, edema and lipodermatosclerosis (a woody texture to the skin). The

TABLE 2

## Levels of Evidence

Level of Evidence	Evidence
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.

RNAO guideline Appendix D provides a sample leg ulcer assessment form.<sup>1</sup>

The RNAO guideline recommendations 9-12 recommend diagnostic evaluation in diagnosing venous disease.<sup>1</sup> An ankle-brachial pressure index (ABPI) test should be completed to determine the presence of arterial disease that may compromise therapeutic interventions such as compression therapy. ABPIs should only be performed by trained health-care professionals. Clinicians must be aware that obtaining an APBI is one part of the total assessment and should be incorporated into all aspects of the history and physical. Moffatt (1995) and Vowden (2001) caution that palpable foot pulses are insufficient to rule out arterial disease.<sup>1,2,7,8</sup> If a patient has an ABPI <0.8, further investigation, such as T<sub>c</sub>PO<sub>2</sub> and Doppler ultrasound, need to be performed by a vascular diagnostic specialist. A routine referral to a vascular surgeon is recommended if the ABPI is <0.8, and an urgent referral is required if the ABPI is <0.5. (RNAO guideline Appendix C').

### Obtaining an Ankle-brachial Pressure Index (ABPI)

- The patient is required to lie in the supine position for 15 minutes.
- Brachial blood pressures are obtained in both arms, and the higher of the two systolic pressures is used.
- Place the blood pressure cuff around the ankle above the malleoli.
- Apply ultrasound gel over the dorsum of the foot to obtain a dorsalis pulse, and at the notch below the medial malleolus to obtain the posterior tibial pulse.
- Place the probe at a 45° angle and obtain an audible pulse.
- Inflate the sphygmomanometer until the pulse is obliterated.
- Slowly release the cuff until the pulse is heard. Use the highest reading of the two pulses (dorsalis pedis and posterior tibial) on each leg for the ankle pressure.
- Divide the ankle systolic pressure by the brachial systolic pressure. This number is the ABPI.

$$\frac{\text{ankle systolic pressure}}{\text{brachial systolic pressure}} = \text{ABPI} \quad \frac{100 \text{ (ankle)}}{140 \text{ (brachial)}} = 0.71 \text{ ABPI}$$

### Interpretation of ABPI

- > 0.9-1.2 .....normal (1.2 or > should indicate calcification)
- 0.80-0.9 .....mild ischemia (inflow disease may be present)
- 0.50-0.79 .....moderate ischemia
- 0.35-0.49 .....moderately severe ischemia
- 0.20-0.34 .....severe ischemia
- < 0.20 .....likely critical ischemia, but absolute pressure and clinical picture must be considered.

#### Caution:

- ABPI testing should be performed by trained personnel.
- ABPIs may be falsely elevated in persons with diabetes.

### Recommendation 3: (Level of Evidence: C)

Determine the cause(s) of chronic venous insufficiency based on etiology: abnormal valves (reflux), obstruction, or calf-muscle pump failure.

### Discussion

Once the history has been taken, it can be determined if the cause of venous insufficiency is related to one or more of the three common etiologies. Chronic venous disease can be congenital or acquired. Valve dysfunction may be due to a congenital weakness or acquired secondary to previous episodes of thrombophlebitis. Valves can also be damaged from previous trauma or infection. Outflow obstruction, such as increased local pressure, can result from obesity and pregnancy. Damage of the proximal venous system, especially in the pelvic system, may result from malignancy or radiotherapy.<sup>9</sup>

As noted in the 2000 paper, the least reported cause of venous hypertension is musculoskeletal changes that can lead to calf-muscle pump failure. The dynamics of the calf-muscle pump can be adversely affected by changes that often accompany major injuries, neurological disease, vascular insufficiency, myositis, or bone and joint pain.<sup>2</sup> The calf muscles rapidly waste and weaken with disuse. Even the change in gait related to a painful ulcer can exacerbate the venous hypertension and cause calf-muscle-disuse atrophy. A normal walking motion consists of ankle dorsiflexion past the 90° position, which may be required for full functional activation of the calf-muscle pump.<sup>2,10</sup>

### Recommendation 4: (Level of Evidence: A)

Implement appropriate compression therapy.

### Discussion

Compression therapy remains the gold standard for venous leg ulcer care in the absence of arterial disease. Kunimoto et al. report that high compression therapy should only be applied with an ABPI ≥ 0.8 and only if not contraindicated by diseases such as “uncontrolled congestive heart failure.”<sup>2</sup> The RNAO guideline recommendations 34-43 discuss the application of compression therapy for the treatment of venous ulcers.<sup>1</sup> High compression is the initial choice of treatment, but in the presence of diabetes, arthritis, infection, and mild arterial disease (ABPI 0.8-0.6) or in the elderly, compression should be modified.<sup>1</sup> Application of modified compression should consider the patient’s physical status (cardiac and renal function) and tolerance to pain. Refer to the RNAO guideline Appendix K for classification of compression bandages.<sup>1</sup> The amount of sub-bandage pressure can be theoretically calculated using La Place’s Law:

$$P \text{ (sub-bandage pressure)} = \frac{N \text{ (number of layers)} \times T \text{ (tension)} \times C \text{ (a constant)}}{C \text{ (limb circumference)} \times W \text{ (width of bandage)}}$$

According to the RNAO guideline, “... the treatment of venous stasis disease demands the life-long use of therapeutic compression.”<sup>1</sup> A randomized controlled trial (RCT) conducted by Patsch and Horakova (1994) demonstrated that persons with high compression stockings healed 84 per cent (n=25) in three months compared to persons in the short-stretch group that healed 52 per cent (n=25).<sup>11</sup> Prescribing graduated compression stockings requires that clinicians

TABLE 3

### Elastic Systems

Pressure	Characteristics	Examples
Low	Single layer	Comprilan™
High	Long stretch	Surepress™
High	Four layer	Profore™

TABLE 4

### Inelastic Systems

Pressure	Characteristics	Examples
Low	Flexible cohesive + padding*	Coban™ + cast padding Rolflex™
Low	Zinc oxide bandage + gauze	Unna's Paste Boot
Moderate	Zinc oxide bandage +/- gauze + cohesive	Modified Duke Boot (Viscopate™ + Coban™)
Moderate	Velcro system	Circaid™
Moderate to High	Short-stretch system	Comprilan™

\* While cohesive bandages do have some stretch they are best considered to be inelastic systems.

have a full understanding of the principles of compression therapy. Proper measurement and the proper amount of pressure prescribed are needed to avoid any untoward effects of compression (Tables 3 and 4). Patients must be aware that recurrence rates can be higher when they do not adhere to wearing their garments. Nelson et al. (2003) searched 19 databases, including the Cochrane Wounds Group, to determine whether there is an optimum pressure/type of compression to prevent recurrence of venous ulcers. There were no trials that compared recurrence rates with or without compression, and there is no evidence to suggest high compression is better than moderate compression. In the same study, it was reported that there is a higher compliance with patients wearing moderate compression versus high compression. The reviewers concluded that it is recommended that patients should be prescribed the highest compression that they can tolerate to prevent recurrence.<sup>12</sup>

Intermittent pneumatic compression (IPC) to treat venous leg ulcers or leg edema is recommended by Kunimoto et al.<sup>2</sup> The RNAO guideline recommendation 48 suggests that pneumatic compression is indicated for individuals with chronic insufficiency.<sup>1</sup> However, Mani et al. (2004) claim that there is little evidence to support that IPC increases the healing of venous leg ulcers. In fact the two studies reported found no evidence of a benefit for IPC plus compression compared with compression alone, and the authors concluded that further trials were necessary to determine whether IPC increases healing in venous leg ulcers.<sup>13</sup>

A Cochrane Review (2005) states, "Compression increases ulcer

healing rates compared with no compression. Multi-layered systems are more effective than single-layered systems. High compression is more effective than low compression, but there are no clear differences in the effectiveness of different types of high compression."<sup>14</sup>

#### Caution:

- High compression therapy should only be applied in the absence of arterial disease, ABPI =  $\geq 0.8$ .
- The application of high compression therapy should be done by trained practitioners.

#### Recommendation 5: (Level of Evidence: C)

Implement medical therapy if indicated for the complications related to chronic venous insufficiency.

#### Discussion

The RNAO guideline offers little guidance on the medical management of the complications of chronic venous insufficiency. The most common related complication is stasis dermatitis. Leakage of fluid and macromolecules into the tissues creates an inflammatory response with erythema, scaling and intense pruritus. Scratching usually leads to skin breakdown and is often the precipitating cause of venous ulceration. Since the problem is related to chronic venous insufficiency, the key to management is reversal of the edema through appropriate compression therapy. In severe cases initial treatment may involve the use of zinc oxide paste bandages plus compression wraps to reduce both the edema and the inflammatory response. In more mild cases the use of properly worn compression stockings to control leg edema may help prevent stasis dermatitis. Judicious use of low- to mid-potency topical corticosteroids may be a useful adjunct to this treatment but should not be used alone. Persons with stasis edema have often tried a multiplicity of lotions and potions on their legs and many may have developed sensitization to one or more components of these topical agents.<sup>15</sup> All topical agents<sup>15</sup> should be stopped. Impaired calf-muscle function can be improved using a mix of tolerable walking and leg elevation to reduce leg edema.<sup>9</sup> Consultation to a physiotherapist or occupational therapist should be considered to initiate an effective exercise program that will maximize calf-muscle pump action.

There is no evidence that supports the use of diuretics for the treatment of pure venous stasis edema. Reducing intravascular volume does address the underlying problems of venous reflux due to valvular incompetence and/or calf-muscle-pump dysfunction. There are, however, multiple medical conditions causing peripheral edema that may respond in whole or in part to diuretic therapy. The clinician must always sort through the differential diagnosis of peripheral edema to rule out other causes, which may include congestive heart failure, renal failure, hepatic failure, lymphedema, arterio-venous fistulas and intra-abdominal obstructing mass lesions.

Pentoxifylline has been used to reduce the woody fibrosis associated with long-standing venous insufficiency (Level of Evidence: A) and

improve wound healing in difficult venous leg ulcers. A Cochrane Review in 2002<sup>16</sup> reviewed a total of nine trials that included a total of 572 adults. Trials included pentoxifylline or placebo both with compression and without compression. The results were improved healing with pentoxifylline plus compression versus placebo and compression. The authors concluded that pentoxifylline appears to be an effective adjunct to compression bandaging for treating venous ulcers. The usual dose is 400 mg TID. Falanga<sup>17</sup> reported that the use of double dose pentoxifylline was also effective in a randomized controlled trial. Few patients, however, are able to cope with the gastric side effects at this dose.

**Recommendation 6:** (Level of Evidence: A)  
Consider surgical management if significant superficial or perforator vein disease exists in the absence of extensive deep disease.

### Discussion

In a Cochrane review, Hardy et al. evaluated two trials that compared, "... external valvuloplasty using limited anterior plication (LAP) in combination with ligation (L) of incompetent superficial veins (L+LAP) against ligation only (L)"<sup>18</sup> and external valvuloplasty and ligation (V+L) of incompetent superficial veins against ligation only (L). Trial participants had primary valvular incompetence with mild to moderate symptoms but no venous ulcers. L+LAP produced significant improvement in ambulatory venous pressure (AVP). AVP values after surgery remained relatively high. Nine of eleven valves repaired remained competent after two years of follow-up. No complications occurred. The overall mean score for clinical outcome was +2 (moderate improvement) in the L+LAP group compared with +1 (mild improvement) in the L group. Patients with deteriorating clinical dynamics over the five years preceding surgery had a significantly higher rate of improvement in clinical condition in V+L compared to L (81 per cent versus 51 per cent after seven years' follow-up). Patients with stable preoperative clinical dynamics demonstrated a similar rate of improvement in both groups (96 per cent versus 90 per cent). AVPs were not performed.<sup>18</sup> The authors concluded that the results indicate that ligation and valvuloplasty may have produced a moderate and sustained improvement for seven to 10 years after surgery in patients with mild to moderate deep venous incompetence (DVI) caused by primary valvular incompetence. However, there is insufficient evidence to recommend the treatment to this subgroup of patients as the trials were small and used different methods of valvuloplasty and different methods of assessment.

Baker et al., in a SF-36 Health Assessment Questionnaire, surveyed "...150 patients following vein surgery and 89 per cent responded. Results reported that overall symptoms improved ( $p < 0.01$ ) at one month and further improved at six months."<sup>19</sup>

**Recommendation 7:** (Level of Evidence: C)  
Communicate with the patients, the family, and the caregivers to establish realistic expectations regarding their treatment plan and provide information for care and management of venous disease.

TABLE 5

## Physical Findings

Venous Disease	Arterial Disease
<ul style="list-style-type: none"> <li>• Usually shallow, moist ulcers</li> <li>• Situated on gaiter area of leg</li> <li>• Edema</li> <li>• Eczema</li> <li>• Ankle flare</li> <li>• Lipodermatosclerosis</li> <li>• Varicose veins</li> <li>• Hyperpigmentation</li> <li>• Atrophie blanche</li> </ul>	<ul style="list-style-type: none"> <li>• Ulcers with a "punched out" appearance</li> <li>• Base of wound poorly perfused, pale, dry</li> <li>• Cold legs/feet (in a warm environment)</li> <li>• Shiny, taut skin</li> <li>• Dependent rubor</li> <li>• Pale or blue feet</li> <li>• Gangrenous toes</li> </ul>

Adapted from the Registered Nurses' Association of Ontario.<sup>1</sup>

The presence or absence of a social support system is important for treatment and prevention of venous leg ulcers.

### Discussion

Lockyear (2004) in a review of the recent literature illustrates the importance of patient perceptions, physician empathy, communication style, and tone of voice.<sup>20</sup> Patients with venous disease often suffer emotional and physical discomfort. Chronic, non-healing wounds affect quality of life (QoL) due to isolation, inability to work, and a fear of impending limb loss. Under these stressful conditions, patients do not always understand or accept their disease, treatment plan and their prognosis. Graduated compression stockings are a lifetime commitment in the treatment and prevention of recurrence in venous ulcers. It is imperative that clinicians communicate empathy when stressing the importance of compression therapy. Patients who feel their caregiver offers empathy are much more likely to adhere to wearing compression stockings. The patient's perception on health and QoL is impacted by personal, environmental and social factors.<sup>1</sup> Some patients may not be able to afford garments or may not have an ability to apply them. Having the input of a social worker in the management of venous ulcer patients is pivotal in their care. Clinicians who may not have access to a social worker will need to have a sound knowledge of available resources that can be accessed for care. Families of patients need direction in these resources. Good communication skills invite patients and their families to be more involved in care. Education of the patient, families, lay caregivers and clinicians is critical in achieving optimal outcomes for venous ulcer management (RNAO guideline recommendations 6 and 7<sup>1</sup>).

**Recommendation 8:** (Level of Evidence: B)  
Assess the wound.

## Discussion

Venous ulcers most commonly present in the gaiter region (distal medial third) and the malleolar areas.<sup>2</sup> Lower limb ulcers that occur in the calf, shin or lower aspect of the leg likely indicate a traumatic injury. The wounds are generally shallow with irregular borders. The wound bed may contain slough, which is the hydrated counterpart of eschar.<sup>2</sup> Granulation tissue or granulation buds should be visible in the wound. Due to leg edema associated with venous disease, venous ulcers are highly exudative and this exudate can cause peri-wound maceration and eczematous changes. Table 5 compares the physical findings that distinguish venous disease from arterial disease (RNAO guideline recommendation 5 and Appendix E<sup>1</sup>).

Non-healing wounds that do not respond to best practices after three months of treatment should be investigated for other co-morbidities such as cancer, anemia, and poor nutrition. Wounds with rolled edges and nodule appearances require further investigation for malignancy by punch biopsy. This should be taken at the wound edges to include the wound tissue as well as peri-wound tissue.<sup>2</sup>

### Recommendation 9: (Level of Evidence: A)

Provide local wound care. Optimize the local wound-healing environment through debridement, bacterial balance, and moisture balance. Consider appropriate adjunctive therapies.

## Discussion

Cleansing and debridement of the wound is required to remove

devitalized tissue and exudates, reducing the risk of infection, preparing the wound bed and promoting healing.<sup>1</sup> The different types of debridement include autolytic, mechanical, enzymatic and sharp surgical removal of debris. The most common form of debridement in venous ulcers is *autolytic*. Selecting a debridement technique requires a combination of the patient's choice and the skill level of the clinician. Sharp surgical debridement is an advanced skill that should be performed by a physician or their delegate.

### Caution:

- Sharp or surgical debridement is performed by physicians, their delegates, or specially trained and experienced health-care professionals. Nurses should be aware of the policies and procedures of their facility.
- Debride only when there is adequate blood supply!

It is important in chronic wounds to determine the bacterial burden. According to the Royal College of Nurses (RCN) (1998) cited in the RNAO guideline, wound swabbing is not normally recommended unless signs of clinical infection are present.<sup>1</sup> Infection is defined in two recent studies conducted by Gardner (2004) et al.<sup>21,22</sup> *Staphylococcus aureus* is significantly related to number of organisms per gram of tissue and is found to be present in 50 per cent of chronic wounds.<sup>21,22</sup> The traditional clinical signs of infection include inflammation, increased pain, purulent exudates, rapid deterioration of the wound and pyrexia.<sup>1</sup> Recent literature also states that early

TABLE 6

## Dressings with Absorptive Properties

Dressing	Main Use(s)	Absorption	Contraindication(s)
Hydrogels amorphous (a) wafer (w)	<ul style="list-style-type: none"> <li>• Hydration of dry wounds</li> <li>• Supports autolysis</li> <li>• Donor sites (grafts)</li> <li>• Epithelialization</li> </ul>	+	<ul style="list-style-type: none"> <li>• Excessively draining wounds</li> <li>• Infected wounds (w)</li> </ul>
Hydrocolloids	<ul style="list-style-type: none"> <li>• Granulation tissue formation</li> <li>• Supports autolysis</li> </ul>	+	<ul style="list-style-type: none"> <li>• Infected wounds</li> <li>• Excessively draining wounds</li> </ul>
Calcium Alginates	<ul style="list-style-type: none"> <li>• Absorption of exudate</li> <li>• Hemostasis</li> <li>• Infected wounds</li> </ul>	++	<ul style="list-style-type: none"> <li>• Superficial wounds</li> <li>• Epithelializing wounds</li> </ul>
Hydrofibers	<ul style="list-style-type: none"> <li>• Absorption of exudate into the fibres (dynamic)</li> </ul>	+++	<ul style="list-style-type: none"> <li>• Epithelializing wounds</li> </ul>
Hydrofibers with silver	<ul style="list-style-type: none"> <li>• Absorption of exudate of critically colonized or infected wounds</li> </ul>	+++	
Foams Adhesive (a) Non-adhesive (n)	<ul style="list-style-type: none"> <li>• Excessively draining wounds</li> <li>• Non-dynamic absorption</li> </ul>	+++	<ul style="list-style-type: none"> <li>• Infected wounds (a)</li> </ul>
Foams Non-adhesive with silver	<ul style="list-style-type: none"> <li>• Excessively draining infected wounds</li> </ul>	+++	

Adapted from Kunimoto B, et al.<sup>2</sup>

indicators of infection include increase in exudate with associated inflammation, bridging, and pitting within the wound bed.<sup>23</sup> An infection is clinically indicated when  $>10^5$  bacteria/gram tissue is present.<sup>1</sup> Infection should be treated with systemic antibiotics. Topical antibiotics and antiseptics should be avoided as they frequently cause sensitization.<sup>1,2</sup> Refer to the RNAO guideline recommendations 27-32 and Appendices E, H and I.<sup>1</sup>

Topical antibacterial agents, such as antiseptics, topical antibiotics, and newer antimicrobial dressings as well as systemic antibiotics can be used to treat critically colonized or infected wounds. See Table 6 and the RNAO guideline Appendix H.<sup>1</sup>

#### Caution:

- Avoid moist wound healing if there is inadequate blood supply to heal the wound.

Selecting the most appropriate dressing takes into consideration the goal of treatment (healing or maintenance), the amount of exudate, wound bed, patient choice, and cost-effectiveness. Dressings should be identified by categories (see Table 6 and a more extensive table in the Preparing the Wound Bed article on page 27) and selected based on ulcer characteristics, patient risk factors and dressing characteristics. According to the RNAO guideline there is "...insufficient evidence to determine whether any particular dressing increases healing or reduces the pain of venous ulcers."<sup>1</sup> The most important factors in dressing selection should be that they are appropriate for the individual patient based on their action, patient comfort, and cost-effectiveness.<sup>1</sup>

#### Adjunctive Therapies

Adjunctive or complementary therapies should be considered as options for wound management when healing is recalcitrant. Adjunctive therapies such as topical negative pressure therapy, biologicals, living skin tissue, electrical stimulation, hyperbaric oxygen and therapeutic ultrasound may offer alternatives to stimulate healing when malignancy is ruled out.<sup>1</sup> Refer to the RNAO guideline recommendations 50-52.<sup>1</sup>

The Canadian Consensus Group VAC Therapy (CCGVT) report recommends the mini VAC for *select* venous leg ulcers using continuous pressure at 50 mm Hg with an increase to 75 mm Hg if there is no evidence of pain.<sup>24</sup> The report suggests that the dressing should be changed every 48 hours followed by the use of short-stretch compression bandaging.

#### Recommendation 10: (Level of Evidence: A)

Consult appropriate disciplines to maximize and individualize the treatment plan to address factors and co-factors that may affect healing (e.g., mobility and nutrition).

#### Discussion

All factors and co-factors identified during the patient history and assessment that may affect healing need to be removed or modified

to support healing. A sedentary lifestyle can exacerbate leg edema, and patients need to be prescribed a regular exercise regimen as well as lifestyle alterations. Elevation of the legs above heart level when lying or sitting, as well as walking (effectively using the calf-muscle-pump action), can augment venous return. Refer to the RNAO guideline recommendation 49.<sup>1</sup> Trained practitioners who can monitor cardiovascular tolerance should supervise an exercise regimen. When there is loss of mobility or joint flexibility, exercise should be modified by a physiotherapist or an occupational therapist.<sup>10</sup>

If a nutritional deficiency is thought to be significant enough to impair wound healing, a nutritionist or dietitian should be consulted. Deficiencies in the intake of proteins and vitamins are common in the elderly. Management of these deficiencies may make the difference between a healing and a non-healing wound even in the presence of best clinical practice.<sup>2</sup>

#### Conclusions

Since the RNAO guideline is a nursing guideline and this enabler is meant to be interprofessional, recommendations 8 and 9 have medical and surgical implications to fully address the needs of the patient with a venous leg ulcer. The development of a best practice care plan for management of venous leg ulcers requires a multidisciplinary approach as well as strong leadership from clinicians who understand concepts of planned change, program planning and evaluation and research utilization that includes the formal adoption of the guideline. The RNAO guideline expands its recommendations beyond clinical practice by making further recommendations relating to educational and organizational changes, as well as recommendation tips that will be required to integrate best practice for venous leg ulcers into the clinical setting.

The CAWC Recommendations for Practice: Prevention and Treatment of Venous Leg Ulcers article contains recommendations that can be applied today. The RNAO *Nursing Best Practice Guideline: Assessment and Management of Venous Leg Ulcers* (2004) has provided the evidence to update and validate the recommendations for the Best Practices for the Prevention and Treatment of Venous Leg Ulcers.<sup>2</sup> We hope that by attaching the evidence to the recommendations we have provided a user-friendly version that supports best practice at the bedside. ☺

#### References

1. Registered Nurses' Association of Ontario (RNAO). *Nursing Best Practice Guideline: Assessment and Management of Venous Leg Ulcers*. Toronto: RNAO. 2004. Available online at [www.rnao.org/bestpractices/](http://www.rnao.org/bestpractices/).
2. Kunimoto B, et al. Best practices for the prevention and treatment of venous leg ulcers. *Ostomy/Wound Management*. 2001;4(2):34-50.
3. Berard A, et al. Risk factors for the first-time development of venous ulcers on lower limbs: The influence of heredity and physical activity. *Angiology*. 2002;53(6):647-657.
4. Nicolaides AN, et al. Investigation of chronic venous insufficiency: A consensus statement. *Circulation*. 2000;102(20):E126-163.
5. Harrison M, Graham I, Lorime K, Friedberg E, Pierscianowski T, Brandys T. Leg-ulcer care in the community, before and after implementation of an evidence-based service. *CMAJ*. 2005;172(11). Available online at [www.cmaj.ca/cgi/content/full/172/11/1447](http://www.cmaj.ca/cgi/content/full/172/11/1447).



6. Sibbald RG, Orsted HL, Schultz GS, Coutts P, Keast D. Preparing the wound bed 2003. *Ostomy/Wound Management*. 2003;49(11):24-51.
7. Vowden P, Vowden K. Doppler assessment and ABPI: Interpretation in the management of leg ulcers. *World Wide Wounds*. March 2001. Available online at [www.worldwidewounds.com/2001/march/vowden/doppler-assessment-and-ABPI.html](http://www.worldwidewounds.com/2001/march/vowden/doppler-assessment-and-ABPI.html).
8. Moffatt C, O'Hare L. Ankle pulses are not sufficient to detect impaired arterial circulation in patients with leg ulcers. *Journal of Wound Care*. 1995;4(3):134-138.
9. Nicolaides AN, et al. Investigation of chronic venous insufficiency: A consensus statement. *Circulation*. 2000;102(20):E126-163.
10. Orsted HL, Radke L, Gorst R. The impact of musculoskeletal changes on the dynamics of the calf muscle pump. *Ostomy/Wound Management*. 2001;47(10):18-24.
11. Partsch H, Horakova M. Compression stockings in the treatment of lower leg ulcers. [German]. *Wien Med Wochenschr*. 1994;144(10-11):224-249.
12. Nelson EA, Bell-Syer SEM, Cullum NA. Compression for preventing recurrence of venous ulcers. *The Cochrane Database of Systematic Reviews* [Internet database]. 2000;4:Art. No. CD002303. Accessible online at [www.thecochranelibrary.com](http://www.thecochranelibrary.com).
13. Mani R, Vowden K. Intermittent pneumatic compression for treating venous leg ulcers. 2004. Available online at [www.medscape.com/viewarticle/485888?src=search](http://www.medscape.com/viewarticle/485888?src=search).
14. Cullum N, Nelson EA, Fletcher AW, Sheldon TA. Compression for venous leg ulcers. *The Cochrane Database of Systematic Reviews* [Internet database]. 2001;2:Art. No. CD000265. Accessible online at [www.thecochranelibrary.com](http://www.thecochranelibrary.com).
15. Sibbald RG, Cameron J. Dermatologic aspects of wound care. In Krasner DL, Rodeheaver GT, Sibbald RG, (eds). *Chronic Wound Care: A Clinical Source Book for Healthcare Professionals*, Third Edition. Wayne, PA: HMP Communications. 2001.
16. Jull AB, Waters J, Arroll B. Pentoxifylline for treating venous stasis ulcers. *The Cochrane Database of Systematic Reviews* [Internet database]. 2002;1:Art. No. CD001733. Accessible online at [www.thecochranelibrary.com](http://www.thecochranelibrary.com).
17. Falanga V, Fujitani RM, et al. Systematic treatment of venous leg ulcers with high dose pentoxifylline: Efficacy in a randomized placebo controlled trial. *Wound Repair Regen*. 1999;7(4):208-213.
18. Hardy SC, Riding G, Abidia A. Surgery for deep venous incompetence. *The Cochrane Database of Systematic Reviews* [Internet database]. 2004;3:Art. No. CD001097. Accessible online at [www.thecochranelibrary.com](http://www.thecochranelibrary.com).
19. Baker DM, et al. How successful is varicose vein surgery? A patient outcome study following varicose vein surgery using the SF-36 Health Assessment Questionnaire. *Eur J Endovascular Surg*. 1995;9(3):299-304.
20. Lockyear P. Physician-patient communication: Enhancing skills to improve patient satisfaction. Medscape [Continuing Medical Education on the Internet]. December 2004. Available online at [www.medscape.com/viewprogram/3679](http://www.medscape.com/viewprogram/3679).
21. Gardner SE, Frantz RA. Obtaining wound specimens: Three techniques. *Advances in Skin and Wound Care*. 2004;17:64-65.
22. Gardner SE, Frantz RA, Saltzman CL, Dodgson K. *Staphylococcus aureus* is associated with high microbial load in chronic wounds. *Wounds*. 2004;16:219-225.
23. Cutting KF, White RJ. Criteria for identifying wound infection—revisited. *Ostomy/Wound Management*. 2005;51(1):28-34.
24. Sibbald RG, Mahoney J; Canadian Consensus Group. VAC Therapy. A consensus report on the use of vacuum-assisted closure in chronic, difficult-to-heal wounds. *Ostomy/Wound Management*. 2003;49(11):52-66.