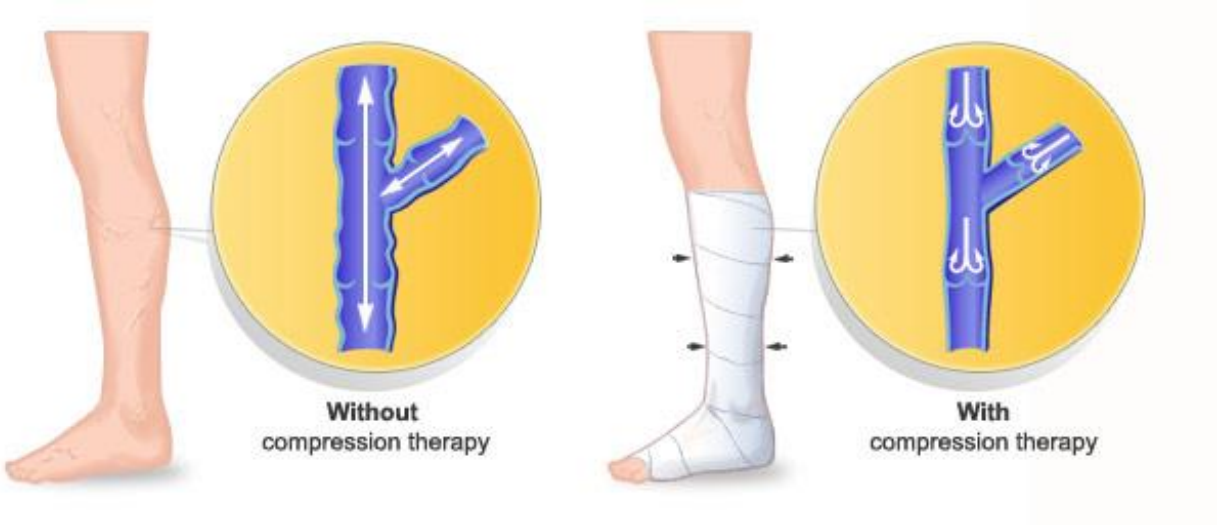
Developed by the British Columbia Provincial Nursing Skin & Wound Committee in collaboration with NSWOCs/WCs from:

Education Module

Application of Compression Therapy for the Management of Venous and Mixed Venous/Arterial Insufficiency



2025 January

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Framework: Mastering Compression Therapy for Venous and Venous/Arterial (Mixed) Insufficiency

Compression therapy is the application of compression wraps or garments to the lower leg for the treatment of venous insufficiency, venous leg ulcers and mixed arterial / venous ulcers.

Practice Level – British Columba & Yukon: see Compression Therapy for Venous Insufficiency: Guideline

Mastering a competency requires nurses to have the appropriate knowledge, technical skill and clinical judgment required to carry out the task. These competencies must be integrated safely into the practice environment. Completing this module is one part of the educational preparation required to be able to apply compression therapy safely and effectively.

Acquiring Knowledge and Skill

Knowledge/Theory

- Complete a Health Authority approved education module e.g., this module.
- Read the following guideline and resource materials in conjunction with this module:
  - Guideline: Compression Therapy for Venous Insufficiency.
  - Product Information Sheets (PISheets) for compression wraps.
- Review the following clinical practice guidelines and reference materials:
  - Guideline: Assessment &Treatment of Lower Limb Ulcers
  - Assessment Tool: Basic & Advanced Lower Limb Assessment Flow Sheet
  - Documentation Guideline: Basic & Advanced Lower Limb Assessment Flow Sheet

or

- Attend an employer-endorsed Compression Therapy theory education session.
- Pre-read evidence-based practice documents selected by a clinical practice lead in your practice setting.

Skill

- Attend an employer-endorsed skills education session with a competent practitioner to learn about compression wraps/garments in order to observe and practice the application of relevant wraps/garments.

Integrating Knowledge into Practice

1. Complete the learning activities contained in the text of the Module and the quiz and case studies included in Section B Learning activity (quiz and case study answers are in Appendix D).
2. Carry out return demonstrations with a designated clinical lead present and in a practice setting where compression therapy is commonly ordered as part of the treatment plan. Return demonstrations are repeated as needed to ensure that both the nurse demonstrating compression therapy and the clinical lead observing are confident of the learner's mastery of the skill.
3. Complete the *Skills Checklist* is in Appendix C.

INTRODUCTION

Compression therapy is the gold standard treatment for venous leg ulcers and edema due to **venous insufficiency** and is applied using either **wraps** or **garments**. It is important not to wait for an ulcer to heal before initiating compression therapy. Compression therapy is also used to treat clients with mixed arterial and venous insufficiency. However, they require additional supervision and more frequent monitoring because of the presence of arterial insufficiency.

The application of external compression initiates a variety of complex physiological and biochemical effects involving the venous system. Provided that the level of compression does not adversely affect arterial flow and the correct application technique and materials are used, the effects of compression can be dramatic, reducing **edema** and pain while promoting wound healing. The amount of compression required is determined following a comprehensive assessment of the lower limb and underlying pathology and consideration of the client's ability to tolerate compression.

Current evidence suggests that:

- Compression therapy increases venous ulcer healing compared to no compression.
- High compression is more effective than low compression.
- Wrap systems with 2 or more layers are more effective that single layer wraps.[26,44]

Based on this evidence, guidelines recommend that high compression multi-component wraps should be used in the treatment of venous insufficiency and venous ulcers, if tolerated by the client.

Purpose

This self-study module has been designed to help you understand the theory required for the making of clinical decisions regarding compression therapy for Venous and Mixed Arterial / Venous Insufficiency (this module does not address compression therapy for Lymphedema). The module will also assist you in the development your skill at applying compression wraps and garments as well as provide information that will help you better assess and plan care, and address problems if they occur.

This module includes content on compression wraps as well as compression garments including stockings, inelastic devices, and tubular sleeves. It does not include content on intermittent pneumatic compression or lymphedema. Completion of this module is only one of the requirements needed prior to applying compression therapy.

Learning Objectives

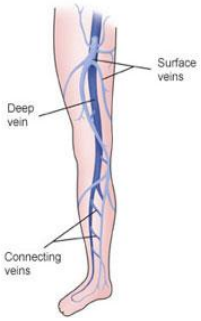
After completing this module, you will be able to:

- Describe the basic anatomy and physiology of peripheral venous and arterial circulation.
- Describe the importance of assessing peripheral arterial circulation prior to initiating compression.
- Describe the pathophysiology that occurs with venous and mixed venous / arterial insufficiency.
- Understand the different types of compression therapy and related physiological effects.
- Identify situations where compression therapy is used with caution or is contraindicated.
- State key principles when applying compression wraps.
- Monitor for and address adverse events that can arise with compression therapy.
- Provide appropriate education on compression therapy to clients and families.
- Demonstrate the ability to correctly apply one or more compression wraps.
- Understand why clients may not adapt to compression therapy and use strategies to help clients participate in treatment.
- Understand the role of the interprofessional team to assess and manage care.

Learning Activities

The learning activities included in this module support knowledge and skill acquisition and should help you to integrate your knowledge and skills into the practice environment. The learning activity, quiz and case studies address content from this module plus the guideline on compression therapy and the compression therapy product information sheets found on the www.clwk.ca website.

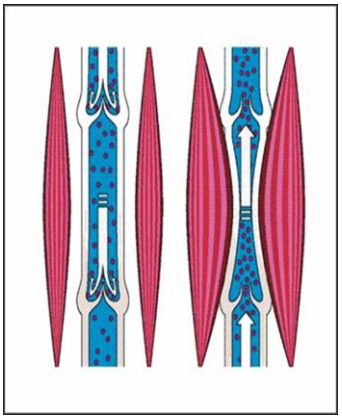
SECTION A - THEORY



ANATOMY AND PATHOPHYSIOLOGY

The Venous System

Three groups of veins take the blood from the legs to the heart: the superficial vein the deep veins and the perforating or communicating veins. The superficial veins la within the subcutaneous layers of the skin while the deep veins lie within the mus--culature. The deep veins are responsible for carrying most of the blood to the hear and lungs where it is oxygenated. The perforating or "communicating" veins connec the superficial and deep veins and are numerous in the leg, especially in the **gaiter area**.



When a person with normal venous circulation stands or mobilizes, the calf and foot muscles contract compressing the veins and moving blood toward the heart. The efficacy of this **calf muscle pump** to maintain normal pressures in the lower leg is dependent on the power of the moving ankle joint and the competency of the veins and valves.[27] One-way bicuspid valves, found in the perforating and deep veins, prevent blood from flowing backward when the muscles relax.

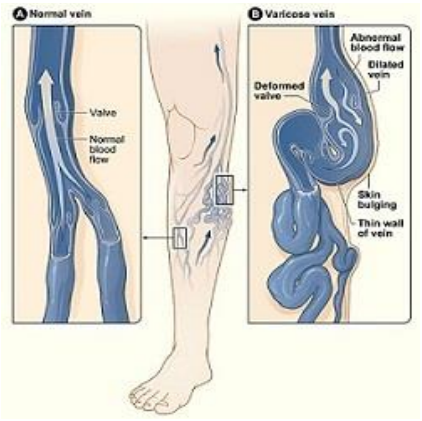
Blood pressure in the venous system is affected by gravity and posture. Normal venous blood pressure in the lower leg is approximately 80 - 100 mm Hg when standing. With mobilization and exercise blood moves toward the heart and the venous blood pressure in the leg drops to 20 - 30 mmHg.[16, 28, 44]

The Arterial System

Arteries carry oxygenated blood to all body tissues. Healthy arteries have strong muscular walls that relax or constrict as required to regulate the rapid blood flow from the heart. The aorta bifurcates at the navel into two iliac arteries which transport blood into each leg. Near the groin, the iliac arteries bifurcate again into the femoral arteries. The small branches of the femoral arteries carry blood to the lower extremities. The posterior tibialis and dorsalis pedis arteries carry blood to the foot.

Venous Insufficiency

Chronic venous insufficiency occurs when blood is not effectively pumped toward the heart and pools in the superficial veins and capillaries of the lower leg causing venous hypertension and edema.



The elevated venous pressures in the lower leg result in damage to the superficial and perforating veins causing a backward flow of blood called reflux. At this point the calf muscle pump, normally present when walking, cannot move sufficient blood toward the heart. When the calf muscle pump is impaired, the reduction in venous pressure associated with walking and exercise decreases resulting in higher pressures in the veins. These increased pressures move fluid from the venous blood system into the surrounding tissues, causing edema.

However, when lying down with the feet elevated above the level of the heart, venous pressures in the lower leg can fall as low as 10 mmHg.[44]

Prevalence estimates vary based on geographic location but in Europe and North America chronic venous insufficiency affects up to 40% of females and approximately 17% of males with approximately 0.3% -1% of adults developing venous leg ulceration.[2,6,26]

One or more of the following risk factors are usually present in clients who develop chronic venous insufficiency and venous hypertension:

- Damaged bicuspid (one-way) valves.
- Muscle wasting, poor mobility, limited ankle mobility or paralysis.
- Complete or partial deep vein obstruction due to **deep vein thrombosis** (DVT) and **post thrombotic syndrome** following a DVT.[28]
- Multiple pregnancies.
- Wound infection or cellulitis.
- Varicose veins.
- History of IV drug use.
- Low protein levels leading to excess edema.
- Trauma or surgery to the leg such as a total knee replacement.
- History of a fractured lower leg.
- Radiation therapy.
- End stage organ disease.
- Obesity.

Classic lower limb changes commonly seen with chronic **venous insufficiency** include:

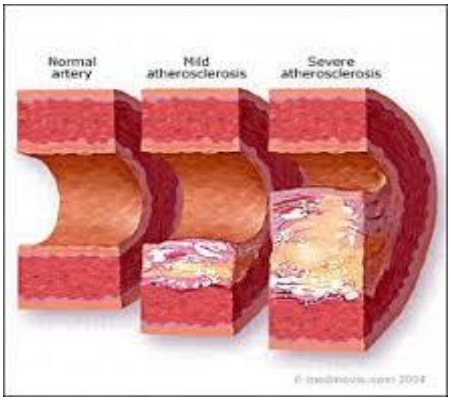
- Elevated skin temperature over the lower leg and foot due to inflammation.
- Edema caused by fluid leaking from the veins into the surrounding tissues. Although pedal pulses are often normal, they may be to difficult to palpate if the edema is severe.
- Wounds:
  - Shallow with irregular borders and covered with yellow slough or granulation tissue.
  - These secrete moderate to large amounts of exudate especially with compression.
  - Located proximal to or over the medial malleolus or the gaiter area.
- Evidence of healed wounds. Cellulitis may be present.
- Pain & heaviness in the legs especially with prolonged standing that is often relieved with elevation.
- **Hemosiderin staining** caused by red blood cells leaking into the tissues, breaking down and infiltrating the subcutaneous tissues. Causes a reddish-brown pigmentation over the lower leg.
- Venous dermatitis presents as weeping, itching, scaling skin, erythema, hyperpigmentation and dilated superficial veins.
- **Woody fibrosis,** also known as **lipodermatosclerosis** is a thickened brawny **induration** over the lower leg. This causes a loss of tissue compliance which prevents expansion of the tissue in the ankle. It gives the leg the appearance of an inverted **champagne bottle** and can ultimately lead to ulceration on the lower limbs.
- Limited mobility in the ankle joint ("fixed or frozen ankle") which in turn limits the proper use of the calf muscle pump

Learning Activity #1

Mr. T has a history of DVT and evidence of a healed ulcer over the left medial malleolus. He works in a bar where he stands for long periods. He is obese and engages in little activity in his off-work hours. He has bilateral edema with thick scaly skin over the left lower leg. He has evidence of hemosiderin staining over both lower legs but no venous dermatitis.[26]

Identify 4 indications of venous disease presented by Mr. T: _____

Arterial Insufficiency



Peripheral arterial disease or **arterial insufficiency** occurs when the flow of blood to the lower leg is obstructed due to atherosclerosis.

Atherosclerosis refers to the accumulation of plaque in the arteries. When plaque collects on the arterial walls, arteries become narrowed, hard, and occluded and are less able to supply adequate amounts of oxygenated blood to the lower extremities (ischemia).

Arterial plaques may accumulate more rapidly for those (1) who smoke, (2) who are affected by obesity, diabetes, or hypertension, (3) with a family history of vascular or coronary disease, (4) with advancing age and hyperlipidemia.[46]

Classic lower limb changes commonly seen with chronic arterial insufficiency include:

- Skin on lower leg is thin, fragile, shiny, dry, and possibly scaly.
- Thin, wasted calf muscles.
- Colour –pale on elevation, rubor (red) in a dependent position and cyanosed when cold.
- Temperature – Cool extremities; may have temperature change along the leg or a temperature difference between the legs.
- Thickened toenails and an absence of hair on the lower leg.
- May present with calluses.
- Diminished or absent peripheral pulses.
- **Ankle brachial pressure index** (ABPI) less than 0.90. Severe arterial insufficiency is diagnosed with an ABPI of 0.49 or less. [33]
- Capillary refill delayed (greater than 3 seconds).
- Gangrene may be present.
- Pain:
  - Severe muscle pain in the thighs, calves and feet that worsens with activity or limb elevation.
  - Ranges from **intermittent claudication** to resting pain.
  - Is often worse at night.
- Wound description:
  - Wound base is pale pink or filled with yellow debris; may be necrotic and eschar is common. May involve tendon or bone.
  - May present as shallow to deep wounds.
  - Wound margins are well defined with a round "punched out" appearance.
  - Wounds occur on, between the toes, over metatarsal heads, on the lateral malleolus, heels, and tibia.
  - Minimal serous or purulent exudate
- Infection is frequent and signs may be subtle due to impaired circulation

Learning Activity #2

Mrs. M is 85 years and lives alone with assistance from Home Support. She had a stroke 2 years ago and has occasional chest pain if she walks longer distances. She has cramping calf pain when she walks more than a block that resolves with rest. On examination she has very thin calves, her left foot is cool to touch and she has thickened toenails. When dependent, her left foot appears dark pink when compared to her right. She has a very small, round wound covered with black eschar on her left lateral malleolus.

Identify 5 indications of arterial disease presented by Mrs. M: _____

An ABPI greater than1.3 indicates arterial calcification and non-compressible arteries and is commonly seen in those with diabetes or renal disease. The **Toe Brachial Pressure Index (TBPI)** is a reliable test to determine the degree of arterial blood flow to the feet when arterial calcification is present. It is calculated using systolic pressures in the arm and the toes. In contrast to the evidence-based limits of the ABPI, the diagnostic criteria for the TBPI remain ambiguous. However, several guidelines and reviews recommend less than 0.7 as the cutoff for lower extremity arterial disease. [8, 13, 36] Compression therapy with calcified arteries should only be applied following specialist advice and must be monitored closely.

Mixed Venous/Arterial Insufficiency

Mixed ulcers are mostly seen in older clients and include signs and symptoms of both arterial and venous ulcers. When arterial and venous insufficiency are both present in the lower extremity, assessment and treatment become more complex and the potential for problems from compression therapy increase. Ulcers with mixed arterial and venous etiology may be more difficult to identify and treat as they present with a combination of symptoms.

Concomitant arterial disease occurs in as many as 22 - 26% of clients with venous disease and this occurrence increases in advanced age. [7] The ABPI for clients with mixed ulcers is usually between 0.89 and 0.5. Compression therapy is not used when clients have severe arterial disease (ABPI less than 0.5 mmHg or TBPI less than 0.3) unless ordered by a vascular surgeon or Physician.

When clients with diabetes also have edema and venous leg ulcers there is always a concern about arterial insufficiency therefore compression is not initiated until adequate arterial status is confirmed[14]. With close supervision, compression therapy may be beneficial for clients with ulcers having a mixed arterial and venous etiology.

Appendix B outlines the characteristics of arterial insufficiency, venous insufficiency and mixed etiology and their related wounds.

Learning Activity #3

Mrs. J is 86 years old. She has an ABPI of 0.7 and a history of smoking for 20 years. She has bilateral edema with a fixed left ankle and an ulcer on her left gaiter area.

Does she have arterial insufficiency, venous insufficiency, or mixed venous/arterial insufficiency? _____

Learning Activity #4

Identify each picture as an arterial or venous wound.

Photo A _____ Photo B_____ Photo C _____

Photo D _____ Photo E _____ Photo F _____

ASSESSMENT PRIOR TO COMPRESSION THERAPY

It is imperative that a complete history and physical assessment occurs before making any decision about compression. Multiple factors impact not only the decisions about compression but also about the client's level of understanding about and participation in compression therapy. The assessment prior to compression therapy includes but is not limited to client concerns, risk factors, pain, and a comprehensive lower limb assessment.

Learning Activity # 5

1. Read pages 5 - 7 of the Compression Therapy for Venous Insufficiency: Guideline for a list of required assessment information
2. Review the Basic & Advanced Lower Limb Assessment Flow Sheet and its documentation guideline
3. After reading about the assessment required prior to compression therapy, answer the following questions:
   a. Why would you assess a client's ankle range of motion and ability to mobilize?
      _____
      _____
   b. Why would you assess for the presence of intermittent claudication and nocturnal or resting pain?
      _____
      _____

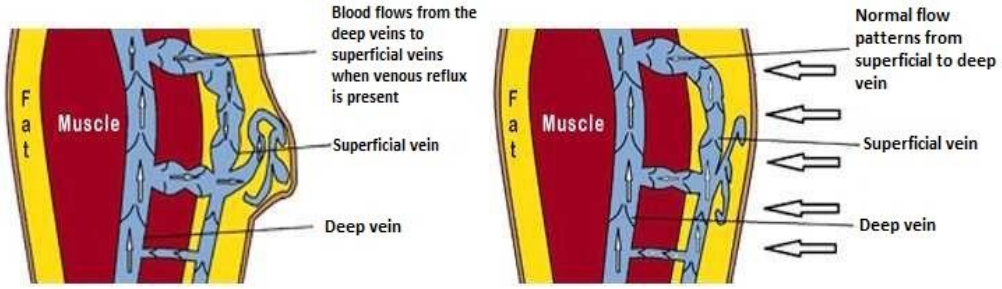
Compression therapy consists of using wraps or garments to directly application of pressure to a limb and is measured in millimeters of mercury (mmHg). It works by squeezing the limb which reduces **venous hypertension** and **edema** and aides venous return to the heart. Research exploring the effects of compression therapy on chronic venous insufficiency indicates that it is the gold standard for treatment.[30] On-going compression therapy, once the ulcer is closed, usually prevents venous leg ulcers from recurring. [28]

Untreated chronic venous disease may progress to **lymphedema** over time. As fluid moves from the capillaries into the tissue the lymphatic system increases its activity to compensate for this. If the lymphatic system cannot cope with the additional fluid, the constant strain damages the lymphatic system and causes combined venous and lymphatic insufficiency which may progress to lymphedema.[37,43]

Therapeutic compression can be applied using wraps or garments. To be effective these must provide sufficient compression and this compression must be sustained over time. A sufficient amount of compression will:

- improve the function of the calf muscle pump,
- decrease the diameter of major veins reducing the backflow of blood and pressure in the lower leg,
- move blood toward the heart,
- reduce edema, and /or
- stimulate the lymphatic system.

Moffatt[19] states that compression wraps can reduce the volume of blood in the lower extremities by 62% in the standing position. As edema decreases there is an associated reduction in pain and aching discomfort in the lower leg. Reducing edema increases blood supply to the skin allowing more nutrients and oxygen to reach the skin, thus improving its condition.



Without Compression **With Compression**

Although sustained compression may be beneficial when venous insufficiency is combined with arterial insufficiency, the use of sustained compression **must be modified based on the severity of arterial disease and requires a team approach and close monitoring.** Failure to recognize arterial disease can result in the unsafe application of high compression therapy. Excess compression may further compromise the already reduced arterial blood flow.

It is important to remember that all aspects of the decision to start compression therapy, including the type of compression wrap as well as the amount of compression are determined by the Physician / NP or Wound Clinician in consultation with the client/caregivers and the interprofessional health care team

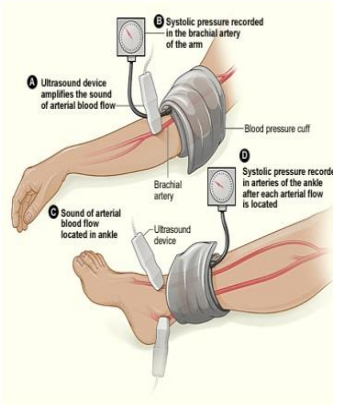
Learning Activity # 6

Mr. B has been treated for his venous insufficiency and significant bilateral edema with a compression wrap for the last 6 months. Over this time his edema resolved so he was again able to walk his dog. The scaly, weeping skin over his lower legs and recurrent bouts of cellulitis also resolved. His wound healed and the heaviness that he has previously experienced improved. He was able to lose weight and his mood significantly improved.

Identify 4 direct effects of compression therapy: _____

Poor Arterial Circulation can be a Precaution or a Contraindication

- The client's arterial circulation is the most important consideration when the NSWOC/Wound Clinician or Physician/NP decides to initiate compression.
    - Prior to initiating high compression therapy, (greater than 20 mmHg) a comprehensive lower limb assessment using the basic and advanced lower limb assessment tools must be completed to screen for the presence and severity of arterial insufficiency.
    - When low-moderate compression is being considered (less than 20 mm/Hg), a lower limb assessment (basic & advanced) must be done but an ABPI or TBPI is not required if the pedal pulses are palpable or present with a hand-held doppler and capillary refill is normal.
- The most used test to determine arterial perfusion is an ABPI. ABPI testing is part of a comprehensive lower limb assessment and must be carried out prior to compression therapy especially in older adults in whom arterial insufficiency is more prevalent.[28,35,44]
    - An ABPI score between 0.90 and 1.30 is considered normal and compression therapy can be used.
    - Consensus among experts [44] indicates that compression therapy for clients with an ABPI between 0.5 and 0.89 or an ABPI of 1.31 or greater requires more frequent monitoring.
    - Compression is contraindicated if the ABPI is 0.49 or less unless ordered by a Physician or vascular surgeon. Adequate resources and very frequent monitoring must be in place in this client situation.
- Failure to identify arterial disease prior to initiating compression therapy can lead to serious consequences for the client.



Precautions

These precautions are factors that increase the risk associated with compression therapy, however they do not preclude its use. If precautions are present, all aspects of decision making and ongoing application must be carried out with caution, *be done in conjunction* with a Physician/NP and/or Wound Clinician and client must be closely monitored. The precautions are:

- Treated wound infection.
- Moderate to mild arterial disease (0.51 - 0.89) combined with venous insufficiency (mixed etiology).
- Compression therapy following vascular surgery, such as an arterial bypass graft, must be ordered by a vascular surgeon.
- The presence of neuropathy.
- Controlled heart, liver, or renal failure.
- Severe pain or untreated pain.
- Treated DVT or phlebitis.

Contraindications

Compression therapy is contraindicated for:

- Severe arterial disease unless the client is under the care of a vascular surgeon or Physician.
- Untreated wound infection.
- Ischemic rest pain.
- Untreated DVT or phlebitis.
- Uncontrolled organ failure (heart, renal, liver).
- Clients who are not able to manage compression due to cognitive impairment, mental health concerns or a lack of support to put on and remove compression therapy systems.

However, once the infection, organ failure or DVT have been treated, compression therapy may be appropriate but should be applied with caution and under the direction of a Physician/NP or Wound Clinician. When compression is applied to both lower extremities there can be a 5% increase in cardiac output which can cause potential cardiac overload for those with acute or uncontrolled heart failure. In situations where heart failure has been treated and is considered stable, one leg may be compressed

and the client monitored closely for signs and symptoms of cardiac overload before the second leg is treated.[19]

Learning Activity # 7

Compression therapy is contraindicated for which of the following conditions? Circle all that apply.

a. Controlled organ failure
b. Venous insufficiency
c. Moderate arterial insufficiency with venous insufficiency.
d. Untreated wound infection
e. Severe pain

COMPRESSION WRAPS

Compression wraps are classified as either **elastic/long-stretch** or **inelastic /short-stretch** and can be applied in one, two, three or four layers depending on the product being used. Most wrap systems include a padding layer and some form of elastic, inelastic or rigid outer layer. Compression wraps can exert high, moderate, or low **sub wrap pressure** depending on the type of wrap chosen.

The amount of compression produced by a wrap system *over time* is determined by:

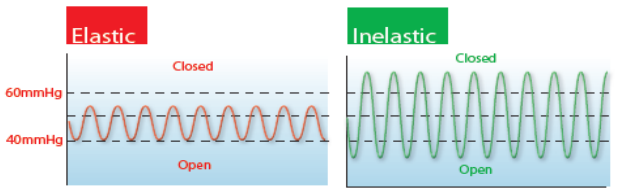
- The width of the wrap.
- The number of layers and the elastic properties of the wrap. A wrap that is applied at 50% overlap essentially provides 2 layers of wrap and therefore higher compression.
- The **tension** (the stretch of a particular wrap) as the wrap is being applied.
- The size and curvature of the limb to which it is applied. This relates to ankle size and the abnormal curvature of the leg such as champagne leg deformity or very thin calves.
- The amount and type of physical activity undertaken by the client. For example, full ankle mobility increases the client's ability to mobilize which improves calf muscle pump function. [26]

Tensor wraps are used to hold dressings in place or provide support for a joint. *They should not be used for compression.*

Elastic/Long-Stretch Compression Wraps

Elastic or long stretch compression wraps contain elastomeric fibers that are capable of stretching and almost returning to their original size. They have a higher **resting pressure** and a lower **working pressure**. Any reduction in limb circumference results in only small changes in sub-wrap pressure. Elastic wraps can sustain their pressure up to a week due to their ability to accommodate changes in limb shape and movement.[44] Examples of elastic compression systems includes Profore, Profore Lite and Surepress; see Appendix A for a more detail description of these compression wraps

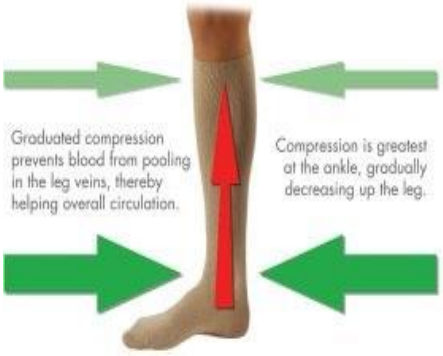
Fig 3: What is the static stiffness index?
The static stiffness index (SSI) of a bandage is the difference between the working and resting pressures. When patients are mobile, bandages with a high SSI will produce higher pressures, generating intermittent high pressure peaks during exercise and low pressure peaks when at rest. The more elastic (extensible) a bandage is, the less resistance it provides, creating lower pressure peaks during exercise. Inelastic bandages and multi-layer systems generally have a higher SSI than elastic bandages.



These pressure peaks create intermittent, short duration venous occlusions which, in much the same way as a valve, are thought to reduce venous reflux and lower venous hypertension (WUWHS, 2008)

Elastic/Long-Stretch Compression Wraps	Description and Indications for Use
Profore ▪ Four-layer elastic long-stretch wrap system providing high compression (30-40 mmHg). ▪ A padding layer covered by a conformable layer followed by a light compression wrap and a cohesive compression wrap.	Click on the link to view the Profore Product Information Sheet

Profore Lite ▪ Three-layer elastic long-stretch wrap system providing moderate compression (20-30 mmHg). ▪ Padding layer covered by a light conformable wrap and a flexible cohesive wrap.	Click on the link to view the Profore Lite Product Information Sheet



The ankle circumference is usually smaller than the circumference of the calf on a normally shaped leg. Therefore, if an *elastic* wrap is applied to a normal leg with constant tension and overlap, the pressure achieved at the ankle will be higher than the pressure achieved at the calf. This is called ***graduated compression*** and is required to move blood from the lower leg toward the heart when *elastic wrap systems* are used.

When applied to a limb with normal proportions, graduated ***elastic*** compression wraps provide a 20–30% therapeutic reduction in pressure from the ankle to just below the knee. Generally, the pressure at the ankle is 40mmHg and decreases to 17mmHg at the top of the calf. Clients who have an altered limb shape such as a very thin ankle, narrow calf muscle (see photo on the left) or champagne bottle deformity require additional padding to approximate a normal leg shape in order to achieve graduated compression.

Most wraps are manufactured to apply the correct pressure for an ankle sized from 18 to 26 cm.[9] Therefore ankles measuring less than 18 cm must be padded to measure 18 cm before applying an elastic compression wrap. If the ankle circumference is greater than 26 cm, the pressure exerted at the ankle by the wrap is reduced because interface pressure decreases as the limb circumference increases. There are compression products available which are designed for ankles with more than a 26cm circumference.

Learning Activity # 8

Mr. W's lower limb assessment has been sent to his doctor. His ABPI is 0.78. He has an irregularly shaped wound on his left malleolus and bilateral hemosiderin staining. His doctor has ordered Profore Lite compression wraps for both legs.

Name two things that you would assess before applying the initial wrap.

1. _____

2. _____

Inelastic/Short-Stretch Compression Wraps

Inelastic or short-stretch compression wraps contain few or no elastomeric fibers and therefore have little extensibility or stretch. They sustain low resting pressures and high working pressures, that is, they maintain high pressures when the client is standing, walking, or exercising and therefore may achieve a quicker reduction in edema. The low resting pressures means that pressure is not sustained at rest or for the non-ambulatory client or as the edema decreases.

When compared to elastic materials, inelastic wraps may need to be changed before 7 days, e.g., 2-3 days, because of a significant reduction in edema.[12] Effective wear times will increase as edema reduces. Inelastic systems are more effective when clients are mobile because the calf muscle contracts against the wrap which forces blood toward the heart. Inelastic short stretch wraps may also be better tolerated by clients with mixed arterial / venous insufficiency because they have a lower resting pressure.[33,44] Examples of inelastic wrap systems include Coban 2, Coban 2 Lite and Comprilan. See Appendix A for a more detail description of these compression wraps.

The advantages of inelastic compression systems include:

- Providing high working and low resting compression.
- Cost effectiveness - Comprilan can be washed without losing elasticity and be reused.
- Having less bulk at the heel so clients can wear normal footwear.
- Padding is not required but it may be beneficial with an altered limb shape to help with ease of application, to avoid slippage and/or to protect against pressure damage to bony prominences.
- Being easy to apply and more likely to have consistent sub wrap pressure when applied by different nurses.[16]

Inelastic/Short-Stretch Compression Wraps	Description and Indications for Use
Coban 2 ▪ Two-layer short-stretch inelastic wrap system providing high compression (30-40mmHg). ▪ Latex free foam padding covered with a cohesive compression wrap	Click on the link to view the Coban 2 Product Information Sheet
Coban 2 Lite ▪ Two-layer short-stretch wrap inelastic wrap system providing high compression (20-30 mmHg). ▪ Latex free foam padding covered with a cohesive compression wrap.	Click on the link to view the Coban 2 Lite Product Information Sheet
Comprilan ▪ Reusable two- layer short-stretch inelastic wrap system providing high compression (30-40mmHg). ▪ A padding layer covered by a reusable short stretch wrap.	Click on the link to view the Comprilan Product Information Sheet

Rigid zinc oxide (viscopaste) based wraps such as Duke and Unna Boots are a subcategory of inelastic compression systems. In addition to providing compression therapy for the treatment of chronic venous ulcers and edema, they are also indicated when the client has skin conditions such as eczema and **venous dermatitis** that require the anti-inflammatory effects of zinc. However, zinc can also be an irritant so it is important to monitor the client when it is first applied. See Appendix A for a more detail description of these compression wraps.

Inelastic Rigid Zinc Oxide Compression Wraps	Description and Indications for Use
Viscopaste without Self-Adherent Bandage (Unna Boot) ▪ Two-layer rigid wrap system providing low -moderate compression (20 mmHg or less). ▪ Zinc impregnated gauze covered with a layer of Kling.	Click on the link to view the Unna Boot Procedure.
Viscopaste with Self-Adherent Bandage (Duke Boot) ▪ Three-layer rigid wrap system providing high compression. ▪ Zinc impregnated gauze covered by a layer of padding (optional) and a layer of cohesive, self-adherent wrap.	Click on the link to view the Duke Boot Procedure.

Learning Activity # 9

Ms. G has a mixed venous arterial ulcer on her left limb. Her ABPI is 0.56. Her vascular surgeon has ordered compression with Coban 2 Lite.

1. Why is an inelastic short-stretch wrap usually better tolerated by clients with mixed disease?

   _____

2. You are applying a Coban 2 Lite wrap on Ms. G. Will the pressure executed on the leg be greater if the bandage is not overlapped or if it is overlapped by 50%? Explain your answer.

   _____

The literature indicates that inelastic short-stretch and elastic long-stretch wraps are equally effective at healing venous leg ulcers, reducing rates of recurrence, maintaining quality of life, and managing pain.[5,12] Different bandages apply compression in different ways, either by the cumulative effect of multiple layers, the vigorous constant pressure of long stretch wraps or by varying resting and working pressures in a short stretch wrap.[3]

Characteristics of the ideal compression system:

1. Incorporates an inelastic or elastic component.
2. Produces a good anatomical fit that is conformable to the leg.
3. Allows full functionality.
4. Is comfortable at rest.
5. Is easy to apply and adapt to a range of limb sizes and shapes.
6. Is durability and non-allergenic.[33]

General Principles of Compression Wrapping

Although it is important to apply compression wraps and garments according to the manufacturer's instructions, the following principles may be helpful.

1. When using an *elastic* wrap system such as Profore or Profore Lite, it is necessary to create a pressure gradient with the pressure highest at the ankle and progressively decreasing toward the knee. If the client has a very narrow ankle in relation to the size of the calf or very thin calves, the leg must be padded to simulate normal leg contours, that is, narrower at the ankle and wider at the calf. When using an *inelastic* system, it may be helpful to pad abnormally shaped lags to make wrapping easier and to avoid slippage.
2. For compression to be effective, the sub-wrap pressure must be sustained over time as close to the same level as when the wrap was applied. Some wraps sustain compression better than others. Inelastic wrap systems have less stretch and may not be able to maintain adequate compression as edema resolves and the calf circumference changes. Therefore, they may require more frequent reapplication in the early stages of treatment until edema is reduced.
3. Wraps are applied from just above the toe crease at the 5th metatarsal head (MTH) to 2 cm (2 fingers) below the knee. This maintains adequate knee flexibility and avoids pressure over the popliteal artery while at the same time not compressing the toes.

4. When applying a compression wrap, ensure that the calf muscle is at rest and that the foot is dorsiflexed as close to 90 degrees as possible. This supports optimal ankle movement once the wrap has been applied. It also minimizes the amount of wrap over the anterior ankle reducing the risk of pressure damage to this area.
5. Do not wrap any excess bandage below the knee because the extra wrap can increase sub-wrap pressure causing a tourniquet effect. Instead cut the excess wrap or remove the wrap and re-apply. If the wrap is not long enough, use a second wrap rather than overstretching the first one. Overstretching a short wrap increases the wrap tension and may also cause a tourniquet effect. Always use the tension recommended in the product information sheets when applying wraps.

6. The frequency of wrap changes is determined based on product specifications, the amount of exudate, reduction in edema and the need for close monitoring, for example when arterial insufficiency or peripheral neuropathy is present. Often the wrap must be changed on a more frequent basis for the first 1-2 weeks as the edema subsides. Changes in limb shape due to reduced edema should be monitored by measuring the circumference of the calf and ankle on a weekly basis.

Learning Activity #10

Which of the limbs on the right require padding prior to treatment with an *elastic* compression wrap?
Circle all that apply

A B C

7. Generally multi-layer wraps that deliver high compression are recommended for use during the therapy phase of treatment to control venous insufficiency, reduce edema and heal the ulcer, if present.[26] However, some clients may not tolerate high compression or have other comorbidities such as arterial insufficiency that require an adapted treatment plan. Stockings or tubular sleeves (Medigrip or EdemaWear) can be used if lower pressures are desired.
8. If a venous leg ulcer is present, compression therapy should occur in conjunction with moist wound healing and debridement, if debridement is indicated.[25]

Skin Care Prior to (Re) Applying Compression Wraps

Skin problems can include peri-wound maceration, irritation or allergic reactions, pruritus, and venous dermatitis. Use a dressing that has adequate exudate absorption to avoid peri-wound maceration and protect the peri-wound skin with skin protectant if necessary. Zinc based compression wraps may be beneficial if pruritus, eczema, or venous dermatitis is present. Venous dermatitis should improve as edema decreases. Carefully washing the leg and applying moisturizers will also help alleviate skin problems.

Good skin care for the lower legs and feet is required before the initial compression wrap and between removing and reapplying all subsequent wraps. Following removal of the compression wrap the feet and lower legs should be washed/showered with warm water/soft cloth and a pH balanced no-rinse skin cleanser/moisturizer, if available. Avoid hot water, bar soap and excessive scrubbing. Gently pat the skin dry, carefully drying between the toes. For the client at home, the client/ caregiver can be taught to remove the wrap and bathe/moisturize the lower legs before the nurse's visit. While washing the skin on the lower extremities, assess for pressure damage and other complications. If not using a combined skin cleanser/moisturizer then moisturize the skin.

Avoid skin care products that contain potential sensitizers or known common allergens such as lanolin, latex, perfumes, cetearyl alcohol and topical antibiotics, such as neomycin or polysporin.

If skin problems such as maceration, dryness, itching, allergic or contact dermatitis or eczema are present, consider one or more of the following interventions:

- Apply a skin protectant if peri-wound maceration is present and review the type of absorptive dressing used.
- The dressing and wrap may need to be changed more frequently.
- Use a cotton stockinette liner against the skin to avoid irritation from padding.
- Review all products being used if contact dermatitis or eczema occurs.
- Zinc based wraps or zinc ointment may be used to decrease pruritus and venous dermatitis lesions. However, zinc can also be an irritant so monitor the client when it is first applied.
- Consult with a Wound Clinician or Physician/NP if skin problems do not resolve with treatment.

Learning Activity # 11

Ms. S is 83 and lives alone with no help. She has a small venous ulcer with a moderate amount of exudate on her right medial malleolus. She also has evidence of venous dermatitis on her lower legs with some peri-wound maceration. The wound clinician has requested that Coban 2 be used as the compression wrap. Ms. S would like to shower at least weekly.

How would you care for the skin and wound on her lower leg?

_____

_____

_____

Client Teaching

Teach the client and/or caregiver:

a. the signs that the compression therapy is effective(decrease in edema, improved wound healing),
b. how to manage any discomfort related to the compression therapy,
c. the need to monitor for the adverse effects of compression therapy, especially the signs and symptoms of arterial insufficiency (numbness, tingling, toes turn blue/cold, increased pain) or slippage/tourniquet effect,
d. when it is necessary to remove the compression wrap, how to remove it, and
e. who to contact if there are problems.

PREVENTING AND TREATING ADVERSE EFFECTS OF COMPRESSION THERAPY

1. Pressure Damage

Pressure damage presents as redness over a bony prominence, blistering, abrasions, open areas, or necrosis. Slippage can cause pressure damage to the skin especially for clients with poor arterial circulation, thin or altered limb shape, foot deformities, reduced sensation, or long term systemic steroid use.

Areas at higher risk for pressure damage include the tibial crest, dorsum of the foot, around an ankle deformity, over-crowded, deformed toes and over bunions.

The tibial crest is particularly vulnerable to pressure damage because it presents at a sharp angle and benefits from additional padding prior to wrap application. To avoid pressure damage, apply extra padding over vulnerable areas, especially as edema is reducing and check frequently for wrap slippage. If pressure damage occurs, consult with a Wound Clinician and/or Physician/NP.

2. Slippage

Those clients wearing elastic and inelastic wraps that have an altered limb shape or experience a rapid reduction of edema are at risk of wrap slippage. Slippage causes uneven pressure distribution resulting in a tourniquet effect over the lower leg. This reduces the effectiveness of the compression and can result in pressure damage abrasions, blisters, and open areas.

When slippage occurs, the wrap should be removed immediately and rewrapped or a different wrap should be applied. When a compression wrap is first applied, it may require reapplication every 2-3 days to avoid slippage especially during the first 1-2 weeks until the edema is reduced. Padding the lower leg to an approximate normal shape or the use of a ***cohesive wrap***, such as Coban 2, may minimized slippage. Do not apply an adhesive to the skin to prevent slippage unless recommended by a wound clinician. Monitor bony prominences if slippage is a concern.

3. Circulatory Problems

Monitor for impaired circulation including pale, cool or numb extremities distal to the wrap or garment. If pain, numbness, tingling, discolouration or swelling of the toes occurs, the compression wrap or stocking **must be removed immediately** and a Wound Clinician or Physician/NP notified.

In addition, monitor for dyspnea, chest pain and other signs and symptoms of heart failure; should these occur, the wrap or stocking **must be removed immediately and the client should go to the Emergency.**

If toes remain edematous with compression, refer to the Wound Clinician.

4. Pain and Discomfort

Monitor for changes in pain intensity/type of pain and ensure that the pain is not related impaired circulation as mentioned above.

Discomfort has a major impact on the client's ability to tolerate compression. A proper assessment, noting an increase / decrease in discomfort over time or a change in client's pain sensation is important. Compression, when applied appropriately may increase discomfort initially but should relieve it over time. If at first the client experiences increasing pain, it may help to reduce the level of compression and / or have the client elevate the limb until the amount of edema decreases if arterial insufficiency is not present. Clients who cannot tolerate compression wraps due to pain may tolerate compression stockings or a tubular elastic bandage with a lower sub-wrap pressure. Clients should receive appropriate analgesia to reduce pain and discomfort to a level that is manageable for them or be instructed on the use of appropriate analgesia if they are at home. Consult the Physician/NP if pain is not resolved to the client's satisfaction.

5. Allergic Reactions
   If an allergic reaction occurs, review the ingredients in the cleansing and moisturizing products and any wound dressings used as well as the compression wrap to determine the source of the reaction and discontinue the product.

Allergic reaction to a dressing

Blister from a tight wrap

6. Blistering
   Blistering is caused when the epidermis becomes separated from the dermis due to excessive shear. This can occur if wraps or garments slip or are applied too tightly. If the blister is intact, consult a wound clinician to determine the most appropriate treatment. If the fluid has drained out of the blister cover it with a non-adherent sheet dressing and a cover dressing, if necessary before re-applying the wrap.

7. Strike Through
   The presence of strike through to the outside of the wrap indicates the need for a more absorbent dressing over the wound. Dressings such as foams, alginates or hydrofibers wick exudate vertically away from the wound to protect the wound margins. More frequent changes of the wrap and dressing may also be indicated. Increased drainage is normal when compression is first applied therefore the wound and peri-wound skin should be checked frequently for maceration.

8. Refer the client to the Wound Clinician, Physician/NP if the wound is not healing, edema is not resolving or the client is having increasing pain.

Learning Activity # 12

Ms. V has a problem with bandage slippage due to a wasted calf muscle. When you remove her elastic compression wrap you note that she has a large fluid filled blister over the front of her leg.

Which of the following would you consider for treatment? Circle all that apply:

1. Pad the calf area prior to re wrapping her compression wrap.
2. Cut the top of the blister with a pair of scissors.
3. Call the wound clinician to discuss changing to a short stretch inelastic compression wrap such as Coban 2.
4. Pad the ankle area prior to re wrapping her compression wrap.
5. Once the blister is drained put a dry gauze dressing over it to protect it from the compression wrap.

Learning Activity # 13

On your second visit to Mr. W (Lesson Activity #8) you notice that wound exudate has soaked through the compression wrap.

What would you do?

_____

_____

ONGOING RE-ASSESSMENT ONCE COMPRESSION IS INITIATED

Ongoing assessment following the application of compression is essential to ensure that it is effective and is modified as edema resolves. It is also important to avoid adverse events or ensure they are treated in a timely manner if they do occur.

1. Assessment Before the Compression Wrap is Removed[42]
    a. Has there been strikethrough?
        i. Heavy exudate levels may suggest a problem with the wound, such as an infection or a dressing that cannot accommodate the amount of drainage.
    b. Has the wrap been "adjusted"?
        i. If the client has adjusted the wrap it may indicate the presence of pain and discomfort. Discuss this with the client and address the problem or provide education as necessary.
    c. Does the client report numbness or discolouration of the toes?
        i. Determine if the bandage is too tight around the foot and ankle.
        ii. Check for pulses, recheck the ABPI and contact the Physician/NP or Wound Clinician for further direction.
    d. Has the client experienced new pain from the wrap or in the ulcer?
        i. Consider pressure levels and padding with the current compression wrap.
        ii. Check for contact sensitivities or infection. Determine the appropriate analgesic use or contact the Physician/NP or Wound Clinician for further direction.
    e. Is there an odour from the wrap?
        i. Assess the wound for infection.
    f. Is there swelling above or below the wrap?
        i. Consider the type of wrap used and the wrapping technique. Ensure that compression is graduated if using an elastic wrap.
        ii. Encourage the client to elevate the legs above the level of the heart if arterial insufficiency is not involved.
        iii. Consult with a Physician/NP or Wound Clinician to determine if full leg compression is required or to rule out other conditions such as lymphedema.
    g. Has the wrap slipped?
        i. Bandage slippage is caused by:
            - Reduction in limb size as edema decreases. This requires more frequent wrap changes until the limb size stabilizes.
            - Incorrect bandage wrapping.
            - Wrapping an abnormally shaped limb without first padding the limb to approximate a normal shape.

2. Ongoing Re-assessment for Clients with Venous Insufficiency
    a. Assess the client within 48 hours of *initiating* compression therapy for the following:
        i. The presence of adverse effects.
        ii. The client's tolerance for compression therapy.
        iii. A reduction in edema and increase in wound exudate (if a wound is present) that necessitates more frequent wrap changes.
        iv. Any slippage of the compression wrap.
    b. Reinforce client /caregiver teaching regarding monitoring for adverse effects and for changes that are expected with compression.
    c. If it is not possible to do an in-person assessment then follow-up with a telephone call is sufficient if the client/caregiver is able to answer questions about adverse effects and expected changes.
    d. Once problems are addressed, if present, continue to assess the client as follows:

i. Complete a basic lower leg assessment each week including calf circumference, amount of edema and monitor for adverse effects when the wrap is changed.
ii. If the wrap is changed more than once weekly assess the amount of edema each time the wrap is changed.

e. Contact the Wound Clinician or Physician/NP immediately if increasing pain is present or circulatory problems are present.
f. Consult with a Wound Clinician or Physician/NP if the edema is not resolving or the wound is not improving within 2 weeks of the initial compression wrap.

3. Ongoing Re-Assessment for Clients with Venous/Arterial Insufficiency (Mixed)
   a. Assess the client within 24 hours of *initiating* compression therapy for the following:
      i. Circulation, warmth, sensation, and mobility (CWSM).
      ii. The client's tolerance for compression therapy.
      iii. The presence of adverse effects.
      iv. Any reduction in edema or increase in wound exudate (if a wound is present) that necessitates an increase in the frequency of compression wrap reapplication.
      v. Any slippage of the compression wrap.
   b. Reinforce client/caregiver teaching regarding monitor for adverse effects and the changes to expect with compression.
   c. If it is not possible to do an in-person assessment then follow-up with a telephone call is sufficient if the client/caregiver is able to answer questions about adverse effects and expected changes.
   d. Once problems are addressed, if present, continue to assess the client as follows:
      i. Complete a basic lower leg assessment each week including calf circumference, amount of edema and peripheral circulation (CWSM) and monitor for adverse effects when the wrap is changed.
      ii. If the wrap is changed more than once weekly, assess CWSM and amount of edema between weekly wrap changes.
   e. Consult with a Wound Clinician or Physician/NP immediately if increasing pain is present.
   f. Consult with a Wound Clinician or Physician/NP if the edema is not resolving or the wound has not improved within 2 weeks of the initial compression wrap.

4. An ABPI assessment is routinely done on admission and every 6 months as part of a comprehensive lower leg assessment for clients receiving compression therapy. It is also done immediately if either of the following occur:
      i. Increasing lower leg and/or foot pain unrelated to infection.
      ii. Increasing signs of arterial insufficiency, e.g., delayed capillary refill, cold skin temperature, absent or diminishing peripheral pulses

Learning Activity # 14

Mrs. P is being treated for a venous ulcer on her right gaiter area. Her ABPI is 0.94 and she does not have diabetes. Her ulcer measures 8 x 2 x 0.1 cm and has a moderate amount of exudate. You have just applied an absorbent dressing and Coban 2 compression wrap.

When would you schedule a follow-up visit?

_____

Name 4 things you would assess during this visit:

_____

_____

TRANSITIONING FROM COMPRESSION WRAPS TO COMPRESSION GARMENTS

All aspects of the transition from compression wraps to garments (stockings, reusable devices, and tubular sleeves), including the level of compression, are determined by a Physician/NP or Wound Clinician. The transition from compression wraps to a garment usually occurs once the ulcer has been closed for 1-2 weeks to avoid damaging fragile, new skin. However, compression garments may also be used in the early stages of chronic venous disease to help prevent disease progression.[44]

Compression garments may be used as first line therapy instead of wraps if:

- Clients have small, uncomplicated ulcers and want to self-care. In these situations, care must be taken to avoid traumatizing the ulcer when stockings are applied and removed.
- Clients require daily lower extremity skin or wound care.
- Clients not able to tolerate compression wraps.
- Nurses are not available or do not have the required competencies to apply compression wraps.

Life-long use of compression garments is required for the on-going management of the client's underlying venous insufficiency and the prevention of venous ulcers. Long term use of compression garments requires a significant life-style change on the part of the client.

Correct limb measurement and garment selection are important when transitioning to compression garments. Prior to determining the level of compression and the appropriate type of garment, a comprehensive assessment is required. In addition, clients must receive education on the methods for applying and removing compression garments. The client and/or client's caregivers must have the manual dexterity, cognitive ability, and visual acuity to understand how to apply and remove the garments. If clients or caregivers cannot apply and/or remove their compression garments they can be referred to Home Support.

COMPRESSION GARMENTS

Compression garments are cloth products used to apply compression. They are reusable and include compression stockings, inelastic devices, and tubular sleeves.

Compression Stockings

Compression stockings are usually used for ongoing conservative treatment of venous insufficiency once edema is reduced or resolved, limb circumference is stabilized and the ulcer has closed. Compression stockings may also be used as initial therapy with those clients who cannot tolerate or will not use compression wraps. They are effective in reducing the recurrence of peripheral edema and ulceration.[7] Venous ulcer recurrence rates between 26% and 33% have been reported with compression stockings but this rose to 56% for those who did not to wear their stockings.[40] Other studies have shown ulcer recurrence rates are 1.7 to 20 times greater when clients do not wear their stockings.[27].

Compression stockings are classed as elastic systems. As with compression wraps, compression stockings should be graduated and used with caution in those clients with arterial insufficiency, a thin or altered limb shape, ankle, or foot deformities or for those at high risk for pressure damage.

There are different types of stockings available and the client, working with the garment fitter, should decide which style works best for them in addition to meeting their compression needs. Stockings may have open or closed toes and reach below the knee or up to the thigh.

2-layer compression stockings

While most stockings are a single layer, some come in kits with 2 layers. Wearing 2 layers results in higher sub stocking pressure than 1 layer. Two layers also allows for easier application especially over a wound dressing.[10,30]

- Some compression stockings can be purchased over the counter. These provide *very light* (8-15 mmHg) or *light* (15-20 mm/Hg) compression and may be referred to as "support stockings". They are chosen according to shoe size. Very light compression stockings provide relief from tired aching legs and can possibly help control minor swelling. Light compression stockings are helpful when travelling, standing, or sitting for long periods of time and also provide relief from minor swelling and minor varicose veins. Prior to the first application, clients must have a complete lower limb assessment (basic & advanced) done but an ABPI and/or TBPI is not required if the pedal pulses are palpable or present with a hand-held doppler and capillary refill is normal.

Stockings that provide higher compression require a prescription from a Physician/NP or a Wound Clinician and proper sizing by a Certified Fitter; compression stockings are available in a range of standard and custom sizes and offer low to high compression.

- 20-30 mmHg – this is the most frequently prescribed compression level. This pressure provides relief from moderate varicose veins and swelling, edema, venous insufficiency and superficial thrombophlebitis and is often prescribed to prevent venous ulcers. These stockings may be used post-sclerotherapy.
- 30-40 mmHg – These stockings are used to treat severe varicose veins and swelling, edema, lymphedema and venous ulceration or following an episode of deep vein thrombosis (DVT).
- 40-50 mmHg – Extra firm compression is rarely used and few people can tolerate it. If tolerated, it is used to treat severe chronic venous insufficiency or post-thrombotic syndrome (PTS).

Compression stockings must be used according to the manufacturer's instructions for application, care, and cleaning. Examples of stocking manufacturers include Bauerfiend, Jobst, Sigvaris, and Valco. Stockings should be replaced every 6 months if they are used daily and every year if the client has 2 pairs as they become ineffective over time.[31] When new stockings are purchased a full lower limb reassessment should be completed to ensure the stockings are still appropriate for the client. Avoid using a moisturizer that contains petrolatum just prior to putting on the stockings as it reduces the longevity of compression stockings.

Antiembolic stockings, e.g., TED stockings, exert 8–12 mmHg pressure over the lower extremity when at rest. They are primarily used to prevent blood clots for those confined to bed or sitting for long periods. They are not recommended for clients with venous insufficiency and edema and cannot be substituted for compression stockings.

Reusable Inelastic Devices

Inelastic devices are particularly helpful for clients with dexterity problems who are unable to apply conventional stockings and for clients who have difficulty getting an appropriate fit.

These compression devices are secured to the lower leg with overlapping Velcro bands. By securing the bands to the correct position indicators, the device can provide therapeutic levels of compression. These devices are easily applied and can be reapplied to prevent slippage as edema resolves and to permit bathing and dressing changes as needed. They can be reused for 12-18 months. A certified garment fitter determines the appropriate reusable inelastic device for the client, e.g., CircAid.

Tubular Compression Bandage

A tubular compression bandage such as Medigrip Latex Free (LF), or stocking such as EdemaWear can be used for clients who cannot tolerate other types of compression or as a temporary solution until another mode of compression therapy is available or until wound exudate decreases.

Medigrip (latex-free) is a reusable bandage tube of material that comes in a roll and is cut to length. They exert their highest pressure over the calf rather than the ankle. The bandage (also called 'stocking') is usually applied in 2 layers over the lower limb and provides support in the treatment of edema and exerts low, moderate, or high circumferential compression depending upon the client's calf measurement and the size of stocking chosen. A single layer of the stocking may be used initially for clients with difficulty tolerating compression, but the pressure exerted will be lower. See Medigrip PISheet for application instructions.

EdemaWear is a latex-free washable tubular compression stocking provides mild longitudinal compression (~10-20mmHg; the tighter the fit the higher the compression), generated by wales of nylon fabric with transverse lycra elastic fibre; the compression makes noticeable 'corn rows' which run up/down the limb. EdemaWear Lite (~6mmHg) is designed for clients unable to manage a higher compression. The stocking may be worn daily for up to 4-6months before needing to be replaced See EdemaWear PISheet for application instructions.

Prior to the first application, clients must have a complete lower limb assessment (basic & advanced) done but an ABPI or TBPI is not required if the pedal pulses are palpable or present with a hand-held doppler and capillary refill is normal.

Learning Activity # 15

Mrs. M requires a daily dressing to a large heavily exudating venous ulcer on the lower left leg. She is 84 with an ABPI of 0.8. She states that she has found it difficult to wear compression stockings in the past. The NSWOC/WC recommends starting with one layer of Medigrip at a low compression. Her calf measurement is 48 cm.

What size of Medigrip LF would you choose? _____ (hint: go to the PISheet)

When Medigrip is applied it should cover from _____ to _____.

APPLYING COMPRESSION GARMENTS

Compression stockings can be challenging to apply. They are not applied like ordinary stockings. If they are gathered together in typical "doughnut fashion" the effect of the elastic material is multiplied many times and makes application difficult.[4]

Ensuring that the foot is dry and applying a small amount of powder to the foot and heel prior to application may reduce friction. Manufacturer's guidelines provide information on the easiest application for each stocking.

When staff are applying compression stockings for a client it is important to use appropriate body mechanics and ask for assistance when necessary.

The best way to avoid slippage with stockings is to ensure that the stockings are properly fitted for clients and applied correctly to the legs . Knee high stockings should extend above the curvature of the calf but be 2 finger widths below the bend in the knee. Clients who have difficulty putting on their stockings so they don't slip may benefit from the use of a donning aid or assistance from a caregiver.

Using Donning Aids to Apply Compression Stockings

For clients able to apply their own stockings there are support devices available to assist in stocking application. These include rubber gloves to better grip the stocking, donning frames, silky toe and heel covers, and foot and lower limb sleeves made of parachute type material. These devices reduce friction making it easier to slide the stocking over the foot and ankle.

Rubber Gloves

Compression stockings are quite slippery and putting them on can be a challenge. Using rubber gloves with raised ridges on the surface helps the client or caregivers to securely grip the stocking during application. The gloves can also be used to smooth any wrinkles once the compression stockings are on to evenly distribute pressure. Special donning gloves are available for purchase.
Using a pair of gloves each time stockings are put on or taken off can help to prevent runs and snags and increase the longevity of the stocking.

Donning Gloves

Doff and Donner Device

The Doff (take off) and Donner (put on) device is a continuous water balloon that uses the characteristics of hydraulics to stretch and roll the stocking onto the leg. With this device compression stockings can be rolled and pushed rather than stretched and pulled. Less strength is required to put on the stockings and it increases the life of the garment.

Silky Toe and Heel Covers and Lower Leg Sleeves

Silky toe / heel covers and lower leg sleeves are made of material that reduces the friction between the stocking and the skin and facilitates application and removal. They are light weight, easy-to-use and are designed for both open and closed toe compression stockings. Some of these aids require the client to bend at the waist while others are designed to minimize this.

Donning Frames

Donning frames are metal frames over which the stocking is stretched, allowing the client to insert the foot and ankle into the opening of the stocking. They are easy to handle and use and are appropriate for all sizes and styles of compression stockings. They are ideal for those with limited dexterity or mobility.

Remember, the best compression wrap or garment is the one that the client will wear.

CLIENT AND/OR CAREGIVER EDUCATION

Once the transition from compression wraps to compression garments has occurred, the nurse must provide adequate education for the clients/caregivers concerning all aspects of the long-term use of compression garments. In addition to teaching the client and/or caregiver about their specific form of compression garment, the nurse should provide the following information:

- The importance of life-long compression therapy. There is a high rate of venous ulcer recurrence that occurs when clients do not wear compression garments.
- Teach the client and/or family to monitor for the adverse effects of compression therapy, especially the signs and symptoms of arterial insufficiency (numbness, tingling, toes turn blue/cold, increased pain). Also teach the client when it is necessary to remove the compression garment and who to contact if there are problems.
- Garments should be applied as soon as the client is out of bed. The longer the client is up and about without compression, the more difficult it will be to put on the garment as fluid starts to pool in the lower legs. Garments should be removed at bedtime.
- How to use any required donning/doffing devices and to refer to Occupational Therapy and/or a Certified Stocking Fitter as needed.
- If the client does not have arterial insufficiency, teach them the benefits of lying flat and elevating the legs above the level of the heart 2-3 times daily for up to 30 minutes and elevating the foot of the bed on 5–10 cm blocks or bed risers. This can help when the lower legs feel 'heavy' or there is discomfort or pain.
- Information on lower leg hygiene and skin care:
    - Lower legs and feet need to be kept clean and the skin should be moisturized.
    - Compression garments must be removed prior to a shower or bath.
    - The best time to bathe is in the evening as trying to put the compression garments on after the skin has been moisturized is difficult.
    - Moisturizer with petrolatum should not come in contact with the stocking as it breaks down the stocking fabric.
    - Clients with urinary and/or fecal incontinence should understand that compression garments must be removed and washed if they become soiled.
    - Toenails should be trimmed to avoid damaging the stockings as holes or runs in the stockings decrease the therapeutic level of compression.
    - Avoid hygiene products and moisturizers that are likely to be sensitizers such as as lanolin, latex, perfumes, cetearyl alcohol & topical antibiotics, e.g., neomycin, polysporin.
- The importance of laundering stockings as per the manufacturer's instructions to keep the stockings clean and reset the elastomers.
- A walking and exercise plan to build up the calf muscle pump, improve limb mobility and ankle joint function. Encourage Active Range of Motion exercises for those with limited mobility, refer to OT/PT as needed.
- Flat footwear makes it easier to wear a compression garment and supports flexion and extension of the ankles which increases the effectiveness of the calf muscle pump.
- How to monitor for and address the potential problems, such as pressure damage that could arise with the use of compression garments.

IMPROVING CLIENT PARTICIPATION IN COMPRESSION THERAPY

Venous leg ulceration and its treatment have a major impact on client's daily life. While initial treatment with compression wraps is time limited, follow up treatment with compression garments is a life-long change for clients. Because of the numerous issues that can arise when wearing compression garments,

non-adherence to compression treatment plans is a common occurrence. In addition, recurrence rates for venous insufficiency and venous ulcers are higher in those who chose not to or are not able to adapt to compression therapy. Therefore, supporting clients to wear compression garments over the long term requires attention from health care professionals.[15,21,30]

Clients report multiple issues that impact their decision to avoid compression therapy including:

- Disbelief that compression will improve their venous disease or prevent ulcer recurrence.
- Application and removal difficulties and/or lack of application assistance.
- Pain and discomfort with compression; wraps/stockings which too tight and/or too hot.
- Financial difficulties.
- Feelings that compression garments may negatively impact their quality of life:
  - Altered body image
  - Social isolation
  - Restricts mobility and work capacity
  - Requires less comfortable or not-stylish footwear
- Lack of information or conflicting information from health care professionals.
- Poor communication between the client and health care team.[7,11,39]

Strategies that may help adherence to compression therapy include:

- A comprehensive assessment that helps the Wound Clinician or Physician/NP determine the appropriate level of compression.
- Careful selection and fitting of the garment or wrap by a certified garment fitter, in collaboration with the client and/or their family using a model of shared decision making.
- Education for the client and/or the family. An informed client is more likely to persevere with treatment if they understand how and why compression works. Attitudes may be influenced by the client's previous experience with compression, failure to understand the underlying cause of their ulcer or edema and how this impacts a non-healing wound or how the compression garment prevents a wound from recurring.
- Assess the degree to which the client and/or family wishes to be involved in the treatment plan.
- Assess and mitigate discomfort and pain. This must be a goal of treatment irrespective of the complexity of the ulcer and the status of healing.
- Those with leg ulceration and compression therapy often socially isolate themselves. Addressing this problem in addition to compression therapy may improve adherence.
- A therapeutic non-judgmental approach is required when clients choose not to wear their compression stockings. Try to understand client's knowledge, attitudes, and beliefs with respect to compression therapy and address these areas using a coaching rather than a controlling style of communication.[7,11,15,16,38]

Some clients who require compression therapy may have cognitive impairment which can impact their ability to participate in treatment. It is the wound clinician and nurse's role to formulate a care plan that is realistic and will most likely be manageable for the client, staff, and caregivers. Because the client may not understand the implications of compression therapy, such as the signs and symptoms of circulatory concerns, lighter compression may be the only realistic strategy. However, each client's abilities and degree of cognitive impairment are unique so care planning must be individualized.

Learning Activity # 17

Mr. F is 40 years old who sustained a DVT following a rugby injury. On his initial assessment 3 months ago, he had small to moderate edema which is usually worse later in the day and a small 1 cm venous ulcer above his right medial malleolus. He had good arterial circulation (ABPI = 1.0) and was fitted for compression stockings. He is very active and his job keeps him walking throughout the day.

Ralph has come to the ambulatory clinic for a reassessment of his wound. The wound is now 3 cm in diameter and with yellow exudate. He tells you that he does not wear his stockings because they are uncomfortable and he is embarrassed to wear them when he is working out and playing rugby.

How would approach your discussion with Mr. F? _____

_____

SUMMARY

Congratulations! You have completed **Section A – Theory** of this self-study module on compression therapy. It has provided information on the anatomy and pathophysiology of the venous and arterial systems and how compression works to address venous insufficiency. It has described the various types of compression wraps and garments and their applications as well as the problems arising from their use. This module has also focused on the important issue of client's reluctance to wear compression therapy and strategies to deal with this.

Section B – Practice starting on page 32 contains a quiz and 3 case studies to help you consolidate the knowledge you have gained in Section A. After successfully completing Section B you are ready to work with a clinical mentor to practice the application of selected compression wraps and garments. See Appendix C for the Skills Checklist.

GLOSSARY

Ankle brachial pressure index (ABPI) – A numerical figure that indicates the amount of arterial blood flow to the extremity. It is determined using Doppler ultrasound or an automatic ABPI system by comparing the ankle systolic pressure and the brachial systolic pressure with the ABPI being a ratio of the two. ABPI is used to evaluate the presence of arterial disease prior to determining a safe and appropriate level of compression therapy to treat venous insufficiency.

Anti-embolic stockings – Stockings worn post operatively to prevent the formation of a deep vein thrombosis. They are not recommended for clients with venous insufficiency and edema and cannot be substituted for compression stockings.

Arterial insufficiency – Insufficient arterial blood flow to the lower extremities. It is caused by occlusive atherosclerotic plaques or emboli, damaged, diseased, or weak arteries, arterio-venous fistulas, aneurysms, hypercoagulability states and heavy use of tobacco. Signs of arterial insufficiency include pale, cyanotic or mottled skin over the lower legs and feet, absent or decreased sensation, tingling, a diminished sense of temperature, muscle pain, reduced or absent peripheral pulses, atrophy of the muscle in the lower legs and possibly arterial ulcers. See Appendix B.

Calf muscle pump – The contraction of the calf muscles forces the blood out of the deep veins into the central circulation and toward the heart. This is the primary mechanism by which venous blood is returned to the heart.

Champagne bottle deformity – Chronic venous insufficiency and recurring edema cause a woody fibrosis that prevents expansion of the tissue in the ankle giving the leg the appearance of an inverted champagne bottle.

Cohesive wrap – A type of wrap that adheres to itself but doesn't adhere to other surfaces, such as the skin, e.g., Coban 2.

Compression therapy – Application of elastic or inelastic wraps or garments that exert sustained external pressure over the lower extremities to relieve venous congestion, reduce edema and promote the return of venous blood to the heart. Compression therapy is effective in reducing edema and healing venous ulcers.

Deep vein thrombosis (DVT) - a blood clot in a major vein that usually develops in the legs and/or pelvis.

Dependent rubor – The lower limb turns red / purple / blue when it is moved to a dependent position. This is caused by blood rushing into ischemic tissues due to gravity. It occurs when arterial blood vessels are severely damaged and remain dilated because they are no longer able to constrict. This is common in advanced arterial disease.

Edema – The accumulation of fluid in extra vascular tissue. It occurs as a result of complex interactions involving the capillary walls and the hydrostatic and osmotic pressure gradients that exist between blood pressure in the vessels and in the surrounding tissue.

Elasticity – Determines the ability of a wrap that is subject to a force to resist any change in length and return to its original length once the applied force has been removed.

Elastic/long-stretch – Wraps that contain elastomeric fibers and are capable of stretching and almost returning to their original size. They can sustain pressure for up to a week. There is only a slight reduction in pressure when client is immobile. Provides low to high compression depending upon the system selected.

Extensibility – The *extensibility* of a bandage, determines the change in length that is produced when the bandage is subjected to an extending force. Extensibility is usually expressed in the form of a percentage which compares the stretched to the un-stretched length.

Gaiter area – The distal two thirds of the lower leg; it extends from mid-calf to just below the ankle. Also referred to as the "sock area".

Garments (compression) – Compression garments include compression stockings, tubular sleeves, and reusable inelastic devices.

Graduated compression – Compression that exerts higher pressures at the ankles and feet, with the pressure gradually decreasing toward the calf and knee.

Hemosiderin Staining – Leakage of red blood cells into surrounding tissue due to venous hypertension in the lower leg. Over time presents as reddish-brown skin pigmentation as iron deposits from hemoglobin break down.

Induration – Hardening of the skin and subcutaneous tissues of the lower leg due to inflammation. It may be secondary to infection.

Inelastic/short-stretch – Wraps made of non-stretch material such as zinc paste or impregnated gauze or short stretch wraps. Have minimal extensibility. Exert high compression during mobilization and a low resting pressure.

Intermittent claudication – Characterized by a predictable pattern of pain, cramping, burning, or aching; caused by insufficient arterial blood flow to the extremities with activity. It is always relieved by rest. It occurs when an ABPI is less than 0.9 but may not be evident if client has peripheral neuropathy or walks slowly.

Lymphedema – Swelling that generally occurs in one arm or the legs and is most commonly caused by the removal of or damage to the lymph nodes. Lymphedema can occur after a mastectomy or following cancer treatment. Untreated chronic venous disease may also progress to lymphedema. It results from a blockage in the lymphatic system, which is part of the immune system. The blockage prevents lymph fluid from draining and the fluid buildup leads to swelling.

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

Mixed Venous/Arterial Ulcers – See Appendix B.

Post Thrombotic Syndrome – The signs and symptoms that may occur as a long-term complication of a DVT. Signs and symptoms in the leg may include pain (aching or cramping) heaviness, itching or tingling, swelling (edema), varicose veins, brownish or reddish skin discoloration and ulceration. Signs and symptoms may vary among patients and over time and are typically worse after walking or standing for long periods of time and improve with resting or elevating the leg.

Product Information Sheet(s) (PISheet) - Information sheets developed by the Provincial Nursing and or Interprofessional Skin & Wound Committees and are found on the Connecting Learners With Knowledge website https://clwk.ca

Resting pressure – Pressure applied by the wrap when the client is at rest. It is continuous pressure exerted externally from the wrap toward the tissues.

Sub-wrap pressure – The pressure against the skin and underlying tissue exerted by a compression wrap or garment.

Tension – Determined initially by the amount of force applied to the wrap fabric during application. The ability of the fabric to sustain a particular degree of tension and therefore sub-wrap pressure is determined by its elastomeric properties.

Tensor bandage – A reusable elasticized bandage used to support a strained or sprained limb. It is also called an ace bandage. Tensor bandages should not be used for compression therapy.

Toe brachial pressure Index (TBPI) – A calculation based on the systolic blood pressures in the arm and the toe. TBI is used to determine peripheral arterial circulation when ABPI readings are greater than 1.3 due to calcification of arteries in the feet. Calcification is commonly seen in those with diabetes.

Venous dermatitis - A common inflammatory skin disease of the lower extremities. The skin is itchy and can be dry and scaly or can weep and form crusts. It may also be associated with erythema, hyperpigmentation and dilated superficial veins. It is one of the earliest cutaneous indications of chronic venous insufficiency. Consequences of stasis dermatitis include an increased incidence of allergic contact dermatitis, lower-extremity ulceration and lipodermatosclerosis.

Venous hypertension – An increase in venous pressure in the lower extremities due to a chronic back flow of blood.

Venous insufficiency – Occurs when the venous wall and/or valves in the leg are not working effectively making it difficult for blood to be pumped from the legs to the heart. Symptoms include aching or tired legs, varicose veins, edema, skin changes on the lower leg, flaking or itching skin and possibly venous ulcers due to blood pooling in the lower legs and feet. See Appendix B.

Woody fibrosis (also called lipodermatosclerosis) – Deposits of fibrin and fat in the deep dermis that result in a firm, woody induration of the gaiter area (distal 2/3 of the lower leg).

Working pressure – The intermittent pressure exerted by an active muscle against the resistance of the wrap during exercise and walking.

SECTION B – PRACTICE

Note that the quiz and care studies in this section include content from:

- This Self Study Module
- The Guideline: Use of Compression Therapy to Manage Venous Insufficiency & Mixed Arterial Venous Insufficiency.
- The Product Information Sheets (PISheets) for compression wraps.

The answers for the learning activities, quiz and case study questions are in Appendix D.

QUIZ

1. Name 2 structures that facilitate the flow of blood in one direction through the vein toward the heart.
   a. _____
   b. _____

2. What "pump" assists the venous return of blood to the heart. Explain how this pump works.
   _____
   _____

3. Which of the following statements are true?
   a. For clients with draining venous ulcers the choice of wound dressing is more important than the type of compression. ____
   b. High compression is better than low compression. ____
   c. *Inelastic* short stretch wraps are always more effective than *elastic* short stretch wraps. ____
   d. For clients with a lower leg wound, a basic lower leg assessment is always done on the first meeting with the client. ____

4. Name 3 situations when you would do an ABPI:
   a. _____
   b. _____
   c. _____

5. Before initiating compression for any client, they should have which of the following. Choose all that apply.
   a. Toe pressures
   b. Monofilament testing
   c. ABPI

6. List 5 adverse effects of compression therapy that can occur for clients.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

7. Chose one of the adverse effects you identified in # 6 and indicate how you would address the problem.
   _____
   _____
   _____

8. Which of the following are considered risk factors for venous insufficiency? Choose all that apply.
    a. DVT
    b. Lower Leg Surgery.
    c. Multiple Pregnancies

9. Which of the following would prompt you to consult with a wound clinician, Physician or NP? Choose all that apply.
    a. Change in the arterial status of the lower limb.
    b. The wound dressing is not adequate to address the amount of exudate.
    c. The client is unable to tolerate compression.
    d. No improvement in the wound after 3 days.
    e. An acute onset of pain in the lower limb.

10. Which of these are changes commonly seen on the lower limb of a client with venous insufficiency? Choose all that apply.
    a. Shallow wounds with irregular borders.
    b. Diminished or absent peripheral pulses.
    c. Evidence of healed wounds.
    d. Limited ankle mobility.
    e. Delayed capillary refill.
    f. Wounds occurring on or between the toes.

11. Which of the following statements are true? Choose all that apply.
    a. Arterial disease also occurs in almost 50% of clients with venous disease. ___
    b. Compression therapy 20 mmHg or greater should only be applied following an order from a Physician or with the direction of a NSOWC/WC. ___
    c. Scrubbing helps to remove the scaly skin for those with venous dermatitis. ___
    d. Palpating pedal pulses is the best way to assess arterial perfusion. ___
    e. Clients with ischemic rest pain should not receive compression therapy. ___
    f. Have the toes pointed toward the floor when applying compression wraps. ___
    g. Elastic compression systems have higher working pressures and are better for clients who are mobile. ___

12. Identify 4 effects of compression therapy on the lower legs and feet.
    a. _____
    b. _____
    c. _____
    d. _____

13. Identify 4 things that determine the frequency of compression wrap changes.
    a. _____
    b. _____
    c. _____
    d. _____

14. Alice works in acute care and is preparing to transfer her client Mr. W to residential care. Mr. W has been wearing Profore Light in acute care and his doctor wishes him to continue wearing compression after the transfer. List 4 things that you must determine prior to deciding to make the transfer.
    a. _____
    b. _____
    c. _____
    d. _____

CASE STUDIES

Case Study #1

MG is a 65-year-old female with a venous ulcer on the medial malleolus. She has longstanding venous disease with moderate (+2 to +3) pitting edema that worsens later in the day. An ABPI had been recently done recently and indicates a value of 1.1. Previous medical history includes 2 episodes of DVT but no varicosities. She is fit, mobile indoors and until recently was walking outside in the garden. She has good ankle movement. Although she has some heaviness in her legs it is manageable and is relieved by walking and elevating her legs. She has been referred to community care because her GP would like her to start compression therapy.

List other information that you would gather during your first visit with her.

_____
_____
_____
_____
_____

Based on the assessment information, the wound clinician has decided to use a Coban 2 compression wrap. When you arrive to apply the wrap, what information would you give to MG about compression and about her specific wrap?

_____
_____
_____
_____
_____

MG's ulcer is 6.5 cm x 3.5 cm with irregular margins and areas of yellow slough and granulation tissue. There is a moderate amount of serous drainage. The wound edges are not macerated and although inflammation is evident on the peri-wound skin the venous leg ulcer is not infected.

How would you protect both the compression wrap and the wound margins from the serous drainage?

_____
_____

MG has been wearing a compression wrap for 4 months and her wound is healed. The goal of her clinic visit today is to discuss the transition from a compression wrap to a compression stocking.

What information will you share with MG?

_____
_____
_____
_____
_____

Case Study #2

Mrs. C is 79 years old with moderate arterial disease and an ABPI of 0.6. She has severe venous disease with pitting edema (+2) over both legs. She lives alone in her home and has home support visit daily. She is very thin and has poor mobility spending long periods sitting in her chair. She has a large ulcer with copious amounts of exudate on her left medical malleolus. She has venous dermatitis with itchy scaly skin and draining areas on both legs. Currently she has a foam dressing over her wound and is not wearing any form of compression. She has just been admitted to the inpatient geriatric assessment unit for assessment and treatment and will be discharged home in 3 - 4 weeks.

She has been seen by an acute care Physician who has ordered a 4-layer Profore compression wrap. Would you apply the Profore compression system? Provide a rationale for your answer.

_____
_____

Mrs. C is wearing a Profore Lite compression wrap. It was applied for the first time yesterday. When you check her today you notice that her toes are pale and cool to touch and she is complaining of pain. What would you do?

_____
_____

Mrs. C has been referred to a vascular surgeon who has ordered Coban 2 Lite. You have removed the wrap and want to measure leg circumference to determine if her edema is resolving. Where on the leg would you measure?

_____

You are concerned about her low body weight. What assessment would you do and what treatment might be appropriate.

_____
_____

Mrs. C is going to be discharged home in 2 days after 6 weeks on the unit. Her venous dermatitis is much improved as is her pitting edema. Her ulcer has healed. She now wears compression stockings. Mrs. C states that she does not know how she will manage at home. What would you do?

_____
_____
_____
_____

Case Study #3

Mrs. W is 69 and lives with her daughter. She has varicose veins that were stripped in her 50's but she continues to have venous insufficiency and heart failure that is well controlled. Her ABPI is 0.9. Her mobility is poor due primarily to advanced arthritis and obesity. She had a left total knee replacement 5 years ago. She has severe edema with venous dermatitis over both legs and has recurrent cellulitis.

Mrs. W has a large untreated infected ulcer over her left medial malleolus. She has pain in her wound that is proving difficult to treat. She is not currently receiving any type of compression.

Her daughter brought her to emergency stating that "she is failing" and she has been admitted to your unit.

What needs to occur before Mrs. W. can have a compression wrap applied?

_____

Mrs. W tells the Wound Clinician that she has never been able to tolerate compression but she has agreed to try an Unna Boot after the wound clinician describes the benefits of compression.

Describe the Unna Boot and state why a wound clinician wound might choose this wrap for Mrs. W.

_____
_____
_____
_____

Mrs. W has 4 risk factors for venous insufficiency. What are they?

_____
_____

Mrs. W finds the Unna Boot painful and restricting and has asked to have it removed. Identify a compression garment that is more flexible that also provides lighter compression.

_____
_____

Mrs. W has been home from hospital for 3 days and is visited by the home health nurse? What might the nurse suggest to her to help reduce her lower limb heaviness and discomfort?

_____
_____

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Document Creation/Review

This learning module is based on the best information available at the time it was published and relies on evidence and avoids opinion-based statements where possible. It was developed by the Provincial Nursing Skin and Wound Committee and has undergone provincial stakeholder review.

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APPENDIX A: Commonly Used Compression Wraps/Tubular Compression Bandages

Type of Compression Wrap	Description and Indication for Use
Coban 2 Two-layer short-stretch inelastic wrap system providing high compression (30-40mmHg). Foam padding covered with a cohesive compression wrap	▪ Requires an ABPI of 0.80 – 1.0 according to the manufacturer's guidelines. ▪ Latex free. ▪ Not reusable. See Coban 2 PISheet for application instructions
Coban 2 Lite Two-layer short-stretch wrap inelastic wrap system providing high compression (20-30 mmHg). Foam padding covered with a cohesive compression wrap.	▪ Requires an ABPI of 0.50 – 0.80 according to the manufacturer's guidelines. ▪ Lower resting pressures than Coban 2 but similar working pressures. ▪ Latex free. ▪ Rot reusable. See Coban 2 Lite PISheet for application instructions
Comprilan Two-layer short-stretch inelastic wrap system providing high compression (30-40mmHg). A padding layer covered by a short stretch wrap.	▪ Requires an ABPI of 0.91 – 1.30 according to the manufacturer's guidelines. ▪ High working pressure when muscles are active and low resting pressure when muscles are inactive. ▪ Wrap fasterers contain latex. ▪ Reusable. See Comprilan PISheet for application instructions
Edema Wear Tubular compression stocking which provides low-moderate longitudinal compression.	• Non-latex • Reusable up to 4-6 months See EdemaWear PISheet for application instructions
Profore Four-layer elastic long-stretch wrap system providing high compression (30-40 mmHg). A padding layer covered by a conformable layer followed by a light compression wrap and a cohesive compression wrap.	▪ Requires an ABPI of 0.80 – 1.30 according to the manufacturer's guidelines. ▪ Latex free; not reusable. See Profore PISheet for application instructions
Profore Lite Three-layer elastic long-stretch wrap system providing moderate compression (20-30 mmHg). Padding layer covered by a light conformable wrap and a flexible cohesive wrap.	▪ Requires an ABPI of 0.60 – 1.30 according to the manufacturer's guidelines. ▪ Latex free. See Profore Lite PISheet for application instructions
Medigrip LF Tubular bandage providing low, moderate, or high circumference compression. Compression applied is based upon the client's calf measurement and the size of bandage chosen.	▪ Best compression effect is with two layers. ▪ Non-latex. ▪ Reusable up to 7 days of wear. ▪ See Medigrip LF PISheet for application instructions.
Viscopaste w/o Self-Adherent Bandage Unna Boot Two-layer rigid wrap system providing low to moderate compression (less than 20 mmHg). Zinc impregnated gauze covered with a layer of Kling.	▪ Effective for chronic eczema and/or dermatitis as well as edema. See Unna Boot Procedure for application instructions
Viscopaste with Self-Adherent Bandage Duke Boot Three-layer rigid wrap system providing high compression. Zinc impregnated gauze covered by a layer of padding (optional) and a layer of cohesive, self-adherent wrap	▪ Effective for chronic eczema and/or dermatitis as well as edema. See Duke Boot Procedure for application instructions

APPENDIX B: Characteristics of Arterial Insufficiency, Venous Insufficiency and Mixed Etiology

	Venous Insufficiency	Arterial Insufficiency	Mixed Etiology
Risk Factors	• Advanced age / family history • Previous deep vein thrombosis • Diabetes mellitus • Post phlebitis syndrome • Varicosities / previous vein stripping • Obesity / immobility / prolonged standing • Acute / Chronic Heart failure • Multiple pregnancies • Traumatic leg injury • Previous vascular & orthopedic (hip/knee) surgery, lower leg trauma or ulcers	• Advanced age / family history • Smoking • Diabetes mellitus • Arterial disease • Anemia • Hyperlipidemia, hyper-cholestremia • Obesity • CVA, angina, MI, HTN • Traumatic injury • Rheumatoid arthritis • Raynaud's Disease	Mixed wounds combine the S & S of both arterial and venous wounds. Although the lower leg and foot may initially appear as venous insufficiency all assessments must include an ABPI especially before compression is started to determine of arterial insufficiency is present.
Location of Wound	Distal medial 2/3 of the lower leg (gaiter area), over the medial malleolus; may occur over scar tissue from a previous venous ulcer	Pressure points or areas of repetitive trauma, e.g. on / between toes, metatarsal heads, lateral malleolus, heels, tibia	See Arterial & Venous
Appearance of Wound	**Base**: shallow, ruddy, & / or yellow slough, granulation tissue frequently present, rarely necrotic. **Depth**: usually shallow **Margins**: Diffuse, irregular **Surrounding skin**: erythema, weeping dermatitis, eczema, hemosiderin staining of lower leg, woody fibrosis & thickening of skin, lower leg/ankle edema, occasionally cellulitis, atrophie blanche	**Base**: pale pink, or filled with yellow debris, may be necrotic / eschar is common; may involve tendon or bone **Depth**: shallow to deep **Margins**: Well-defined, round "punched out" appearance **Surrounding skin**: thin, shiny, dry skin with hair loss, thickened toenails, calluses	**Base:** poor granulation tissue **Depth:** shallow to deep **Margins**: may be macerated; rolled wound edges **Surrounding Skin:** calluses eczema may be present
Pain	Heavy, aching pain associated with legs in dependent position. Generally not as painful as arterial wounds except over the medial malleolus	Severe pain that worsens with activity or leg elevation. Intermittent claudication to resting pain. Pain worse at night.	See Arterial & Venous
Circulation	**Peripheral pulses:** present & palpable, may be hard to find due to edema **Capillary refill:** normal (less than/equal to 3 seconds) **Skin temperature:** normal **Skin colour** may be cyanotic; reddish brown discolouration, red from inflammation / cellulitis/ dermatitis **ABPI:** 0.9 1 – 1.30	**Peripheral pulses:** Absent or diminished **Capillary refill**: Delayed (greater than 3 seconds.) **Skin temperature:** Cool / cold **Skin colour:** Pale on elevation & rubor when dependent Gangrene may be present **ABPI: L**ess than 0.91	See Arterial & Venous
Edema	Generalized dependent edema.	None to minimal localized edema.	Usually present.
Infection	Less common in venous wounds, but may have bacterial burden or cellulitis	Frequent & signs of infection may be subtle due to impaired circulation	Can become easily infected
Exudate	Moderate to heavy serous exudate	Minimal serous or purulent exudate	May initially have large to moderate drainage.
Photos			

APPENDIX C: Knowledge and Skills Checklist for Compression Wraps

Compression Wraps: Education and Skills Checklist

Name _____ **Date**_____

Assessor _____ **Date Learning Module Completed** _____

Criteria	Profore	Profore Lite	Coban 2	Coban 2 Lite	Comprilan	Duke Boot	Unna Boot
1. Describes the purpose of compression therapy.							
2. Describes the components of the assessment that must be completed prior to compression therapy.							
3. Identifies the contra-indications for applying compression therapy.							
4. Completes a Basic Lower Limb Assessment. Describes the assessment parameters and the implications for practice. Identifies when an advanced lower limb assessment must be carried out.							
5. Completes an Advanced Lower Limb Assessment							
6. Understands that an order from a Physician / NP or direction from a NSWOC/WC is required prior to applying compression therapy greater than 20 mmHg.							
7. Understands compression therapy of 20 mm/Hg or less does not require an order or require an ABPI and/or TBPI but lower limb assessment must indicate pedal pulses are palpable or present with a hand-held doppler and cap refill is normal.							
8. Adequately prepares the client and the environment for compression bandaging.							
9. Provides education for the client and/or family. Understands the role that education plays in promoting adherence to compression therapy.							

Criteria	Profore	Profore Lite	Coban 2	Coban 2 Lite	Comprilan	Duke Boot	Unna Boot
10. Following demonstration by a competent nurse, applies compression therapy according to the product information sheet for those products commonly used in the clinical setting							
11. Describes the follow-up required for clients receiving compression therapy.							
12. Assesses the lower leg for improvement or deterioration and for problems associated with compression therapy. Describes how to evaluate that the compression therapy is effective. Describes the problems associated with compression therapy.							

Competency achieved:

Coban 2	YES □	NO □	NEEDS REVIEW □
Coban 2 Lite	YES □	NO □	NEEDS REVIEW □
Profore	YES □	NO □	NEEDS REVIEW □
Profore Lite	YES □	NO □	NEEDS REVIEW □
Comprilan	YES □	NO □	NEEDS REVIEW □
Unna Boot	YES □	NO □	NEEDS REVIEW □
Duke Boot	YES □	NO □	NEEDS REVIEW □

Comments

Clinician/Educator Signature _____ **Date**_____

APPENDIX D: Learning Activities, Quiz and Case Study Answers

LEARNING ACTIVITIES ANSWERS

1. Learning Activity #1
   - Evidence of a healed ulcer over the medial malleolus
   - Bilateral edema
   - Thick scaly skin over the lower leg
   - Hemosiderin staining

2. Learning Activity #2
   - Calf pain
   - Thin wasted calf muscle
   - Left foot cool to touch
   - Thickened toenails
   - Dependent rubor
   - Wound on lateral malleolus

3. Learning Activity #3
   - Mixed arterial and venous disease

4. Learning Activity #4

A = Venous	B = Venous	C = Arterial
D = Arterial	E = Arterial	F = Venous

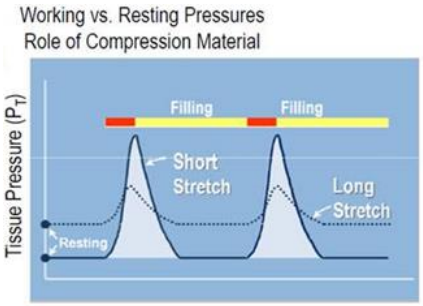
5. Learning Activity #5
   - To determine factors affecting the ability of the calf muscle pump to move blood toward the heart.
   - To determine if arterial insufficiency is present and further vascular assessment is required.

6. Learning Activity #6
   - Edema resolved.
   - Weepy scaly skin resolved.
   - Recurrent cellulitis resolved.
   - Wound healed.
   - “Heaviness” in the legs resolved.

7. Learning Activity #7
   - # d

8. Learning Activity #8
   - Measure ankle and calf circumference.
   - Assess the shape of the leg and pad if necessary.

9. Learning Activity #9
    - Short stretch bandages are usually better tolerated by clients with mixed arterial venous disease because they have a lower resting pressure. Therefore, when the client is supine without gravity to assist with blood flow the short stretch wrap does not maintain a high level of compression so does not interfere with circulation as much as the long stretch elastic wrap. The long stretch elastic wrap maintains a high level of compression at rest.



    - A wrap that is applied at 50% overlap essentially provides 2 layers of wrap which increases the amount of compression.

10. Learning Activity #10
    - A = No padding
    - B = Pad wasted calves
    - C = Pad ankle to compensate for a champagne leg deformity.

11. Learning Activity #11
    - Gently wash and pat legs and feet dry; gently wash and dry between the toes.
    - Apply a moisturizer over the legs and feet unless using a combined cleanser and moisturizer.
    - Suggest the client shower and treat legs and feet each time wrap is changed.
    - Apply skin barrier to the peri-wound skin.
    - Cover the wound with an absorbent dressing.
    - Visit the client to remove the wrap and do an assessment within 48 hours and then as needed but at least once a week.
    - Consider consulting with the wound clinician if dermatitis does not improve with edema reduction. A viscopaste bandage may help to resolve the dermatitis.

12. Learning Activity #12
    - #1 and #3

13. Learning Activity #13
    - Change to a more absorbent, non-adherent dressing such as foam, alginate or hydrofiber.
    - Increase the frequency of wrap changes until the edema resolves or the dressing stops leaking.

14. Learning Activity #14
    - First follow-up visit within 48 hours.
    - Assess for the:
        - Presence of adverse effects.
        - Client's tolerance for compression therapy.
        - A reduction in edema and/or an increase in exudate if a wound is present.
        - Presence of slippage.
        - Effectiveness of dressing material to absorb all wound exudate.
        - Client's adjustment to the compression wrap.

15. Learning Activity #15
    - Size J
    - Base of the toes to 4 cm (2 finger widths) below the knee.

16. Learning Activity #16
    - Carry out a more detailed assessment to determine if there are other reasons that he was not wearing his compression stockings.
    - Educate the client about the relationship between compression and wound healing and the reason for his wound deterioration.
    - Carry out further assessment of pain associated with wearing the stockings. Referral to a certified fitter to find stockings which are more comfortable or more stylish, such as the sport compression stocking. Consult with the physician regarding pain management if indicated.
    - Suggest that he wear his stockings at times other than when he is working out or playing sports.

QUIZ ANSWERS

Note: for multiple choice and true /false questions that the **correct answers** are **bolded.**

1. Name 2 structures that facilitate the flow of blood in one direction through the vein toward the heart.
    a. One-way bicuspid valves.
    b. Calf muscle pump.

2. What "pump" assists the venous return of blood to the heart. Explain how this pump works.
    a. Calf muscle pump
    b. When a person with normal venous circulation stands or mobilizes, the calf and foot muscles contract compressing the veins and moving blood toward the heart.

3. Which of the following statements are true?
    a. For clients with venous ulcers the choice of wound dressing is more important than the type of compression.
    b. High compression is more effective at reducing edema than low compression.
    c. *Inelastic* short stretch wraps are always more effective than *elastic* long stretch wraps.
    d. For clients with a lower leg wound, a basic lower leg assessment is always done when first meeting the client.

4. Name 3 situations when you would do an ABPII:
    a. Every 6 months as part of a comprehensive lower leg assessment for clients receiving compression therapy Increased lower leg and/or foot pain unrelated to infection.
    b. Increased lower leg and/or foot pain unrelated to infection.

c. Increased signs of arterial insufficiency, e.g. delayed capillary refill, cold skin temperature, absent or diminishing peripheral pulses.
d. Prior to deciding to apply high compression therapy.

5. Before initiating compression for any client, they should have which of the following. Choose all that apply.
    a. Toe pressures
    b. Monofilament testing
    c. ABPI

6. Name 5 adverse effects of compression therapy that can occur for clients wearing compression therapy.
    a. Pressure Damage
    b. Slippage
    c. Circulatory problems
    d. Allergic reactions
    e. Blistering
    f. Strikethrough
    g. Discomfort or pain

7. Chose one of the adverse effects you identified in # 6 and indicate how you would address the problem.
    a. Slippage
    When a compression wrap is first applied, it may require reapplication every 2-3 days to avoid slippage especially during the first 1-2 weeks until the edema is reduced. Padding the lower leg to an approximate normal shape or the use of a cohesive wrap, such as Coban 2, may minimized slippage.

    b. Pressure Damage
    To avoid pressure damage, apply extra padding over bony prominences and other areas at risk for pressure damage, especially as edema is reduced. Check the client frequently for wrap slippage especially at the start of compression therapy. Apply compression wraps according to manufacturer's instructions. A wrap that is put on too tightly can cause pressure damage.

    c. Circulatory Problems
    If numbness, tingling, discolouration or swelling of the toes occurs, the compression wrap or stocking must be removed immediately and the Wound Clinician or Physician/NP notified. Monitor for dyspnea, chest pain and other signs and symptoms of heart failure and consult the Physician/NP if they occur. If toes are edematous ensure that the wrap starts at the base of the toes and refer to the Wound Clinician if it does not resolve. Teach the client at home to recognize circulatory problems and remove the stockings promptly or have someone else remove them and call the nurse or wound clinician.

    d. Allergic Reactions
    If an allergic reaction occurs, review the ingredients in the cleansing and moisturizing products and any wound dressings used as well as the compression wrap to determine the source of the reaction and discontinue the product.

    e. Blistering
    If the blister is intact consult with a wound clinician to determine the most appropriate treatment. If the fluid has drained out of the blister cover it with a non-adherent sheet dressing such as Mepitel and a cover dressing if necessary before re applying the wrap.

f. Strike-through
The presence of strike through to the outside of the wrap indicates the need for a more absorbent dressing over the wound such as foam, alginates or hydrofibers that wick exudate vertically to protect the wound margins. More frequent changes of the wrap and dressing may also be indicated.

g. Discomfort and Pain
Discomfort and pain have a major impact on the client's ability to tolerate compression. A proper assessment, noting an increase in pain over time or a change in client's pain sensation is important. If at first the client experiences increasing pain, it may help to reduce the level of compression and / or have the client elevate the limb until the amount of edema decreases if arterial insufficiency is not present. Clients who cannot tolerate compression wraps due to pain may tolerate a compression stockings or tubular sleeve such as Medigrip as the sub-wrap pressure is lower.

Clients should receive appropriate analgesia to reduce pain and discomfort to a level that is manageable for them or be instructed on the use of appropriate analgesia if they are at home. Consult the Physician/NP if pain is not resolved to the client's satisfaction.

8. Which of the following are considered risk factors for venous insufficiency?
   a. DVT
   b. Lower Leg Surgery
   c. Multiple Pregnancies

9. Which of the following would prompt you to consult with a Wound Clinician, Physician or NP?
   a. Change in the arterial status of the lower limb.
   b. The wound dressing is not adequate to address the amount of exudate.
   c. The client is unable to tolerate compression.
   d. No improvement in the wound after 3 days.
   e. An acute onset of pain in the lower limbs.

10. Which of these are changes commonly seen on the lower limb of a client with venous insufficiency?
   a. Shallow wounds with irregular borders.
   b. Diminished or absent peripheral pulses.
   c. Evidence of healed wounds.
   d. Limited ankle mobility.
   e. Delayed capillary refill.
   f. Wounds occurring on or between the toes.

11. Which of the following statements are true?
   a. Arterial disease also occurs in almost 50% of clients with venous disease.
   b. Compression therapy greater than 20 mm/Hg should only be applied following an order from a Physician or with the direction of a NSWOC/WC.
   c. Scrubbing helps to remove the scaly skin for those with venous dermatitis.
   d. Palpating pedal pulses is the best way to assess arterial perfusion.
   e. Clients with ischemic rest pain should not receive compression therapy.
   f. Have the toes pointed toward the floor when applying compression wraps.
   g. Elastic compression systems have higher working pressures and are better for clients who are mobile.

12. Identify 4 effects of compression therapy on the lower legs and feet.
    a. Decrease in venous hypertension.
    b. Restoration of bicuspid valve function.
    c. Increased blood flow to the deep veins.
    d. Decreased blood volume in the foot and lower leg.
    e. Facilitates the calf muscle pump.
    f. Reduces edema.
    g. Improves ulcer healing.
    h. Improves the skin condition on the lower leg.

13. Identify 4 things that determine the frequency of compression wrap changes.
    a. Product specification / manufacturer's instructions.
    b. The amount of exudate.
    c. A reduction in edema.
    d. The client needs close monitoring, for example when arterial insufficiency or peripheral neuropathy are present.

14. Alice works in acute care and is preparing to transfer her client Mr. W to residential care. Mr. Wi has been wearing Profore Light in acute care and his doctor wishes him to continue wearing compression after the transfer. List 4 things that you must determine prior to deciding to make the transfer.
    a. The receiving agency staff are competent to apply and remove compression wraps or garments.
    b. Staff in the residential care facility can address adverse effects or can access help promptly if adverse effects occur.
    c. The required supplies are available at the facility to ensure un-interrupted compression therapy.
    d. The facility has been provided with a care plan or transfer document that outlines the current client care and wound management if the client has a wound, as well as all relevant information about compression therapy and follow-up.

CASE STUDY ANSWSERS

Case Study #1 Case study **answers** are **bolded**

MG is 65 years old and has a venous ulcer on the medial malleolus. She has longstanding venous disease with moderate (+2 to +3) pitting edema that worsens later in the day. An ABPI done recently indicates normal arterial circulation. Previous medical history includes 2 episodes of DVT but no varicosities. She is fit, mobile indoors and until recently was walking outside in the garden. She has good ankle movement. Although she has some heaviness in her legs it is manageable and is relieved by walking and elevating her legs. She has been referred to community care because her GP would like her to start compression therapy.

List other information that you would gather for during your first visit with her.

1. **Any questions or concerns she might have about compression therapy, including her level of understanding about compression, her current environment, and any impact it might have on compression therapy, any preferences about compression therapy and her ability and motivation to participate with compression therapy.**
2. **Risk factors for venous insufficiency, e.g. nutritional status, medical conditions, medications, previous injuries, lifestyle factors, functional ability, and history of compression therapy.**
3. **Basic and advanced lower limb assessment.**
4. **The presence of either cutaneous or wound infection.**
5. Refer to pages 5 -7 of the *Guideline* to review these areas of assessment in more detail.

Based on the assessment information, the wound clinician has decided to use a Coban 2 compression wrap. When you arrive to apply the wrap what information would you give to MG about compression and about her specific wrap?

1. **Coban 2 is an inelastic wrap so walking and other activities will increase the effectiveness of the wrap in reducing edema.**
2. **Explain about the adverse events that might occur with compression therapy, how to monitor for these, what to do and who to call.**
3. **Her wrap has less bulk at the ankle so she can wear normal shoes.**
4. **When the nurse will be back to redo the wrap and check the lower limb. How to contact the nurse if she needs help prior to that.**
5. **What to expect with respect to resolving edema and increased wound exudate over the first 1 – 2 weeks.**
6. **That she might have an increase in discomfort initially but that should resolve as the edema resolves.**
7. **Personal hygiene with respect to bathing and options.**
8. **The benefits of elevating her legs above the level of her heart.**

MG's ulcer is 6.5 cm x 3.5 cm with irregular margins and areas of yellow slough and granulation tissue. There is a moderate amount of serous drainage. The wound edges are not macerated and although inflammation is evident on the peri-wound skin the venous leg ulcer is not infected. How would you protect both the compression wrap and the wound margins from the serous drainage?

1. **Apply a barrier cream to the wound margins.**
2. **Apply a non-adherent absorptive dressing that wicks fluid vertically away from the wound bed and peri-wound skin.**
3. **Change the compression wrap and the dressing more frequently until the wound exudate decreases.**

MG has been wearing a compression wrap for 4 months and her wound is healed. The goal of her clinic visit today is to discuss the transition from a compression wrap to a compression stocking. What information will you share with Mrs. Green?

1. **The use of required donning aides or refer to a community OT or stocking fitter for same.**
2. **A walking and exercise plan to increase limb mobility, improve the function of the ankle joint and calf muscle pump and decrease edema. Refer to the PT as necessary.**
3. **The benefits of lying flat and elevating the legs above the level of the heart 2-3 times daily for up to 30 minutes and elevating the foot of the bed on 5 – 10 cm blocks or bed risers.**
4. **Information on the following:**
    a. **Early referral at the first sign of skin breakdown or trauma to the limb.**
    b. **Appropriate lower leg hygiene and skin care.**
    c. **Avoidance of products likely to be sensitizers.**
    d. **How to monitor for adverse effects of compression, especially for signs and symptoms of ischemia.**
    e. **The importance of wearing her stockings every day for the rest of her life.**
    f. **How to get a prescription from her Physician for appropriate stockings.**
    g. **Information on where to purchase stockings and how to care for them.**

Case Study #2 Case study **answers** are **bolded**

Mrs. C is 79 years old with moderate arterial disease and an ABPI of 0.6. She has severe venous disease with pitting edema (+2) over both legs. She lives alone in her home and has home support visit daily. She is very thin and has poor mobility spending long periods sitting in her chair. She has a large ulcer with copious amounts of exudate on her left medial malleolus. She has venous dermatitis with itchy scaly skin and draining areas on both legs. Currently she has a foam dressing over her wound and is not

wearing any form of compression. She has just been admitted to the inpatient geriatric assessment unit for assessment and treatment and will be discharged home in 3 - 4 weeks.

She has been seen by an acute care Physician who has ordered a 4-layer Profore compression wrap. Would you apply the Profore compression system? Provide a rational for your answer.
Do not apply the 4-layer Profore compression wrap as it is not indicated for an ABPI of 0.6. (See PISheet for Profore)
Call the Physician to discuss other options.

Mrs. C. is wearing a Profore Lite compression wrap. It was applied for the first time yesterday. When you check her today you notice that her toes are pale and cool to the touch and that she is complaining of pain. What would you do?
Remove the wrap immediately and assess the foot, then contact a Wound Clinician or Physician/NP.

Mrs. C. has been referred to a vascular surgeon who has ordered Coban 2 Lite. You have removed the wrap and want to measure leg circumference to determine if her edema is resolving. Where on the leg would you measure?
Measure ankle circumference 10 cm from the bottom of the heel and calf circumference 30 cm from the bottom of the heel.

You are concerned about her low body weight and her poor intake. What further assessment would you do and what treatment might be appropriate?

Assessment
1. **Call the Physician to ask for a pre-albumin.**
2. **Monitor her food and fluid intake while in hospital and discuss her food and fluid preferences.**
3. **Discuss her intake at home, her ability to prepare meals and access to groceries.**
4. **Assess for causes of poor intake such as difficulty swallowing, ability to feed self and GI problems.**
5. **Ask the dietitian to assess the client and possibly refer to a community-based dietitian for follow up at home.**

Treatment
1. **Provide protein drinks (if not contraindicated) and food and fluid preferences if available.**
2. **Ensure she has fluid available at all times.**
3. **Refer to the appropriate professional for treatment of causes of poor intake if present.**
4. **Follow through on dietitian's recommendations.**

Mrs. C. is going to be discharged home in 2 days after 6 weeks on the unit. Her venous dermatitis is much improved as is her pitting edema. Her ulcer has healed. She now wears compression stockings. Mrs. C. states that she does not know how she will manage at home as she is not able to prepare meals and clean her house. What would you do?
1. **Collaborate with the OT to assess her ability to put on and take off her stockings and demonstrate donning and doffing aids if necessary prior to discharge.**
2. **Provide education on the importance of continuing her compression therapy.**
3. **Refer to the Social Worker, LTC Assessor or appropriate professional in the community (if available) to ensure that she has adequate support for meal preparation, household chores, and to provide help to apply and remove her stockings if necessary.**
4. **Refer to Home Health Care and explain to Mrs. Campbell about the involvement of home health nurses after discharge.**

Case Study #3 Case study **answers** are **bolded**

Mrs. W is 69 and lives with her daughter. She has varicose veins that were stripped in her 50's but she continues to have venous insufficiency and heart failure that is well controlled. Her ABPI is 0.9. Her mobility is poor due primarily to advanced arthritis and obesity. She had a left total knee replacement 5 years ago. She has severe edema with venous dermatitis over both legs and has recurrent cellulitis.

Mrs. W has a large untreated infected ulcer over her left medial malleolus. She has pain in her wound that is proving difficult to treat. She is not currently receiving any type of compression. Her daughter brought her to emergency stating that "she is failing" and she has been admitted to your unit.

What needs to occur before Mrs. W. can have compression therapy applied?

1. **She must receive treatment for her cellulitis and infected wound.**
2. **Her wound pain should be assessed and different treatment strategies implemented.**

Mrs. Wattle tells the wound clinician that she has never been able to tolerate compression but she has agreed to try an Unna Boot after the wound clinician describes the benefits of compression. Describe the Unna boot and state why a wound clinician might choose this wrap for Mrs. Wattle.

An Unna Boot is a 2-layer, rigid wrap system comprised of :

- **Layer #1 - Viscopaste Wrap - a layer of gauze impregnated with 10% zinc oxide paste.**
- **Layer #2 – A layer of kling.**

Is effective in treating the symptoms of venous dermatitis where compression is indicated.

Mrs. W has 4 risk factors for venous insufficiency. What are they?

1. **Varicose veins**
2. **Total knee replacement**
3. **Obesity**
4. **Decreased mobility**

Mrs. W finds the Unna boot painful and restricting and asks to have it removed. Identify a compression garment that is more flexible and provides lighter compression.

A compression garment such as a tubular compression bandage (Medigrip LF) in either a single or double layer based upon Mrs. Wattle's tolerance.

Mrs. W has been home from hospital for 3 days and is visited by the home health nurse? What might the nurse suggest to her to help reduce her lower limb heaviness and discomfort?

The benefits of lying flat and elevating the legs above the level of the heart 2-3 times daily for up to 30 minutes and elevating the foot of the bed on 5 – 10 cm (2 - 4 inch) blocks or bed risers.