

SESLHD PROCEDURE COVER SHEET



Health
South Eastern Sydney
Local Health District

NAME OF DOCUMENT	Wound – Graduated Compression Therapy (GCT) in Venous Disease
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AUTHOR	SESLHD Wound Committee
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FUNCTIONAL GROUP(S)	Surgery, Perioperative and Anaesthetics
KEY TERMS	Compression, venous, leg ulcers, cellulitis, graduated, wound
SUMMARY	This document outlines the appropriate use of compression therapy for the treatment of venous leg ulcers and lower limb cellulitis.

COMPLIANCE WITH THIS DOCUMENT IS MANDATORY

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SESLHD PROCEDURE

Wound – Graduated Compression Therapy (GCT) in Venous Disease

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1. PROCEDURE STATEMENT

Compression therapy must provide safe and effective treatment for patients with venous leg ulcers and lower limb cellulitis. Where uncertainty about the appropriate use of compression exists, the clinician must seek a review of the patient by a Wound Care Expert, which includes but not limited to the following: a Medical Officer (including Vascular surgeons), Wound CNC/NP or Podiatrist.

Compression whether it be bandages, compression wraps, stockings or intermittent pneumatic compression is a therapeutic treatment. A patient should be fully informed prior to initial application of therapy including benefits and potential risks. Compression should not be discontinued until all the ramifications of this decision have been discussed with the patient and carers, unless clinically indicated. Alternative methods of compression therapy should be explored should the patient not want to wear or is not able to tolerate compression bandages.

The application of compression bandages must not put the patient at a falls risk, therefore, when contemplating the type of compression to be used, consider how safe footwear can be achieved.

Note: this procedure is not applicable for the management of lymphoedema.

2. BACKGROUND

Graduated Compression Therapy (GCT) is the primary intervention in the prevention and management of venous hypertension, venous oedema and venous leg ulcers¹ and aims to correct the long term complications of chronic venous insufficiency including, venous pooling, and capillary permeability through improving venous return². GCT includes compression bandages, compression wraps, compression garments and intermittent pneumatic compression (IPC) systems. When compression bandages are applied to the lower limb, graduated compression is achieved in a leg of normal proportions, with the greatest compression at the ankle and decreasing at the calf³. GCT increases healing rates of most venous leg ulcers, improves quality of life and reduces the likelihood of recurrence^{1,4}. GCT should be considered for any lower leg wound that has been present for 2 weeks or more⁴.

Where a leg ulcer has mixed aetiology of arterial and venous disease, compression may still be suitable however this should only be applied following consult with a vascular specialist^{2,4,5}. GCT has the potential to cause serious adverse effects if applied incorrectly or to a vascularly impaired limb, peripheral arterial disease should be excluded prior to initiation of GCT^{5,6}. A lower leg arterial occlusion must be addressed prior to application of compression. Compression therapy may also be beneficial in the treatment of lower limb cellulitis².

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3. DEFINITIONS

Ankle Brachial Pressure Index (ABPI):	Ratio of ankle arterial systolic blood pressure over the brachial systolic pressure ^{6,7} , used to exclude Peripheral Arterial Disease.
Compression Bandages:	Bandage systems that apply external pressure to a limb. Can be cotton and/or synthetic, with or without elastic or latex and are described as short or high/long stretch bandages.
Compression Garments	Manufactured graduated compression hosiery that is applied to the lower limb provides GCT. Can be 'off the shelf' or custom-made and vary in compression levels (20-30 mmHg, 30-40 mmHg, 40-50 mmHg or >50 mmHg) depending on patients requirements.
Compression Levels/scales	This can be variable depending on type of pressure required. Therapeutic pressure aims to achieve 40mmHg at the ankle and gradually reduces up the limb ⁸ GCT can alter depending on Laplace's Law. Appendix I .
Compression Therapy	Also known as Graduated Compression Therapy (GCT), can be achieved through compression stockings/garments, compression bandages or the use of intermittent pneumatic compression pumps. Achieved by applying a bandage at a constant and even pressure from toes to below knee. GCT can alter depending on the Laplace's Law. Appendix I . This can be also achieved with a compression stocking/garments.
Light / Mild Compression Therapy	This is not an effective treatment for venous leg ulcers. However, some pressure is better than no pressure but ideally higher pressure is better than lower pressure ³ . A three layer tubular system can be consider in patient who are unable to tolerate full therapeutic compression Appendix K .
Graduated Compression Therapy (GCT)	See Compression Therapy
High / Long stretch bandages (Elastic)	Provides both a high resting pressure and a high working pressure. Produces a sustained pressure irrespective of patients' mobility and position. Elastic bandage preferred for immobile patient ⁹ .
Short stretch bandages (Inelastic)	Provides a low resting sub-bandage pressure and high working pressure when the calf muscle is active. Inelastic bandage is recommended for active / mobile patients ³ .
Multi-Layer Bandages	Includes long-stretch and short-stretch elements within bandage system. The total sub-bandage pressure of the multi-layers systems is the sum of pressure achieved from each compression layer.
Intermittent pneumatic compression (IPC) systems	Intermittent pneumatic compression (IPC) is a mechanical method of delivering sequential compression to swollen limbs.
Lanarkshire Oximetry Index (LOI):	A protocol for pulse oximetry toe / finger O ² saturation to check the suitability of compression therapy.
Toe Brachial Pressure Index (TBPI):	A procedure to determine arterial perfusion in the feet and toes by measuring the systolic pressure in the arm and the great toe

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4. RESPONSIBILITIES

4.1. Employees will:

- Adhere to the content of this document
- Ensure they work within their scope of practice
- Attend relevant education related to this procedure
- Obtain and document valid consent before and during the proposed treatment/procedure as per the [NSW Health Consent to medical and Healthcare Treatment Manual⁹](#)

4.2. Line Managers will:

- Ensure all clinical staff are given the opportunity to attend district wound management education
- Ensure all clinical staff work within this procedure and have appropriate resource
- Have appropriate stock items to implement the recommendations within this procedure.

5. PROCEDURE

5.1. Assessment

5.1.1. Arterial Disease Determination

Significant arterial disease should be excluded prior to application of GCT. Arterial disease can be determined by a comprehensive physical examination and the following tests:

- Ankle brachial pressure index (ABPI) every six months
- Toe brachial pressure index (TBPI) every six months
- Lanarkshire Oximetry Index (LOI) every six months
- Arterial/venous duplex every 12 months
- Arteriogram

5.1.2. Minimum requirement before GCT can be applied

When compression has been ordered without any of the above, the [Lanarkshire Oximetry Index](#) can be undertaken to ensure the arterial circulation is not compromised by the application of compression therapy. This should be undertaken by a clinician trained in this method. If results are within normal limits, compression can be applied as per procedure/written order. If results are outside the normal limits contact a wound care expert to discuss the results.

5.1.3. Prior to Application of Compression Bandages

5.1.3.1. In the hospital setting:

Consent¹⁰ must be obtained from patient or patient advocate and documented A [wound care expert](#), medical officer, or vascular specialist should document an order in the clinical notes. This should include the type and level of compression.

5.1.3.2. In the community setting:

Community Nurses should be provided with an authority form of authority to apply compression by a wound care expert following a comprehensive clinical assessment including an ABPI/TBPI or arterial duplex scan with the result recorded in clinical records.

An ABPI should be within range of 0.8-1.2. If recording outside this range a referral to a vascular specialist is required⁵.

A TBPI should be within range >30mmHg in non-diabetic patient and >60mmHg in a diabetic patient¹².

An authority form is required for any compression system with a compression level >20mmHg. An authority form should include level and type of compression, date and results of arterial test (please refer to the example in [Appendix A](#)).

5.1.4. Who can apply GCT?

Health professionals are not permitted to apply compression until they have gained specific education and assessment (determined at a local level) in the application and use of GCT. The correct level of compression must be applied and the correct application technique must be used refer to appendices below:

- [Appendix B - Complications following the Application of Compression](#)
- [Appendix C - Specific Compression Bandage Systems](#)
- [Appendix D - Four Layer Bandage Systems](#)
- [Appendix E - Two Layer Compression System](#)
- [Appendix F - Short Stretch \(Inelastic\) Compression Bandage](#)
- [Appendix G - High Stretch \(Elastic\) Compression Bandage](#)
- [Appendix H - Intermittent Pneumatic Compression \(IPC\)](#)

5.1.5. Factors Influencing Choice of Compression System

The patients' psychological, cultural and social factors must be considered in the selection of appropriate GCT, as they may have difficulty accepting compression therapy due to its effect on work, showering / bathing, choice of clothing and footwear. Decisions about the compression system should consider the following issues:

- The shape and size of the leg, unusually shaped legs may require custom made compression garments
- Patient tolerance and preference
- Patient's lower leg sensation e.g. if reduced
- Patient's ability to remove compression if required
- Patient's cognitive ability to understand education re: monitoring for complications
- Clinician knowledge and experience in application
- Environment e.g. temperature/climate
- Ease of application and removal
- Access to compression systems
- Presence of comorbidities

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- Level of the individual's activity

5.1.6. Patient/Carer Education

The patient / carer should be educated on the importance of concordance and of possible complications and problems arising as a consequence of the compression.

Appendix B

Education should include:

- Signs and symptoms of arterial compromise
- Pain management and the management of loose, slipping and wet bandages
- Advice should be given about appropriate footwear, consider an orthotics consult to ensure appropriate foot wear achieved to avoid risk of falls
- Manufacturer's guidelines regarding laundering and replacement of bandages or stockings should also be provided to the patient. Garments should be discarded and replaced according to the manufacturer's recommendations. For further information please refer to [Appendix J](#)

5.1.7. Limb Assessment Considerations

- Some wound management products are not suitable for use under compression, e.g. thick dressing products and hydrocolloids. Discuss product selection with a wound care expert if unsure.
- Prior to the application of compression bandages assess the wound and skin condition of the limb and treat accordingly in line with [SESLHDPR/297 - Wound Assessment and Management Procedure](#).

5.1.8. Compression Therapy Pressures

Compression bandages should be applied as per the manufacturer's instructions and in a manner that will achieve graduated compression.

- Compression therapy of $\geq 40\text{mmHg}^{13,14}$ at the ankle should only be used where the arterial investigations have indicated that there is no significant arterial disease e.g. ABPI or LOI is 0.8-1.2, TBPI >0.7
- Caution should be exercised if compression has been prescribed for a patient with an ABPI or LOI of less than 0.8 or a TBPI of less than 0.7. Always consult a wound care expert before applying compression therapy in these patients, a reduced compression system may be required

5.1.9. Ankle Measurement

The ankle should be measured prior to the application of compression bandages.

- Ankle sizes less than 18cms apply extra padding to the ankle / lower leg area until the 18cms is reached at the ankle and the calf is proportionally larger than the ankle
- Ankle circumference of around 18cm, regular measurement of the ankle is recommended as these patients are at risk of complications caused by the compression⁴
- Ankles greater than 25cms alteration maybe needed in compression therapy application see [Appendices C-H](#)
- ankles greater than 30cms consider the use of IPC [Appendix H](#)

- limbs not conical in shape or misshaped consider the use of IPC [Appendix H](#)

5.2. Application

5.2.1. Safety Considerations before GCT Application

Application of compression bandages can cause injury to the clinician or carer. The patient should be positioned to ensure easy access to the leg. The following should be considered:

- Appropriate posture throughout the procedure must be maintained
- A position must be assumed which will minimise twisting, reaching and bending
- Avoid squatting and kneeling for long periods whilst applying garments or bandages
- Take breaks as necessary between bandage layers and between legs
- Avoid rushing the procedure as this may result in inappropriately applied bandages/garments and increase the risk of injury

5.2.2. Assessment Required Before, During and After Application of GCT

- Neurovascular status of the affected limb/limbs and patient's level of comfort must be assessed before and immediately after the application of compression therapy
- Pain scores should be measured before and after application of compression therapy with reference made to any increase in scores or changed sensation as appropriately applied compression should reduce pain. If pain persists remove compression and ensure arterial status has been adequately assessed
- In the community, GCT must not be applied unless the patient or carer can remove it if problems arise such as severe pain, changes in colour / perfusion or sensation

5.2.3. Correct Application of the GCT System

- A natural padding layer is required under all compression bandages to protect the skin
- A compression bandage must extend from just proximal to the toes to two fingers widths below the knee. The foot should be positioned at 90 degrees to the leg during application to avoid the bandage wrinkling during standing or walking
- A figure of eight technique should be used to anchor the bandage to the foot. Adequate padding is essential to protect bony prominences and additional padding maybe required to achieve a conical limb shape for patients who have altered leg contour e.g. 'champagne bottle legs'
- Changes of limb shape due to reduced oedema should be monitored by measuring and documenting circumference at defined sites (ankle and calf)
- For Single use bandages, the excess bandage should be 'taped off' or 'cut off' as winding around the limb or turning it over can impair circulation. If one bandage does not adequately cover the leg a second bandage should be used. Finishing the bandaging too low or applying increased stretch to reach the knee may result in adverse patient outcomes

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- For Reusable systems, if excess bandage present, once compression has finished 2 fingers below the knee, then loosely wrap 1.5 turns back down the leg, ensuring no tension is applied, and cut and tape bandage to secure. This allows for any potential increase in limb size.

5.3. Monitoring

5.3.1. Monitoring Following Application of GCT

Following application of compression the patient should be observed for pain, colour/perfusion, warmth, sensation, movement, capillary return, if there is a change in perfusion remove compression therapy.

Note: in patients unable to verbalise pain increased pain may present as delirium.

5.2.3.1. In the Hospital setting:

If bandaging is satisfactory post initial application assessment, compression bandages and neurovascular status should be reviewed every eight hours thereafter.

5.2.3.2. In the community setting:

Reassessment of neurovascular status of the affected limb/limbs, bandage integrity and patient comfort level must occur within 24 hours of initial application. The client/carer must be provided with information on indications for bandage removal & CHN contact details. The assessment findings and action taken must be documented in the health care record.

5.3.2. Assessment on removal of GCT System

On removal of a GCT system, assess for visible skin trauma including pressure damage, and loss of calf muscle and skin problems⁴ [Appendix B](#).

5.3.3. Compression and Cellulitis

When cellulitis is confirmed and managed, compression therapy can be continued if tolerated by the patient. Lighter compression can be used to improve patient tolerance and ease pain, and then the compression can be gradually increased when discomfort has been managed².

5.3.4. After Hours Compression on Patients with Cellulitis

After undergoing assessment by a medical officer, compression can be initiated if:

- All leg pulses are present i.e. femoral, popliteal, posterior tibial, dorsalis pedis
- The patient has no known co-morbidities
- The patient or their carer are capable of taking off bandages if they are too painful
- The patient has a referral to an appropriate service for testing to occur as soon as possible

5.4. Alternative compression methods

5.4.1. Reduced Compression

Reduced compression pressure may be used in patients:

- Initially upon commencing compression therapy to aid tolerance and compliance. If no clinical contraindications the level of compression should be increased to therapeutic levels as the patient's tolerance improves

- Where a mild degree of arterial impairment exists (ABPI 0.5-0.8) (consultation with wound care expert should occur prior to commencement of compression for these clients)
- If ordered by treating specialist and tolerated by the client
- During periods of infection where pain may be increased
- Where tolerance of optimal compression levels is unable to be obtained. Patient should be educated on reduced healing outcome and potential complications if full therapeutic pressure is not applied

5.4.2. Tubular Bandaging System

- A three layer tubular bandaging system may be considered if the patient is unlikely to tolerate full compression. The outer layers can be removed by the patient if required. This system can also be used if the applicator does not have the expertise to apply other compression systems⁵ (see [Appendix J](#) for appropriate sizing and application)
- Moderate compression can be unsafe or painful for patients with arterial insufficiency, neuropathy or cardiac failure. Mild or light compression may be required⁴
- In the hospital or clinic setting tubular bandages (e.g. Tubular form, Tubigrip) may be used temporarily if the decision is made for the patient to have compression bandages after hours or on weekends as there may be problems in accessing the appropriate resources including staff to apply therapy at the higher levels that may be required. Sizing should be determine based on limb measurements and manufacture guidelines

5.4.3. Patients Unable to Tolerate Compression Bandaging

Alternatives to compression bandages should be considered:

- Intermittent Pneumatic Compression (IPC) [Appendix H](#)
- Compression wraps e.g. Farrow wraps™ (Essity), Ready wraps™ (Cosmac), CircAid™ (Reis Orthopaedics). These are a short-stretch compression system designed for patients with fluctuating oedema, rebound oedema, problems getting compression stockings on or off or for patients who are unable to tolerate bandaging, these wraps can be easily removed and reapplied by a patient/carer. The overlapping bands provide support and rigidity to control oedema and can also be used on a patient with open wounds. The wrap needs to be specifically measured to fit the patient to ensure graduated compression will be achieved

5.4.4. Patients Unsuitable for Compression Bandaging

When there are safety concerns that mean patients are unsuitable for compression bandaging, educate patient on leg elevation, calf muscle exercises and refer to medical officer for review.

5.5. Compression Post Healing of Venous Leg Ulcer

- Compression needs to be continued for life unless surgical intervention is an option and successful.

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- Once the venous leg ulcer has been closed for 2-4 weeks consider:
 - If the patient could be reviewed by a vascular specialist for possible vascular surgery to prevent recurrence
 - If the patient can be fitted with appropriate compression stockings, consider if they are able to get the stockings on and off, an applicator maybe required
 - If the patient is unable to get the stockings on and off consider alternatives e.g. compression wraps or referral for home assistance package

6. DOCUMENTATION

- SESLHD Wound Assessment and Management Plan SEI060.118 or the Electronic equivalent e.g. in Ambulatory and Primary Health Care (APHC) use Wound Assessment Treatment Evaluation Plan (WATEP).
- Any additional comments are to be recorded in the patient's health care record, including:
 - valid consent given⁹
 - discussion re treatment options
 - discussion re patient goals (short and long term)
 - aspects of the education provided
- Transfer or clinical handover documentation e.g. from community to hospital or vice versa
- Discharge letters should include wound assessment and management plan information
- When appropriate, attach digital wound photo/images to patient's health care record per [SESLHDPR/285 – Wound - Clinical Digital Photography](#) procedure.
- Complete [IMS+](#) if:
 - any adverse events occur during the application or management of GCT
 - there were any breaches in Aseptic Non-Touch Technique (ANTT) during dressing procedures

7. AUDIT

Sites are required to follow up with any incidents that occur in relation to this policy.

8. REFERENCES

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9. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
February 2015	0	Area wound committee Endorsed by Executive Sponsor
April 2017	1	Minor amendment to Appendix A
April 2018	2	Minor amendment to Appendix E. Approved by Executive Sponsor
May 2018	2	Processed by Executive Services prior to publishing.
August 2021	3	Major review commenced. Draft for comments period.
October 2021	3	Reviewed and approved by SESLHD Wound Committee, Review lead by Naomi James CNC. Approved by Executive Sponsor. To be tabled at Clinical and Quality Council.
November 2021	3	Approved at Clinical and Quality Council.

SESLHD PROCEDURE- APPENDIX A

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Appendix A: Example of Medical Authority Form

	SURNAME: _____ OTHER NAMES: _____ DOB: _____ SEX: _____ AMO: _____ AFFIX PATIENT ID LABEL HERE																								
South Eastern Sydney Local Health District Authority to Apply Compression Therapy																									
<p>I (please print).....give permission to apply compression therapy for the above patient (Please select compression below). Please specify which limbs/limb compression to be applied: Signed: Position: Facility: Date:</p> <p>Print Name: Phone number:</p> <p>Allergies:</p> <p>In the last six months has this patient had the following (indicate by ✓):</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">□ Ankle Brachial Pressure Index</td> <td style="width: 50%;">Date.....</td> </tr> <tr> <td>□ Toe Brachial Pressure Index</td> <td>Date.....</td> </tr> <tr> <td>□ Lanarkshire Oximetry Index Assessment</td> <td>Date.....</td> </tr> <tr> <td>□ Vascular studies</td> <td>Date.....</td> </tr> </table> <p>Results:</p> <p>Medical Officer/Specialist Vascular Diagnosis:</p> <p>Vascular Specialist Name:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 50%;">Graduated Compression Therapy: Bandages</th> <th style="width: 50%;">Graduated Compression Therapy: Stockings</th> </tr> </thead> <tbody> <tr> <td>Moderate: 2 layer 20-40mmHg: padding / short stretch e.g. Putterbinde, Urgo k 2, Coban2.....</td> <td><input type="checkbox"/> Very Strong: >60mmHg (Lymphoedema).....</td> </tr> <tr> <td>Moderate: 2 layer 20-40mmHg padding / high stretch e.g. Surepress, Setapress.....</td> <td><input type="checkbox"/> Strong: 40-60mmHg (Class three stocking)</td> </tr> <tr> <td>Moderate: 4 layer high stretch 20-40mmHg e.g. Profore, Veno4.....</td> <td><input type="checkbox"/> Moderate: 20-40mmHg (Class two stocking).....</td> </tr> <tr> <td>Moderate: Zinc Bandage / then padding /short stretch or high stretch compression.....</td> <td><input type="checkbox"/> Mild: 18-24mmHg (Class one stocking).....</td> </tr> <tr> <td>Light: Tubular bandage e.g. Tubigrip, TubularForm, Flexigrip</td> <td><input type="checkbox"/> Light: 15mmHg tubular system (e.g, three layer Tubular Form system).....</td> </tr> <tr> <td>Other:</td> <td><input type="checkbox"/> Ex Light: 5mmHg tubular system (single layer) Note: Not used for VLU.....</td> </tr> <tr> <td></td> <td><input type="checkbox"/> Other:</td> </tr> </tbody> </table> <p>Comments: (Recommended dressing for wound review only)</p> <p>.....</p> <p>.....</p>		□ Ankle Brachial Pressure Index	Date.....	□ Toe Brachial Pressure Index	Date.....	□ Lanarkshire Oximetry Index Assessment	Date.....	□ Vascular studies	Date.....	Graduated Compression Therapy: Bandages	Graduated Compression Therapy: Stockings	Moderate: 2 layer 20-40mmHg: padding / short stretch e.g. Putterbinde, Urgo k 2, Coban2.....	<input type="checkbox"/> Very Strong: >60mmHg (Lymphoedema).....	Moderate: 2 layer 20-40mmHg padding / high stretch e.g. Surepress, Setapress.....	<input type="checkbox"/> Strong: 40-60mmHg (Class three stocking)	Moderate: 4 layer high stretch 20-40mmHg e.g. Profore, Veno4.....	<input type="checkbox"/> Moderate: 20-40mmHg (Class two stocking).....	Moderate: Zinc Bandage / then padding /short stretch or high stretch compression.....	<input type="checkbox"/> Mild: 18-24mmHg (Class one stocking).....	Light: Tubular bandage e.g. Tubigrip, TubularForm, Flexigrip	<input type="checkbox"/> Light: 15mmHg tubular system (e.g, three layer Tubular Form system).....	Other:	<input type="checkbox"/> Ex Light: 5mmHg tubular system (single layer) Note: Not used for VLU.....		<input type="checkbox"/> Other:
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Authority to Apply Compression Therapy

SESLHD PROCEDURE- APPENDIX B

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Appendix B: Complications following the application of compression

Pain:

The application of compression bandages should not increase pain in the limb. If pain persists remove compression and recheck arterial status of the limb, also reassess for infection.

Pressure Damage:

Patients with impaired peripheral perfusion, thin or altered limb shape, foot deformity or dependent oedema are at increased risk of pressure damage. Other risk factors include reduced sensation, reduced pain sensation, long term systematic steroid use and presence of chronic disease associated with reduced mobility, loss of calf muscle and foot / ankle deformity.

- Avoid using sustained compression on these patients, consider inelastic systems or IPC
- Apply extra padding over bony prominences
- Ensure bandaging is not too tight and overlap is even. At risk areas include the ankle, the dorsum of the foot and the calf
- Observe for signs of pressure damage such as erythema, blistering or altered limb shape
- Encourage limb elevation for dependent oedema

Loss of Calf Muscle:

Wastage of calf muscle can occur for patients receiving long term compression. This is usually directly not due to the compression but is often caused by reduced patient activity, underlying co-morbidities and medication.

- Ensure bandage allows good knee and ankle mobility. Ensure flat comfortable shoes are worn
- Encourage exercise and rehabilitation

Skin Problems:

Maceration, excoriation, dryness, itching, allergic or irritant eczema and erosive pustular dermatosis are often associated with compression, topical preparations or chronic inflammation.

- Ensure adequate exudate control with appropriate primary dressings
- Use cotton liner or paste bandage against the skin
- Moisturise the skin with a simple emollient. Use downward movement in direction of the hair growth to avoid folliculitis
- Treat eczema
- Review all products used in treatment of the limb⁴

Allergy Alert:

Some bandages / compression garments may contain latex remember to check this and do not use if patient has latex allergy or sensitivity.

Bandage slippage:

Reassess method of bandage application to ensure it has not been applied too loosely. Slippage can also occur if bandages have been applied correctly as the reduction of oedema and subsequent limb size may cause the bandages to slip. If slippage continues consult wound care expert for review.

Swelling of the Toes or the area around the Knee:

This may result from the bandage being too tight, too low from the knee, too far back from the toes, lack of exercise or sitting for long periods with legs down. This reduces the effectiveness of the pump action required for venous return and increases oedema in these areas.

Foot wear:

Some clients will not tolerate compression bandaging as they can't wear their usual footwear. Therefore adjustable footwear to accommodate compression bandaging may need to be sourced such as a temporary post-op shoe e.g. a 'DARCO' shoe. Allied health departments, e.g. Orthotics, Podiatry, Physio or Occupational Therapy, can advise or assist.

SESLHD PROCEDURE- APPENDIX B

Wound – Graduated Compression Therapy (GCT) in Venous Disease

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Ineffective compression:

Reassess the client's limb shape. Make certain there is enough padding and the bandage materials are appropriate. Ensure the primary dressing is not reducing the sub-bandage pressure. Check that the bandage is being applied at the correct tension.

Tourniquet effect:

This can occur at the top of the limb when compression bandaging is finished off incorrectly. At the completion of applying the compression layer any leftover bandage needs to be cut off or taped off so that the bandage is held in place without causing a tourniquet effect. This can also occur in limbs where a skin lobule over hangs the joint e.g. at base of leg over ankle joint. This skin fold needs to be padded out to be level with surrounding skin.

Tourniquet effect from stockings:

Circular / round knit stockings may not be appropriate in patient with a skin lobule that over hangs the joint e.g. at base of leg over ankle joint, customise flat knit stockings may be required to level skin out. Education should be provided to patients to ensure they pull up stockings or tubular bandages if these slip to avoid the tourniquet effect.

SESLHD PROCEDURE- APPENDIX C

Wound – Graduated Compression Therapy (GCT) in Venous Disease

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Appendix C: Specific Compression

Bandage Systems giving 40mm Hg (full therapeutic compression) at the ankle include:

- Four Layer Bandage Systems
- Two Layer Bandage Systems
- Short stretch compression bandages
- High stretch compression bandages

Compression therapy giving 40mm Hg at the ankle include:

- Intermittent Pneumatic Compression
- Compression wraps
- Compression Stockings grade 2

Reduced compression bandage systems and alternatives

- Four Layer Bandage Systems Lite
- Two Layer Bandage Systems Lite
- Intermittent Pneumatic Compression reduced intensity
- Three (3) Layer tubular bandaging e.g. Tubular Form / Tubigrip
- Compression wraps applied at reduced intensity
- Compression stockings grade 1 or up to 25mm Hg

Compression bandages should be applied as per the manufacturer's instructions and in a manner that will achieve graduated compression.

Compression achieved by static stiffness

- Short stretch compression bandages however, may need multiple bandages to achieve desired effect.

SESLHD PROCEDURE- APPENDIX D

Wound – Graduated Compression Therapy (GCT) in Venous Disease

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Appendix D: Four Layer Bandage Systems e.g. Profore™ (Smith and Nephew) or Veno 4™ (Hartmann)

A four layer bandage system achieves 40mmHg at the ankle through application of a number of layers of low compression that together exert a cumulative effect. To achieve 40mmHg at the ankle all four layers must be applied correctly and to the correct ankle size.

The four layers include:

1. The padding bandage
2. Crepe or similar retention bandage
3. Light weight long stretch (elastic) bandage (This layer delivers approximately 17-20mmHg)
4. Elasticised rubber bandage. (This layer delivers approximately 23 mmHg)

Apply in the following sequence for ankle size 18-25cms:

- Wound contact layer. Apply directly to the wound. If wound has a moderate to high exudate an alternative dressing might be required
- Padding bandage (layer 1). Apply from toes to knee with slight tension (to avoid puckering) using a spiral technique with 50% overlap. Ensure shin and ankle is adequately padded
- Light retention bandage (crepe or similar) (layer2). Apply from toes to knee using spiral technique with 50% overlap
- Light compression bandage (layer 3). Apply from toes to knee using figure of eight technique with 50% extension of bandage. Use central yellow line as a guide to overlap. Secure with tape
- Flexible cohesive bandage (layer 4). Apply from toes to knee using a spiral technique with 50% extension and 50% overlap. This bandage will adhere to itself. The use of tubifast over the flexible cohesive bandage is acceptable if the client finds the cohesiveness uncomfortable

A reduced compression can be achieved by omitting the light compression bandage (layer 3) or the cohesive bandage (layer 4). Application of only three (3) layers will approximately halve the level of compression.

For ankle size greater than 25cms the four layer bandage system will need to be modified as per table.

18-25 cm Ankle Circumference	25-30 cm Ankle Circumference	> 30 cm Ankle Circumference
Padding bandage	Padding bandage	Padding bandage
Crepe or similar retention bandage	Crepe or similar retention bandage	Lightweight long stretch bandage
Light weight long stretch bandage	Long stretch bandage	Long stretch bandage
Elasticised cohesive bandage	Elasticised cohesive bandage	Elasticised cohesive bandage

SESLHD PROCEDURE- Appendix E

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Appendix E: Two Layer Compression System e.g. Coban™ (3M) or UrgoK2 (Link Medical)

Two Layer Compression System - UrgoK2

This system comprises two layers that cohere to form one thin conforming compression bandage that can be left in place for up to seven days. The system chosen is available in latex or latex free and dependent on the ankle size (either ankle size 18-25cm or 25-32cm) and the amount of compression required e.g. regular or lite option.

- First Layer KTECH: white, short-stretch bandage, providing compression, protection and absorbency. Composition: wadding: viscose, polyester; knitted layer: polyamide, elastane
- Second layer: KPRESS: pink / beige, cohesive long-stretch bandage, providing additional compression necessary to achieve the therapeutic pressure and securing the bandages in place. Composition: cotton, polyester, polyamide, elastane; synthetic latex free cohesive material

Application Method

Before applying the bandages:

- Examine the shape of the leg and identify any areas at risk of excessive pressure (i.e. bony prominences)
- Protect and reshape leg with wadding if necessary. If a wound is present, apply an appropriate dressing before applying any bandages
- Apply the compression system first thing in the morning or after the patient's legs have been elevated for an hour to minimise any orthostatic oedema

Ankle circumference 18-25cm kit – 50% overlap

1. Place foot at a 90% angle – ‘toes to nose’. Start applying KTECH Lite at the base of the toes using two turns to anchor the bandage, ensuring wadding side is in contact with the skin and the pressure indicator is at the top edge, towards the patient. Secure the heel by using a figure of eight, ensuring full coverage of the heel. Do not apply with pressure indicator at full stretch on the foot.
2. Spiral KTECH Lite up the leg from malleolus, stretching the bandage so that the pressure indicator (printed on the bandage) forms a circle, achieving the therapeutic pressure. A correct overlap is applied when the pressure indicator is just covered (50% overlap). Finish 2cm below popliteal space and cut off any excess bandage. Secure with tape.
3. Apply KPRESS (or KPRESS Latex Free) over KTECH Lite using the same application technique as KTECH Lite. For patient comfort, allow a small border of KTECH Lite at the toes and knee. Once applied, press down gently on bandage to ensure full cohesion.

Ankle circumference 25-32cm kit – 2/3 overlap

- Apply in the same way as the 18-25cm kit, stretching the bandage so that the pressure indicator forms a circle
- Cover the pressure indicator (printed in the middle of the bandage) to achieve the correct overlap (2/3 overlap)

Two Layer Compression System – Coban 2™ 3M

This system comprises two layers that cohere to form one thin conforming compression bandage which can be left in place for up to seven days.

Apply from just proximal to the toes to two fingers widths below the knee. The foot should be positioned at 90 degrees to the leg during application to avoid the bandage wrinkling during standing or walking. A figure of eight technique can be used to anchor the bandage to the foot.

Apply in the following sequence:

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- First Layer (comfort layer): Is composed of foam laminated to a latex-free cohesive bandage and is wrapped upwards around the foot and leg with a minimal overlap
- Second Layer (Compression Layer): Is wrapped over the first layer with a 50% overlap using full stretch to provide effective sustained compression.

Two Layer Compression System – Coban 2 Lite™ (3M) 25% less resting pressure compared to standard - Combine 2.

Apply from just proximal to the toes to two fingers widths below the knee. The foot should be positioned at 90 degrees to the leg during application to avoid the bandage wrinkling during standing or walking. A figure of eight technique can be used to anchor the bandage to the foot.

Apply in the following sequence:

- First Layer (comfort layer): Is composed of foam laminated to a latex-free cohesive bandage and is wrapped upwards around the foot and leg with a minimal overlap
- Second Layer (Compression Layer): Is wrapped over the first layer with a 50% overlap using full stretch to provide effective sustained compression

Appendix F: Short Stretch (inelastic) Compression Bandage e.g. Comprilan™ (Essity) or Putterbinde (Hartmans)

Short stretch bandages do not contain significant amounts of elastomer; rather they rely heavily on heavily twisted cotton yarns for their elastic properties. These systems are washable and washing instructions should be attended as per manufactures guidelines.

Short stretch bandages exert low resting pressures – i.e. a low pressure is exerted whilst the patient is resting and high working pressures – i.e. a high pressure is exerted whilst the patient is walking and the calf muscle is pushing the against the inelastic bandage.

Short stretch bandages might need to be reapplied frequently in patients with oedema as they do not have the ability to alter tension and will therefore become loose.

Short stretch bandages may be applied singularly, as directed and then if needed a second short stretch bandage may be applied if additional pressure is required.

Apply in the following sequence:

- Padding bandage
- Short stretch bandage: Apply from toes to knee using a spiral technique with 75 to 100% extension and 50% overlap*
- In-elastic retention tubular bandage e.g. Tubifast™ (Molnlycke), if required

* Apply second Short stretch bandage if required: Apply from toes to knee using a spiral technique with 100% extension and 50% overlap in the opposite direction to the first Short stretch bandage.

SESLHD PROCEDURE- Appendix G

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Appendix G: High Stretch (elastic) Compression Bandage e.g. Surepress™ (ConvaTec)

High stretch bandages contain elastomers and their length can increase significantly when stretched.

High stretch bandages exert a high resting pressure – i.e. a high pressure is exerted whilst the patient is resting and high working pressures – i.e. a high pressure is exerted when the patient is walking and the calf muscle is pushing against the bandage.

Apply in the following sequence:

- Padding bandage
- Long stretch bandage: Apply from toes to knee using spiral technique with 50-75% extension and 50% overlap
 - Note Surepress is a guided compression bandage, the rectangles on the bandage show the correct amount of tension (pull) required to achieve the correct compression based on the ankle size.
 - Ankle size: 18-26cm - use small rectangle guide
 - Ankle size: >26cm - use large rectangle guide
- In-elastic retention tubular bandage e.g. Tubifast™ (Molnlycke), if required

SESLHD PROCEDURE- Appendix H

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Appendix H: Intermittent Pneumatic Compression e.g. Flowtron Hydroven (Arjohuntleigh) or LX9 (Medirent)

- Intermittent Pneumatic Compression is generally tolerated well by most people. This is an external compression device consisting of an inflatable boot and machine. Consider if external providers will cover the cost of this for community clients e.g. Veterans Affairs will pay for this for their clients.

SESLHD PROCEDURE- Appendix I

Wound – Graduated Compression Therapy (GCT) in Venous Disease

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Appendix I: Compression Level / Scales

Compression Scale 1

COMPRESSION LEVEL	INDICATIONS FOR USE
Retention Bandages	<ul style="list-style-type: none"> Retention of wound product e.g. Crepe or similar bandages DO NOT provide sufficient compression to result in an increase in venous return.
Light Compression 14-17 mm Hg at ankle	<ul style="list-style-type: none"> Relief of leg discomfort associated with tired aching legs or mild varicose veins People who spend long periods of time standing Relief from leg discomfort during pregnancy
Mild Compression <20 mm Hg at ankle	<ul style="list-style-type: none"> Varicose veins Prevention or treatment of mixed ulcers Management of mild moderate oedema Post-surgery for leg veins or muscles weakened by surgery or lack of exercise
Moderate Compression 20-40 mm Hg at ankle	<ul style="list-style-type: none"> Varicose veins Prevention of venous ulcer recurrence Management of moderate oedema
Strong Compression 40-60 mm Hg	<ul style="list-style-type: none"> Venous ulcer treatment Post thrombotic venous insufficiency Severe chronic venous insufficiency Severe varicose veins
Very Strong Compression >60 mm Hg	<ul style="list-style-type: none"> Lymphoedema

Compression Scale 2: Compression Hosiery¹²

Class	British Standard	European Standard	USA	International System
1	14-17mmHg	18-21 mmHg	18-30 mmHg	20-30 mmHg
2	18-24 mmHg	25-32 mmHg	30-40 mmHg	30-40 mmHg
3	25-35 mmHg	36-46 mmHg	40-50 mmHg	40-50 mmHg
4				>50 mmHg

15-20 mmHg

- Mild ankle, foot and leg swelling
- Leg fatigue
- Pregnancy
- Mild varicose veins
- Spider veins
- Tired, aching legs
- Travel (usually greater than four hours)

20-30 mmHg

- Moderate to severe varicose veins
- Post sclerotherapy / vein stripping surgery
- Moderate venous disease
- Helps prevent recurrence of venous leg ulcers

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- Prevention of post thrombotic syndrome
- Treatment of deep venous thrombosis.

30-40 mmHg

- Venous ulcer management and prevention
- Severe leg swelling e.g. post fracture or trauma
- Chronic venous insufficiency
- Severe varicose veins.

Notes

- Anti-embolic stockings are indicated for prevention of deep venous thrombosis whilst lying in bed. They do not provide sustained adequate compression whilst ambulating
- A parallel support bandage will not achieve adequate compression at the ankle to enhance venous return and may cause a reverse pressure gradient e.g. TubiForm
- The level of compression is dependent on the type of garment chosen and application technique e.g. a long stretch bandage applied with 40% stretch will apply less compression pressure than one applied with 60% stretch
- Specialised compression stockings are available in a range of compression pressure levels

Factors which Determine Sub-Bandage Pressure

- The pressure developed beneath any bandage is governed by the:
 1. Tension in the fabric.
 2. Radius of curvature of the limb.
 3. Number of layers applied.

Applying a bandage at a 50% overlap produces two layers of fabric, which generates pressure twice that produced by a single layer. Sub-bandage pressure may be calculated using a simple formula derived from the Laplace's equation as follows.

Principles of Sub-bandage Pressures based on Laplace's Law¹¹

$$\text{Pressure (mmhg)} = \frac{T \times N \times 4620 \text{ (constant)}}{C \times W}$$

- **T = Bandage tension* (kgf)** – the greater the force applied, the greater the pressure
- **N = number of layers applied** – the more layers, the greater the pressure
- **C = Limb circumference/shape (cm)** – the smaller the circumference at any given point, the greater the pressure
- **W = Bandage width (cm)** – the narrower the bandage, the greater the pressure

SESLHD PROCEDURE- Appendix J

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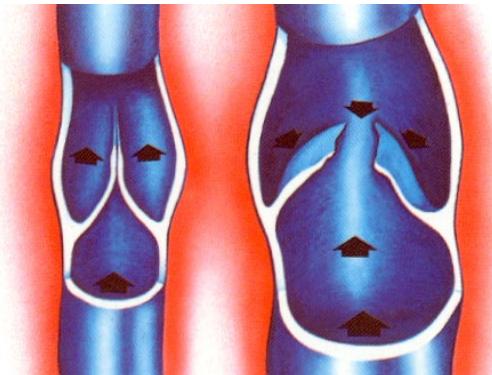
Appendix J: Compression stocking to prevent venous leg ulcers returning

What are venous leg ulcers?

Venous leg ulcers are caused by your veins not working properly to bring the blood from your legs back to your heart. This condition leads to increased swelling in your lower legs, which causes ulcers to form. To help your veins return your blood back to your heart and reduce this swelling, you must wear a compression stocking to prevent the ulcer returning.

Compression stockings need to be very firm at all times. Please observe the following advice:

Normal vein Abnormal vein



COMPRESSION STOCKINGS: Once the ulcer has healed using bandages, you will be required to wear a compression stocking every day to prevent an ulcer from reoccurring (coming back). Your doctor or nurse will advise if you need to wear compression stocking on one leg or both legs.

TO HELP YOU WEAR YOUR COMPRESSION STOCKING EACH DAY PLEASE:

- ❖ Shower of an evening immediately prior to going to bed (do not shower in the morning)
- ❖ Massage moisturiser (e.g. Sorbolene cream) into skin of legs (after shower)
- ❖ Sleep with legs elevated (raise foot end of bed slightly)
- ❖ Put compression stockings on before putting feet to floor in the morning (to prevent swelling). Note: keeping stocking by bedside may help with this
- ❖ Cover any open wounds (sores or ulcers) before putting compression stocking on
- ❖ If due to hot weather the compression stockings become unbearable to wear you may remove them **BUT DO NOT** walk around whilst compression stockings are off, as your legs will immediately swell making re-application difficult. **Rest with your ankles higher than your hips and move feet back and forwards to improve circulation!**

**STOCKINGS MUST BE REPLACED EVERY SIX MONTHS and as per the
Manufacturer's instructions!!!**

SESLHD PROCEDURE- Appendix J

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COMPRESSION STOCKING TO PREVENT VENOUS LEG ULCERS RETURNING

FITTING: Compression stockings can be very hard to put on. When you buy your stocking ask if there is something to help you ‘put on’ and ‘take off’ your compression stocking.

When applying compression stocking:

- ❖ Protect the stocking from jewellery and fingernails – by wearing cotton or rubber gloves
- ❖ When pulling up stocking do not over stretch the stocking. The stocking should start at the toes and stop just below the knee cap. (do not fold or roll the top of the stocking over as this can stop the blood flow in the leg)
- ❖ Always wear stocking as the instructions say

CARE OF COMPRESSION STOCKING:

- ❖ Do not use Vitamin E or petroleum based moisturisers
- ❖ Wash stocking by hand or gentle machine wash daily
- ❖ Use a mild laundry detergent
- ❖ Do not dry in direct sun – DO NOT use a clothes dryer
- ❖ Do not soak garments or use bleach
- ❖ Always lie stocking flat to dry (hanging may stretch stocking)

Please remove the compression stocking and contact your GP, Community Health Nurse or hospital emergency department if you are concerned or notice any of the following:

- ❖ Increasing pain in toes, foot or leg
- ❖ Blue discolouration of the toes
- ❖ Numbness, coldness or swelling of the toes, foot or leg
- ❖ Staining from a wound coming through the compression stocking

SESLHD PROCEDURE- Appendix K

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Appendix K: 3 Layer tubular bandaging system

How do I apply 3 layer compression bandaging with Tubular *Form*TM tubular compression bandage ?

Why would I use 3 layers of Tubular *Form*TM ?

- Weller et al. Wound Practice & Research 2010 shows that 3 layers of Tubular Form straight is useful to inform future compression bandages studies that plan to measure venous ulcer healing rates
- Bale S, Harding KG. Br J Nurse. 2003 shows that tubular bandages are useful for managing patients who cannot tolerate therapeutic forms of compression

How do I measure for the correct size Tubular *Form*TM ?

- Always measure smallest circumference (ankle) to select the correct Tubular *Form*TM bandage size and refer to table below
- Each bandage length is determined from measuring along back of the toes around the heel to desired length along the leg (Long, Medium, Short)

How do I apply?

- Apply Long 1st, Medium 2nd and Short 3rd (refer diagrams)

What if the patient is unable to tolerate 3 Layers?

- Simply remove Layer 3 (short) first, then if patient is still unable to tolerate remove Layer 2 (medium)

What if I am unsure of the patients vascular condition?

- Always consult physician if unsure of patient's vascular condition
- This method of compression therapy is recommend for Venous Insufficiency



Tubular *Form*TM Measuring guide
(ankle circumference)

15-25cm	26 - 35cm	36 - 44cm	45 - 50cm	51 - 60cm
Size C	Size D	Size E	Size F	Size G

1 LONG



LAYER 1
FROM BASE OF TOES TO BACK OF KNEE

2 MEDIUM



LAYER 2
FROM BASE OF TOES TO MID CALF

3 SHORT



LAYER 3
FROM BASE OF TOES TO MID POINT BETWEEN MID CALF AND THE ANKLE