



**AMERICAN VEIN &  
LYMPHATIC SOCIETY**

# Selecting Appropriate Compression for Lymphedema Patients

## Position Statement of the American Vein & Lymphatic Society

**Heather Hettrick PT, PhD**

College of Health Care Sciences  
Nova Southeastern University • Ft. Lauderdale Florida

**Suzie Ehmman PT, DPT**

Grand Strand Medical Center • Myrtle Beach, SC

**Brandy McKeown OTR/L, CLWT**

International Lymphedema and Wound Training  
Institute • Tifton, GA

**Dean Bender BS**

American Vein and Lymphatic Society • Chicago, IL

**John Blebea MD, MBA**

Department of Surgery  
Central Michigan University College of Medicine •  
Saginaw, MI

# BACKGROUND

## Description of the condition

A healthy lymphatic system manages the clearance of tissue waste products, such as excess fluid, proteins, cellular debris, and microorganisms. It also mediates inflammation and immune trafficking, acting as the first line of defense against infection. When lymphatic vessels or lymph nodes are damaged, a chronic, disfiguring, and sometimes painful accumulation of interstitial fluid can occur. Primary or congenital lymphedema develops from genetic causes and can occur early in life. Secondary lymphedema is related to lymphatic dysfunction from surgery, trauma, infectious disease, chronic venous insufficiency, and a host of other factors.<sup>1</sup> Lymphedema commonly affects the legs and/or arms, often leads to morbid skin infections (cellulitis) and remains a lifelong functional problem requiring daily treatment. Control of the edema significantly reduces the risk of cellulitis.<sup>2</sup>

## Prevalence of Lymphedema

With a prevalence of about 1 in 1,000 people in the United States, and many millions worldwide, lymphedema is a significant medical and socio-economic burden.<sup>3</sup> Currently, there is no cure for most patients, and it is a source of major limiting symptoms and loss of function.

# TREATMENT

The standard of care for treatment of lymphedema is an individualized approach consisting of complete decongestive therapy (CDT), which includes manual lymphatic drainage, multi-layer short stretch compression bandaging, daytime and nighttime compression garments, exercise, and the adjunctive use of pneumatic compression.<sup>4</sup> CDT is individualized to the patient based on stage of lymphedema. For those patients who fail to manage their lymphedema with conservative treatment, surgical intervention may be needed. Volume reduction and surgical interventions can be beneficial in selected patients when performed by surgeons experienced in micro- and super-micro as well as reductive procedures.<sup>5</sup>

Compression bandaging is the cornerstone therapy for the necessary lifelong management of chronic lymphedema.<sup>4,6</sup> Compression bandages are used during the intensive phase of treatment to reduce the swelling. Compression garments are needed for lifelong management of lymphedema. While all compression therapy garments apply external pressure to the extremity, there are many therapeutic options available to provide medical grade compression pressure. Compression garment design falls into four different technologies:

**Circular knit**, often called “ready to wear,” stockings and arm sleeves. Circular knit stockings are available with compression gradients of 15-20, 20-30, and 30-40mmHg in standardized sizes for average shaped limbs. Due to their elastic nature, pressure variations under circular knit garments are minimal with movement.

**Flat knit**, mainly provided in made-to-measure “custom” garments, are designed to fit the patient’s specific anatomical extremity dimensions. Flat knit garments are elastic, but the knit design provides significantly higher resistance to stretch, providing more containment of edema under the garment. Options for compression levels for flat knit garments are similar to circular knit; however, because the garment is custom engineered specifically to the accommodate the size and shape of the limb, there is a more predictable pressure distribution. The stiffer construction results in slightly larger pressure variations with

movement. Flat knit garments are typically easier to apply as they are form fitting and specific to the patient.

**Inelastic adjustable wraps** are designed to provide patients with adjustable compression levels along the length of the leg. The adjustable design, often with Velcro® inelastic adjustable bindings, allows for easier application of the garment by the patient or the caregiver and permits adjustments throughout the day as needed. These compression devices provide the stiffest construction, producing larger pressure variations with movement. Inelastic adjustable wraps can be worn during the day and night time hours.

**Nighttime garments** are designed for use when a lymphedema patient is supine or sleeping. These garments are designed to provide containment of the edema with lower compression levels during sleep. They are specifically engineered with textured textiles to soften fibrotic tissue.

The appropriate prescription of compression therapy requires individualization.<sup>7</sup> For most patients diagnosed with lymphedema, flat knit garments or inelastic adjustable wraps are indicated as they are the only daytime compression options which provide adequate containment of the edema while also having the ability to cross folds in the skin without causing constriction.<sup>6</sup> Ready-to-wear circular knit fabric may cause the patient harm when the fabric gathers into creases in the skin and thereby generates excessively high levels of compression in a focal area. This can lead to pain, ulceration of the skin, and decreased patient compliance with compression therapy.

## MECHANISMS OF ACTION OF FLAT KNIT CUSTOM COMPRESSION

Flat knit and circular knit fabrics are very different because of the manufacturing process used in their creation. Both utilize needles and stitching but the functional end results are very different.

**Circular knitting** creates a continuous spiral of fabric which produces a lighter weight fabric that is naturally seamless throughout the leg and foot portions of the stocking. In some cases, a top elastic band is sewn to the garment to prevent slipping and rolling. Circular knitting equipment has a fixed number of needles. Therefore, to increase the circumference of a garment as is found in the calf as compared to the ankle, the knit is less dense in those areas to allow for greater stretch. While the employed fabrics are very good at delivering a consistent pressure, circular knit stocking will stretch and expand outwards and thus a patient can still develop progressive edema during the day. The circular knit stocking does not have the fabric density or “stiffness” required to provide containment and prevent or control the excessive edema associated with most lymphedema patients.

**Flat knit technology** creates a fabric on a flat sewing surface so that there are rows of stitches created that can ultimately be brought together either by sewing or via a special linking process to form a cylindrical garment. Unlike circular knitting, these products are not a continuous spiral but rather distinctive rows of stitches. Each row can be varied in stitch count allowing for a garment to be made wider in circumference without decreasing the knit density and thereby preventing stretch. The resulting “heavier” flat knitted garment is related to the additional rows of stitches as the garment increases in size. This creates a more uniform and denser fabric which is stiffer and provides a greater resistance to stretching. In addition, research has shown that stiffer textiles have a greater hemodynamic response.<sup>8,9</sup> The result is a garment much better at preventing and controlling edema.

For lymphedema patients, proportional containment of edema along the entire limb is important to maintain limb shape and prevent regional swelling. Furthermore, flat knit compression garments are all made on a custom basis, meaning that each one is created to the specific measurements and requirements of an individual patient. Because each patient's size, shape and severity of lymphedema vary tremendously, the circumference at defined anatomical landmarks are used to determine the specific stitches per row needed at each location to manufacture a garment best suited for the patient. This customized formation optimizes applied pressure on the extremity providing for edema control.

**Inelastic adjustable** wraps are unique from both circular and flat knit technologies because the materials utilized are made from a lamination of multiple fabrics and materials. They are designed to provide a consistent but reproducible level of stretch and stiffness. These products are significantly stiffer, resulting in the highest level of edema containment of the compression garments discussed.<sup>10</sup> These inelastic adjustable wraps are available in both ready-to-wear and custom options. Because they have limited stretch, they must be selected for each individual patient to fit their specific anatomical shapes.

**Nighttime garments** have a wide variety of designs and are constructed from multiple layers of fabric, foam, strapping, etc. Each is designed to provide containment when a patient is supine and thus do not require high levels of compression. Some designs are targeted to address focal areas of viscous edema or fibrosis in the tissue while others provide a more uniform in design.

## DOCUMENTATION

There are several important points to consider in preparation for successfully obtaining prior authorization approval and documentation of medical necessity. Among the most important of these is an accurate diagnosis and coding of lymphedema as well as describing and quantifying the degree of disease.

### Accurate Coding of lymphedema

The present ICD-10 codes appropriate for lymphedema reporting are:

- a. Q82.0 Primary or Congenital Lymphedema
- b. I89.0 Lymphedema, Acquired. This code includes all secondary lymphedema patients except post-mastectomy lymphedema syndrome. The less specific codes for edema, R60.0 or R60.9, should not be used to code for lymphedema.
- c. I97.2 Postmastectomy Lymphedema Syndrome, following a mastectomy procedure
- d. I97.89 Other post-surgical lymphedema. Although this code is not specific for lymphedema as it includes many other post-surgical complications of the circulatory system, it may be useful to use in combination with I89.0 to clarify the etiology of the acquired lymphedema.

### Stages of Lymphedema

Lymphedema patients should be staged depending on their clinical condition. Selection of the appropriate compression garment is dependent on the stage of the patient.

**Stage I:** edema is transient and can be reduced with elevation. Circular knit compression garments are usually sufficient.

**Stage II:** fibrosis and fat deposition has occurred, elevation does not reduce the edema, there may be limb shape changes with formation of lobules and/or ankle cuffs. This stage requires a more substantial compression product such as flat knit custom compression garment or inelastic adjustable wrap.

**Stage III:** significant skin thickening with additional fibrosis and fat deposition, papillomas and warty overgrowths, significant change to limb shape. As with Stage II, this stage requires more substantial compression products, as stated above.

## Physical Examination

Clinical notes on the physical examination should include measurements of the length and circumference of the extremity at specified locations (Figure) as well as a description of the skin condition, including the presence of hyperkeratosis, fibrosis, papillomatosis, and any wounds, blisters, or skin irritations.



## Photographs

A photograph of the diseased limb is encouraged at least monthly during treatment associated with an office or home visit to document progression in therapy. Such photographs are useful and should be included in any pre-authorization application for custom garment payment.

Photograph of a patient with Stage III lymphedema affecting the left leg. Both legs have been marked for circumference measurements for flat knit custom compression stockings at the ankle (B), mid-calf (C), below the knee (D), at the knee (E), mid-thigh (F) and the top of the leg (G).

# SUMMARY OF RECOMMENDATIONS

1. For patients with Stage II or Stage III lymphedema, flat-knit custom-measured compression and/or inelastic adjustable garments are preferred to circular knit ready-to-wear compression as they are stiffer and provide better containment and hemodynamic effect.
2. Some patients will require nighttime garments to prevent swelling recurrence and to manage fibrotic tissue changes.
3. Two compression garment sets are required for hygiene purposes (one to wear and one to wash).
4. Compression garment textiles are not medically equivalent.
5. Patient compliance with compression is critical as is follow-up care and therapy.

# ACKNOWLEDGEMENT

This Position Statement has been reviewed and approved by the Guidelines Committee of the American Vein and Lymphatic Society.

## REFERENCES

1. Rockson SG. Advances in lymphedema. *Circulation Res.* 2021;128:2003–2016.
2. Burian E, Karlsmark T, Franks P, Keeley V, Quéré I, Moffatt C. Cellulitis in chronic oedema of the lower leg: an international cross-sectional study. *Br J Dermatol.* 2021; 185: 110–118.
3. Rockson SG, Rivera KK. Estimating the population burden of lymphedema. *Ann. N.Y. Acad. Sci.* 2008;1131:147–154.
4. Lurie F, Malgor RD, Carman T, et al. The American Venous Forum, American Vein and Lymphatic Society and the Society for Vascular Medicine expert opinion consensus on lymphedema diagnosis and treatment. *Phlebology* 2022; 37(4 ): 252–266.
5. Chang DW, Dayan J, Greene Arin K et al. Surgical treatment of lymphedema: a systematic review and meta-analysis of controlled trials. results of a consensus conference. *Plastic Reconstructive Surg.* 2021; 147(4):975–993.
6. Rabe E, Földi E, Gerlach H, et al. Medical compression therapy of the extremities with medical compression stockings (MCS), phlebological compression bandages (PCB), and medical adaptive compression systems (MAC). S2k Guidelines of the German Phlebology Society. *Hautarzt* 2021;72 (Suppl 2): S37–S50.
7. Bjork R, Ehmann S. STRIDE. Professional guide to compression garment selection for the lower extremity. *J Wound Care.* 2019; 28(Sup 6a):1–44.
8. Mosti G, Cavezzi A. Compression therapy in lymphedema: Between past and recent scientific data. *Phlebology.* 2019;34(8):515–522.
9. Partsch H, Schuren J, Mosti G, Benigni JP. The Static Stiffness Index: an important parameter to characterise compression therapy in vivo. *J Wound Care.* 2016;25 (Suppl 9):S4–s10.
10. Borman P, Koyuncu EG, Yaman A, et al. The comparative efficacy of conventional short-stretch multilayer bandages and Velcro adjustable compression wraps in active treatment phase of patients with lower limb lymphedema. *Lymph Res Biol.* 2021;19(3):286–294.