

Lymphoedema practice patterns: maintenance recommendations

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Key words

Lymphoedema, compression, practice pattern, maintenance phase, survey

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Lymphoedema is a progressive, chronic, and debilitating condition linked to functional limitations (Jeffs et al, 2018). An accumulation of protein-rich fluid in the interstitium leads to chronic inflammation and fibrosis in the affected tissue (International Society of Lymphology [ISL], 2020). A lack of standardised methods to quantify and diagnose lymphoedema contributes to the difficulty in determining incidence and prevalence (Levenhagen et al, 2018). Currently, there is a lack of population-based epidemiological studies defining the incidence and prevalence of primary and secondary lymphoedema in the US (Keast et al, 2019). However, it is estimated that primary and secondary lymphoedema affect 1 in 100,000 and 1 in 1,000 Americans, respectively (Sleigh and Manna, 2021).

Complete decongestive therapy (CDT) is the standard for conservative management of lymphoedema of any aetiology and consists of manual lymphatic drainage (MLD), multi-layer compression bandaging (CB), therapeutic exercise, skin care, and lifelong precautions (Jeffs et al, 2018; ISL, 2020).

Abstract

Lymphoedema practitioners ($n=866$) were surveyed by the Lymphology Association of North America (LANA) to understand current management of patients with lymphoedema and related disorders. The purpose of this study was to describe the current trends in compression recommendations for the maintenance phase of complete decongestive therapy based on lymphoedema severity. The authors' findings show that flat-knit (37%) and circular-knit (35%) garments were most frequently recommended for daytime maintenance, while adjustable wraps (27%), foam/padded garments (21%) and compression bandages (20%) were most frequently recommended for nighttime use. Variability was noted amongst the correlations between severity of disease and compression recommendation demonstrating practitioner autonomy in product recommendations.

CDT is divided into two phases and is effective for the management of lymphoedema, especially in the earlier stages, ie ISL Stages I and IIa (Table 1; Carl, 2017). Phase I (intensive phase) incorporates daily treatments to reduce the limb volume and normalise tissue texture, while phase II (maintenance phase) is performed by the patient to retain the volume reduction achieved during intensive phase (Földi et al, 2018). The maintenance phase includes the implementation of lifelong precautionary measures, meticulous skin care, weight management, home exercises, self-MLD, utilisation of day and/or night compression, and intermittent pneumatic compression devices (ISL, 2020). Compression in this phase may include garments for daytime and CB or speciality compression products, including adjustable wrap garments (AWG) and foam/padded garments, for nighttime (ISL, 2020).

It is well understood that appropriate compressive interventions are key to maintaining the volume reduction achieved during the intensive phase of CDT (Mestre et al, 2017). CB is routinely recommended during the intensive phase and applied by

a qualified healthcare provider in a manner that meets the individual needs of patients.

The modalities utilised in the maintenance phase are often less precise compared to the intensive phase because custom fit products are measured for the patient when they achieve maximal volume reduction (Mestre et al, 2017). Increases in tissue volume tend to occur during the maintenance phase secondary to lack of appropriate compression (Ochalek et al, 2015) and lack of patient adherence to time-consuming self-management interventions (Stollendorf et al, 2016).

Few empirical studies exist to guide practitioners' prescription of compression garments with the multitude of products available for consumers (Longhurst et al, 2018). However, a recent publication offers guidance on lower extremity compression garment selection; it is based on clinical experience and the theoretical understanding of the different types of compression products (Bjork and Ehmman, 2019).

Compression garments

Compression therapy reduces interstitial fluid formation, supports venous return,

Table 1. International Society of Lymphedema Staging (ISL, 2016).

ISL stage	Description
Stage 0 (or Ia)	Subclinical state, swelling is not evident despite impaired lymphatic transport, subjective complaints present.
Stage I	Early onset, accumulation of oedema in the tissue that subsides with elevation, pitting may be present.
Stage II	Elevation of the limb does not impact the oedema, pitting is present.
Late stage II	Pitting may or may not be present, fibrosis present.
Stage III	Presence of hard, fibrotic tissue; pitting is absent; thickening of the skin, hyperpigmentation.

Table 2. Descriptions of self-management products.

Operational term	Product description for SIS item interpretation
Compression bandage	Multi-layer short-stretch limb bandaging with a hygienic liner and a padded underlayer.
Circular knit garment	Seamless, elastic graduated compression stocking or sleeve manufactured on a cylindrical form.
Flat knit garment	Elastic graduated compression stocking or sleeve manufactured as a flat, stiff fabric, stitched closed with a centre seam.
Adjustable wrap garment	Short-stretch strapping garment, applied to the limb with hook and loop closures.
Foam/padded garment	Compression garment constructed of a foam core with tailored fabric exterior. These garments may have hook and loop closures and/or non-elastic straps.

augments muscle pump, improves lymphatic flow, and maintains limb volume reduction during phase I of CDT (Lim and Davies, 2014; ISL, 2020). Compression is an appropriate strategy for long-term volume control, with a variety of garments discussed in the literature (Whitaker, 2016; Bertsch, 2018).

Compression garments can be classified as non-medical, anti-embolism or graduated medical based on the fabric properties, amount of compression, and whether the garment achieves a compression gradient (Bjork and Ehmann, 2019). No international standard for compression class exists, but the amount of compression needed for long-term lymphoedema management ranges between 20 mmHg and 60 mmHg, based on patient need and tolerance (ISL, 2020).

Woven, elastic fabrics are referred to as hosiery, compression stockings/sleeves or knit garments. Circular knit garments are constructed on a cylindrical form to create a round-knit garment which is smooth and free of seams. Flat-knit garments are constructed from a piece of fabric sewn together with a centre seam, which is stiff and customised to body contours with a

decreased tendency to bind in skin creases (Lim and Davies, 2014; Wounds UK, 2015). Knit garments are generally recommended for daytime use in ambulatory patients (ISL, 2020).

Compression garments are costly and need to be replaced every 3–6 months to maintain compressive efficacy (Wounds UK, 2015; Bjork and Ehmann, 2019). In the US, insurers are reluctant to cover costs related to lymphoedema, in part due to a perceived lack of research on the most effective treatment and long-term patient needs (Weiss, 2016). Additionally, there is little to no reimbursement through government-sponsored insurance plans and variable reimbursement from private insurance companies (Boyages et al, 2017).

AWG are used for volume reduction during the intensive phase and in lieu of CB for nighttime compression during the maintenance phase. Mestre et al (2017) found that patients who utilised nighttime compression with an auto-adjustable night garment were able to maintain 89% of their initial volume reduction, while those who only utilised daytime compression maintained just 54%. Patients find nighttime compression uncomfortable, hot, painful,

tight and inconvenient, which negatively affects overall adherence (Whitaker, 2016).

AWG consist of a short-stretch material that is wrapped over the limb and held in place by Velcro straps, allowing the patient to control the level of pressure applied to the limb (Ehmann et al, 2016; Balcombe, 2017). Damstra and Partsch (2013) found that AWG were effective in the intensive phase of CDT demonstrating greater reduction in oedema volume compared to CB over the course of 24 hours. Patients were able to adjust the AWG to tolerance resulting in appropriate and consistent pressure compared to CB permitting (Partsch, 2019). AWG were found to improve the overall appearance of the limb, subjective symptoms of discomfort, and overall quality of life (Borman et al, 2020).

For the purposes of interpreting the results of this survey, we have operationalised descriptors of self-management products (Table 2). The purpose of this study was to describe the current trends in compression recommendations for the maintenance phase of CDT based on the severity of lymphoedema.

Methods

Survey design and development

The State of the Industry Survey (SIS) was developed by the Lymphology Association of North America (LANA) for healthcare practitioners who provide intervention for patients with lymphoedema and related disorders. Details of survey development, recruitment of participants, data collection and survey questions relating to the intensive phase of CDT were reported in a previous paper (Hunley et al, 2020).

Data analysis

SPSS Statistics 23 (IBM) was used to analyse survey findings across geographic regions and describe responses. Categorical data were collapsed to meet chi-square conventions (Field, 2013). The Internal Review Board of Mount Mary University approved the analysis of survey data.

Results

Characteristics of respondents

US and Canadian respondents ($n=866$) were categorised by discipline and region. Physical and occupational therapists represented 78% of respondents. Midwest and Northeast regions of the US were over-represented (57%). No significant

differences were found between regions, so data analysis included the entire sample. Most respondents (87%) were eligible for the LANA certification examination, having attained 135 or more hours of training. Referral sources were collected, allowing each respondent ($n=858$) to contribute multiple responses ($n=1,826$). Cancer centres (59%), breast cancer centres (34%), and primary care physicians (43%) were strong referral sources. Vein (29%) and wound (25%) centres were common sources of referrals. Details of the respondents were reported in a previous paper (Hunley et al, 2020).

Patient population

Patient populations were described by diagnosis and severity. Thirty-three per cent of patients had received previous lymphoedema treatment. Lymphoedema severity was reported as mild (38%), moderate (41%), and severe (21%). Respondents were asked to rank body segments from high to low in frequency of referral in the prior year. Leg (57%) was the most frequent lymphoedema site, followed by arm (27%), breast (8%), genital (5%), trunk (2%) and head/neck (2%).

Transition from intensive to maintenance phase of CDT

The transition from CB to garments varied from 1 week (1%) to more than 4 weeks (17%) weeks. The most common transition times were 4 weeks (30%) and 3 weeks (24%), while 2 weeks reported by 12% (Figure 1). Maintenance recommendations were associated with the number of weeks in CB. The greater number of weeks patients spent in CB was associated with recommendations to continue using CB for nighttime ($r=0.103, P=0.004$) and daytime ($r=0.078, P=0.021$) maintenance.

The number of weeks in CB was negatively correlated ($r=-0.240, P<0.01$) with the intensive phase treatment frequency. Mild lymphoedema was negatively ($r=-0.155, P<0.001$) associated with time in bandaging during the intensive phase while severe ($r=0.098, P=0.004$) and moderate ($r=0.068, P=0.035$) lymphoedema were positively associated with the time in CB.

Compression garment recommendations

Garment recommendations were collected in the following categories for daytime and nighttime use: CB, circular knit garment,

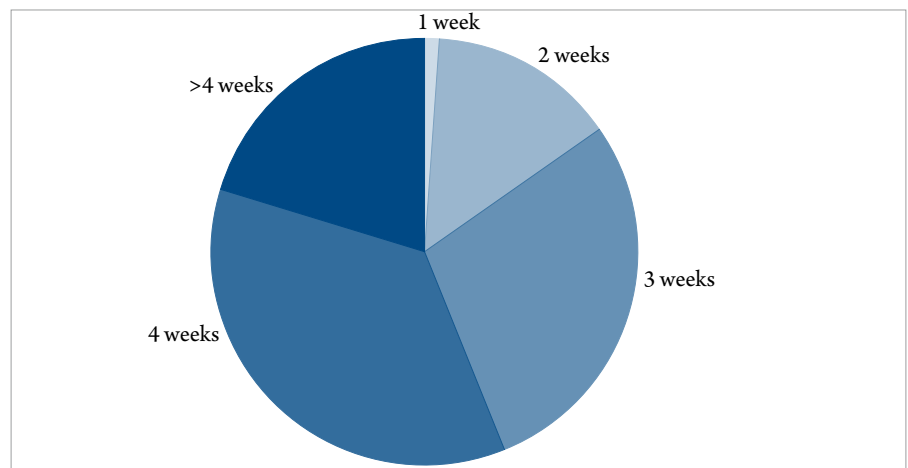


Figure 1. Time spent in compression bandages before transition to products.

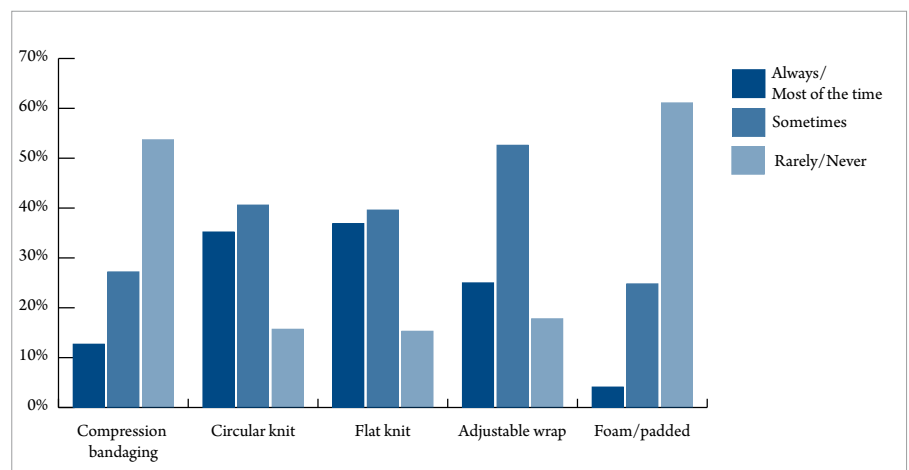


Figure 2. Maintenance product recommendation: daytime.

flat knit garment, AWG and foam/padded garment. Practitioner reported frequency for garment recommendation were categorised as ‘always’, ‘most of the time’, ‘sometimes’, ‘rarely’ and ‘never’. To determine the most recommended garments, ‘always’ and ‘most of the time’ were combined for each product. Responses of ‘sometimes’ were considered neutral, while the least recommended garments were determined by combining the ‘never’ and ‘rarely’ responses.

Daytime maintenance products

Knit garments were recommended by most respondents ‘always/most of the time’, with 37% reporting flat knit and 35% circular knit. Respondents reported ‘sometimes’ recommending AWG (53%), circular knit (41%) and flat knit (40%) garments. Foam/padded garments (61%) and CB (54%) were least reported for daytime maintenance (Figure 2). AWG was the only product with significant positive correlations for moderate ($r=0.126, P<0.001$) and

severe ($r=0.165, P<0.001$) lymphoedema and a negative correlation with mild lymphoedema ($r=-0.167, P<0.001$). See Table 3 for all correlations.

Nighttime maintenance products

AWG, foam/padded garments, and CB were rated ‘always’ (27%, 21%, 20%) and ‘sometimes’ (43%, 41%, 37%) recommended for nighttime maintenance, while circular knit (76%) and flat knit (75%) were least recommended. Figure 3 shows all nighttime maintenance product recommendations.

AWG was positively associated with severe ($r=0.106, P=0.001$) and moderate ($r=0.098, P=0.003$) lymphoedema and negatively associated with mild lymphoedema ($r=-0.100, P=0.002$). Correlations are listed in Table 4.

Discussion

The purpose of this study was to describe the current trends in compression

Table 3. Correlations between lymphoedema severity and daytime compression products.

	1	2	3	4	5	6	7	8
1	1.000							
2	-0.481**	1.000						
3	-0.512**	0.205**	1.000					
4	-0.052	-0.013	-0.019	1.000				
5	0.027	0.021	0.034	-0.002	1.000			
6	0.023	0.032	-0.019	0.017	-0.155**	1.000		
7	-0.167**	0.126**	0.165**	0.037	-0.050	-0.090**	1.000	
8	-0.033	0.022	0.008	0.344**	0.055	0.108**	0.058	1.000

1=mild lymphoedema, 2=moderate lymphoedema, 3=severe lymphoedema, 4=compression bandaging, 5=circular knit, 6=flat knit, 7=adjustable wrap, 8=foam/padded. * =significant at 0.05; ** =significant at 0.01.

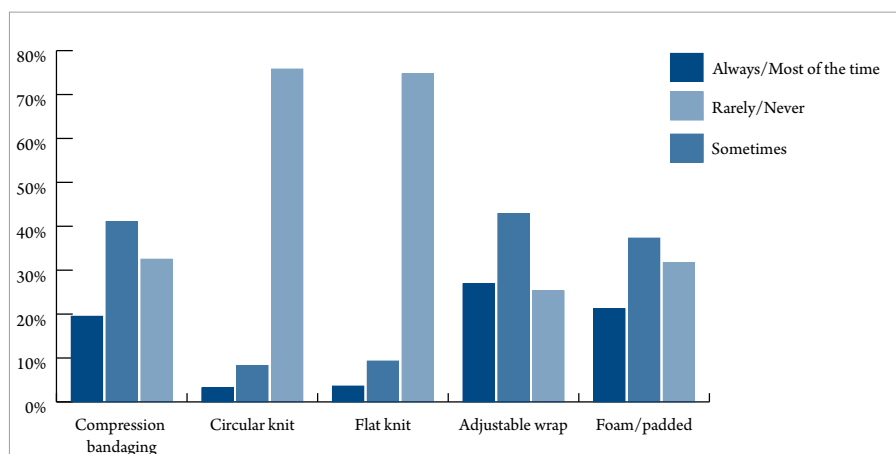


Figure 3. Maintenance product recommendation: nighttime.

Table 4. Correlations between lymphoedema severity and nighttime compression products.

	1	2	3	4	5	6	7	8
1	1.000							
2	-0.481**	1.000						
3	-0.512**	0.205**	1.000					
4	-0.033	0.044	-0.014	1.000				
5	-0.023	-0.022	-0.014	0.041	1.000			
6	0.002	-0.001	-0.072	0.029	0.598**	1.000		
7	-0.100**	0.098**	0.106**	0.077*	-0.064	0.024	1.000	
8	0.001	0.019	0.010	0.113**	-0.088**	-0.020	0.067	1.000

1=mild lymphoedema, 2=moderate lymphoedema, 3=severe lymphoedema, 4=compression bandaging, 5=circular knit, 6=flat knit, 7=adjustable wrap, 8=foam/padded. * =significant at 0.05; ** =significant at 0.01.

recommendations for the maintenance phase of CDT based on the severity of lymphoedema. The results of the SIS identified variability of time spent in CB during the intensive phase and compression recommendations for the maintenance phase. The evidence base for recommending intensity, duration

and type of compression is inconsistent for lymphoedema and related disorders (Sugisawa et al, 2016; Longhurst et al, 2018; O'Donnell et al, 2021). Without sound evidence guiding practice, practitioners are charged with the responsibility of determining the most appropriate maintenance recommendation

for individual patients, leading to varied and inconsistent recommendations.

Time spent in compression bandages

The amount of time spent in CB during the intensive phase was significantly related to the severity of lymphoedema. Most of the transitions from CB to maintenance products occurred after 3 weeks or more of intensive treatment. Recommendations for the continued use of daytime and nighttime CB during the maintenance phase were related to the length of time CB was used during the intensive phase. However, decreased adherence with CB may be compromised by its time-consuming nature, leading to an inability of patients to maintain volume reductions achieved during the intensive phase (Stolldorf et al, 2016; Mestre et al, 2017).

Practitioners reported that patients receiving more time in CB were treated fewer times weekly than patients receiving less time in CB. This finding suggests that patients spending more weeks in CB had lower weekly treatment frequencies than patients with fewer weeks in CB, which is difficult to reconcile with current practice guidelines that call for daily treatment (McLaughlin et al, 2017; ISL, 2020).

If patients requiring more weeks in CB had more severe lymphoedema, we would expect that higher weekly treatment frequency would have optimised volume reduction. The reason for this pattern is unclear.

Daytime product recommendations

Most respondents recommended circular or flat knit garments 'always/most of the time' and 'sometimes', while 'rarely/never' recommending CB and foam/padded garments, which is consistent with standard of care (ISL, 2020). Ochalek et al (2015) found that adherence to daytime knit garments maintained a 9% limb volume reduction over a period of 5 years, whereas non-adherence demonstrated a 7% increase in limb volume. AWG were only 'sometimes' recommended, most likely demonstrating that contemporary practice allows variability in product recommendation. The data also revealed that recommendations for daytime AWG had significant positive correlations for moderate and severe lymphoedema and a negative correlation with mild lymphoedema. The direction of this relationship points to tailoring an

individual's garment recommendation based the stage of disease (McLaughlin et al, 2017; ISL, 2020).

Evidence demonstrates that AWG allows for limb size reduction and affords ease of self-adjustment to maintain appropriate levels of compression on the limb and reduce the cost-burden of lymphoedema care (Damstra and Partsch, 2013; Williams 2016).

Nighttime product recommendations

Nighttime compression is a common recommendation given to patients to self-manage their lymphoedema during the maintenance phase. When indicated, the patient and/or caregiver is instructed in applying CB or other inelastic products, including AWG and foam/padded garments. The AWG and foam/padded garments are typically easy to don/doff and pressure can be easily adjusted (McNeely et al, 2016).

Minimal evidence exists to support which product is best for nighttime use and which product is most efficacious at maintaining limb volume reduction (McNeely et al, 2016; Whitaker, 2016). Whitaker (2016) found that practitioners made nearly 60% of nighttime compression recommendations for patients. CB (26%) and AWG (26%) were used most frequently followed by foam/padded garments (18%). These findings are similar to the SIS in that CB (60.6%) and AWG (69.8%) were recommended 'always/most of the time' or 'sometimes', followed by foam/padded garments (58.5%; Figure 3).

Vignes et al (2011) found that women with breast cancer-related lymphoedema who wore compression sleeves during the day and utilised CB at night had a decreased risk of relapse. CB is highly effective at maintaining and reducing limb volume when worn overnight (Keisuke, 2017). The results of the SIS, while not statistically significant, demonstrate a negative correlation between severe lymphoedema and the use of CB at night.

While the efficacy of the AWG is not well supported in the literature, there was a statistically significant correlation between the use of these garments at night for both moderate and severe lymphoedema with the relationship with severe lymphoedema being most meaningful.

Strengths and limitations

The SIS gained input from a large number of respondents, providing opportunities for descriptive and comparative analysis of responses. Participants were from all US states and six Canadian provinces, providing an opportunity to explore the varied practice patterns in the recommendation of maintenance compression products for patients of all severity levels of lymphoedema and related disorders. The large sample was a strength, but contributed to finding statistical significance in correlations that had less clinical application. The direction of these correlations was relevant for the identification of clinical trends.

Limitations exist that are inherent to snowball sampling. Survey respondents were able to select multiple responses and 'other' for items limiting the ability to analyse all of the data quantitatively. While the results demonstrated significant correlations between disease severity and garment recommendation, the survey was not able to capture rationale for the compression product recommendation. Finally, the survey did not undergo pretesting or validation as it was not initially developed as a study tool; rather, a tool to help LANA better understand the trends in contemporary practice patterns.

Conclusion

The SIS provides a glimpse into the current practice patterns related to the maintenance product recommendations for patients with lymphoedema and/or related disorders. The results demonstrate variability in recommendation based on the severity of the edema. The variability of the results demonstrates practitioner autonomy in recommending maintenance products that are appropriate and available to their patient population. Guiding bodies encourage more research on maintenance recommendations as innovative compression products are incorporated into clinical practice (Longhurst et al, 2018; ISL, 2020).

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