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RELAX IN COMFORT AND SLEEP WELL

USING NIGHT-TIME COMPRESSION TO AVOID RECURRENT OEDEMA

CONTENTS

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OBSERVING THE BENEFITS OF NIGHT-TIME COMPRESSION

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Over the past few years, it has been increasingly recognised that the current recommendations for compression therapy are not sufficient to ensure long-term maintenance that prevents rebound oedema. Following intensive decongestive lymphatic therapy (DLT), many patients experience a recurrence of their swelling within one year (Quéré et al, 2014). The reasons for this are often extremely complex and difficult to unravel. However, one factor is the typical recommendation that compression therapy should be worn only during the day, rather than for 24 hours (Vignes et al, 2011).

Further research is required to assess the efficacy of products developed to address these issues. This supplement contains cases studies describing patients' and nurses' clinical experience with an advance in compression: JOBST® Relax, a garment that has been specially designed to be worn at night. The outcomes indicate that both health professionals and patients found it beneficial.

Patients with lymphoedema are a highly heterogeneous population, even when the underlying aetiology, such as breast cancer treatment, is considered. As demonstrated in the case studies in this supplement, they can experience many comorbidities which, along with the underlying disease process, will affect their swelling. For example, breast cancer-related lymphoedema is often described as a minor problem that has been largely eradicated due to improvements in surgical technique. Despite this, approximately 25% of patients still develop lymphoedema (Moffatt et al, 2003), although early surveillance might ensure they are identified early and offered treatment to prevent a deterioration. In addition, complex postoperative complications, such as seroma and wound infection, can occur, increasing the risk of swelling, as can wider issues such as obesity and treatments including radiotherapy, chemotherapy, reconstructive surgery and repeated surgery (DiSipio et al, 2013; Paiva et al, 2013; Rebegea et al, 2015).

Lymphoedema in the leg is more complex to manage than arm oedema, and can have a greater impact on quality of life, possibly owing to the effect on mobility, which in turn can cause social isolation (Tiwari et al, 2006).

As the case studies show, the main outcome that facilitates adherence with treatment is patient comfort. Lymphoedema is a life-long problem and there is a need for garments that can address this issue. In some cases, JOBST Relax was used in patients with brachial plexopathy or who were receiving palliative care, where garments are required that provide comfort as well as compression. The patients' symptoms improved, despite the severity of their condition. In other cases, night-time compression enhanced patients' control of their swelling and provided increased comfort and relief. They also found it aesthetically pleasing.

The case studies also show that patients' preferred outcomes can differ to those of health professionals. Traditionally, the outcome of lymphoedema treatment has been defined as the change in limb volume. While this remains an important factor, given that uncontrolled oedema is associated with pain, numbness, reduced function and cellulitis, factors such as comfort, enhanced wellbeing and improved self-management may be more important to people managing a life-long condition.

The opportunity to use night-time compression to increase the effectiveness of treatment is an important development. Further innovations, like JOBST Relax, are likely in this area for many reasons, including the need for better management and to reduce intensive DLT treatments for recurrent swelling and cellulitis.

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MAKING NIGHT-TIME COMPRESSION A COMFORTABLE REALITY

WEARING COMPRESSION 24 HOURS A DAY WILL HELP PREVENT REBOUND OEDEMA. GARMENTS WORN IN BED OVERNIGHT NEED TO BE COMFORTABLE, COOL AND EASY TO DON

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Compression therapy has been used for centuries to treat disorders of the venous and lymphatic circulatory systems. As long as bandages have been used to manage lower limb problems, compression has been applied at night. Research shows that use of compression at night-time can reduce swelling, but that patients can be deterred from wearing it as they often find it too hot, uncomfortable and difficult to put on (Whitaker, 2016). Until now, no flat-knit compression garment has been designed specifically for use at night. This article explores the benefits of including night-time compression into a self-management regimen, and describes the development of a garment that is compatible with night-time usage.

Table 1. The International Society of Lymphology (ISL) stages of lymphoedema (ISL, 2013)

Stage	Characteristics
0	Latent or subclinical lymphoedema, which is not evident despite impaired lymph transport, and subtle changes in tissue fluid/composition and subjective symptoms. This stage can last for months or years before the oedema is apparent
I	Early onset of the condition, where there is an accumulation of fluid in the tissue, which subsides with limb elevation. Pitting can occur
II	Limb elevation alone rarely reduces the swelling and pitting is manifest
Late stage II	Excess fat and fibrosis are more evident and pitting may or may not be present
III	This includes lymphostatic elephantiasis, where pitting can be absent, and trophic skin changes, which can result in further fibrosis and fat deposits. There might also be hyperpigmentation, increased skin folds and warty overgrowths

Causes and characteristics of lymphoedema

The circulatory system comprises the arterial, venous and lymphatic systems. Arteries deliver oxygen-rich blood from the heart to the tissues, and veins return deoxygenated blood to the heart. The lymphatic system absorbs and filters excess water and waste products, returning this back to the venous system at the subclavian vein (Kesler et al, 2013). It also transports immune cells around the body.

The lymphatic system regulates the amount of fluid in the tissue in a process known as homeostasis. It also absorbs gastrointestinal lipids from the intestine to form chyle (lymph and fat cells), which is taken to the liver for processing. It monitors the movement of antigen-presenting cells and lymphocytes to lymphoid organs, such as the thymus, spleen, tonsils and appendix, and then on to the vascular circulatory system, thereby supporting the immune system (Aspelund et al, 2016).

When this complex physiological system does not function adequately, homeostasis is impaired, resulting in the accumulation of excess fluid in the interstitial spaces. This manifests as swelling in the tissue. If the failure is short term, as in an acute injury, the productivity of the lymphatic system will increase to remove the excess fluid and the swelling will resolve. In more complex situations, where the functioning of the lymphatic system is disrupted on a more permanent basis, the excess fluid is not removed and lymphoedema can develop. Lymphoedema can be either primary or secondary in origin:

- Primary lymphoedema is associated with genetic and congenital disorders of the lymphatic system, such as Milroy's disease and lymphoedema-distichiasis syndrome (Connell et al, 2013)
- Secondary lymphoedema is secondary to another cause, such as cancer and its treatments, venous insufficiency, trauma, infection, immobility and obesity (Browse et al, 2003)

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The International Society of Lymphology (ISL, 2013) has published a grading scale for assessing the severity of lymphoedema (*Table 1*). Stages 0–II are regarded as early/mild, late stage II and III as moderate and stage III can be either severe or severe complex lymphoedema (*Figure 1*).

The Lymphoedema Framework (ILF) position document, *Best Practice for the Management of Lymphoedema*, promotes a two-phase approach to the treatment and long-term management of the condition (ILF, 2006). As lymphoedema is a chronic condition, self-management is a long-term process requiring commitment and collaborative working from health professionals and the patient.

DECONGESTIVE LYMPHATIC THERAPY

Phase 1, which is commonly referred to as decongestive lymphatic therapy (DLT), is initiated when intervention is required to control the swelling, reshape the limb and reduce its volume, soften the tissues, improve limb function and movement, and reverse skin changes. It also involves provision of education on the condition and self-management. In this phase, treatment usually consists of either multilayer lymphoedema bandaging (MLLB) or wrap compression systems, manual lymphatic drainage (MLD), skin management regimens and exercise programmes. In some instances, these are complemented by other techniques tailored to the individual and his or her needs, such as therapeutic movement and exercise using the Lebed method, which is part of Healthy Steps (2017), physical and manual therapy used for the treatment and rehabilitation of soft issue (myofascial release), and MLD with a hand-held negative pressure wound therapy device. This phase usually lasts for 2–4 weeks, depending on the service delivery plan, the individual's needs, the severity of the condition and the skill of the lymphoedema clinic staff.

During this phase, treatment lasts 24 hours a day, which means that the individual will sleep in their MLLB or wrap compression system. In general, these are only removed in the clinic, which does not necessarily happen daily. Some bandage systems are only changed twice weekly (Franks et al, 2013).

Once the DLT phase has been completed, phase 2 starts. This is the maintenance phase, where self-management, with or without clinic support, is initiated. Patients are enabled to take ownership—and therefore control— of their lymphoedema through a self-management routine that normalises their life with this condition (Jeffs et al, 2016). This requires an understanding of the condition and how it can be effectively managed in the long term, plus a commitment to adhere with the programme. If this is achieved, it is likely to increase patients' independence and wellbeing (Jeffs et al, 2016). Components of the maintenance phase include strategies to prevent a rebound of the swelling following DLT, reduce the risk of cellulitis, improve limb function and mobility, and maintain skin integrity. Patients are often recommended a compression garment for the limb or other affected area, such as the breast or genitals.

SEVERE	No pitting, tissue is hard (fibrotic). Distorted shapes of the limb, often with increased skin folds and skin changes
MODERATE	Pitting is manifest. Limbs are misshapen, but not severely distorted
MILD	Slight pittingis possible (when you press your finger on the tissue it leaves a dent that slowly 'fills' up again). No or low distortion of limbs

Figure 1. Categorisation of lymphoedema severity, based on the International Society of Lymphology standards (ISL, 2013)

Types of compression garments

Compression garments used during the maintenance phase are usually either a circular-knit elastic garment or a flat-knit garment. Circular-knit garments are knitted using a cylinder and a fixed number of needles. They are seamless, and the shape is determined by variations in the height of the stitches and tension of the yarn. Flat-knit garments are knitted in one flat piece, which is usually joined to form a seam. The shape of the garment is altered by adding or removing needles. Circular-knit elastic garments are generally produced to a standard size, so are mainly ready to wear, although some can be made to measure (custom-fit). Flat-knit garments are nearly always custom fit and tend to be stiffer due to the knit and their lower elastic properties, although this can differ from manufacturer to manufacturer. As a result, flat-knit garments are often the product of choice after DLT (Todd, 2015). Guidance on when to use flat-knit or circular-knit garments is given in the ILF position document (ILF, 2006).

In the maintenance phase, an increasingly popular alternative to garments is the wrap compression system. This is suitable for some, but not, all patients, when self-managing (Whitaker et al, 2015). Most compression garments are indicated only for day use. However, some lymphoedema clinics and professionals will recommend wearing them at night-time, although the rationale for this will vary, depending on the patient and health professional (Whitaker et al, 2015).

Benefits of night-time compression

The ILF position document discusses a 'transition phase', which occurs when patients move from DLT to self-management (ILF, 2006). During this phase, some individuals will need 24-hour compression to prevent rebound oedema and reverse other symptoms associated with lymphoedema. It is difficult to quantify the number of patients that wear compression at night-time, let alone understand the factors that drive them to wear it overnight, or why they do not do so when recommended. A recent study, undertaken in five western countries (Australia, Germany, Sweden, UK and US), surveyed 94 patients who wore compression overnight during the maintenance phase about their experiences of this. The inclusion criteria were that patients had to have been diagnosed with lymphoedema at least 12 months before entering the study and were wearing night-time compression (in addition to their day garments) at least

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once a week as part of self-management. The patients had primary or secondary lymphoedema on different anatomical locations. Data were collected using interview questions during a 45-minute telephone conversation.

Just over one third of participants questioned had initiated night-time compression themselves (Whitaker, 2016), although it should be noted that night-time compression therapy is common practice in three of the five countries (Australia, Sweden and USA) from which patients were recruited. According to the results, reasons for not wearing compression at night-time included:

- Being too exhausted and tired to put on compression at night (27% of patients)
- Heat or temperature (20%)
- The oedema was already stable (18%)
- 'Wanted to give myself a break' (14%)
- Skin problems (5%).

Many participants wore products that are generally used in both DLT and for self-management, such as MLLBs, wrap compression systems and daytime compression garments. They stated that the products available to them at that time for night-time use had the following drawbacks:

- They were uncomfortable to wear
- They were too hot and caused sweating
- They made the skin itchy
- They slipped down the limb during the night
- They were time consuming to don at the end of the day
- They disturbed their sleep.

The Whitaker (2016) study also demonstrated benefits of night-time compression. In total, 89% of patients reported that their swelling increased when night-time compression was not used. Circumferential measurements of the ankle, calf and thigh in the lower limb were monitored at bedtime and in the morning. The swelling was reduced or maintained at the same level in 86% of the thigh, 87% of the ankle, 83% of the arm and 86% of the wrist measurements (*Table 2*). Subjective findings included that night-time compression reduced swelling and was associated with less pain and better sleep (Whitaker, 2016). Using compression did not deter the patients from undertaking skin care and other methods to soften the limb, with almost all (97%) stating that they used two or more other products, such as moisturiser, padding and intermittent pumps.

Other evidence on the benefits of night-time compression include a Japanese evaluation involving patients with breast cancer-related lymphoedema treated with MLLB. After undergoing a 2-week training course on self-bandaging, the patients independently applied MLLB at night-time for 7 days. Both objective measure of segmental total body water (STBW) in the upper limb, measured with bioimpedance spectroscopy, and subjective measures of tightness, heaviness and fullness decreased, suggesting that the swelling and swelling-related symptoms improved when night-time MLLB was included in self-management (Keisuke et al, 2017). However, it should be noted that this evaluation had a sample of only eight patients and the inclusion criteria were not clearly stated. Due to the lengthy time commitment involved, a 2-week course on applying MLLB at night not be a feasible management strategy for most patients.

Developing a night-time compression garment

When developing night-time compression products, manufacturers need to take patients' needs into account and understand what deters them from wearing them. When managing a long-term chronic condition, the use of tailored products designed for a specific purpose, such as to provide comfortable compression at night, will help improve clinical outcomes. According to the ILF, this could reduce the incidence of cellulitis and, in turn, hospital admissions and decrease the number of episodes of DLT, thereby achieving considerable cost savings (ILF, 2006).

In 2016, an Australian study investigated the economic impact of breast cancer-related lymphoedema in a national sample of 361 women (Boyages et al, 2017). The authors cited National Hospital Cost Data Collection cost data, published in 2014, stating that the average cost per admission for cellulitis was AUS $4102 (£2418) for less severe and AUS $9605 (£5342) for more severe cases (currency conversion to UK sterling based on September 2017 exchange rates). Obviously, this will also have economic implications for patients, with 56% of Boyages' entire sample reporting that their condition affected them financially. This rose to 83% when just those with severe lymphoedema were asked about this. Boyages study is one of the few studies to consider the financial burden of lymphoedema for patients. This should be considered when calculating the full economic burden of lymphoedema.

Table 1. Circumferential measurements of the upper and lower limb: night vs morning

	Upper limb*			Lower limb**		
	Beneath armpit	Elbow crease	Narrowest part of wrist	Ankle	Calf	Thigh
Lymphoedema increased	13%	14%	9%	7%	10%	6%
Lymphoedema stayed the same	38%	46%	63%	27%	29%	37%
Lymphoedema decreased	45%	36%	23%	60%	54%	49%

**Measurements recorded on 21 respondents over 101 nights **Measurements recorded on 45 respondents over 415 nights*

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Patient self-management will benefit from the development of products that deliver tailored care. However, it is important that such products are developed in consultation with patients as this will ensure they meet their needs and preferences. The participants in Whitaker's study were asked how the night-time product that they were using during the study could be improved. The main feedback related to the need for a more comfortable product, with 28% suggesting that it should be made from a different material and 18% identifying 'required improvements': the product needed to be less tight, to not cut into the skin and be free of slippage. Fourteen percent said it would be helpful if the product were easier to don and doff, which supports another finding in the study that 15% needed help to don their garments. Finally, 13% stated that it would be beneficial if the garment were made from a breathable material, to help prevent the patient feeling too hot at night-time when wearing it (Whitaker, 2016).

JOBST RELAX

A night-time compression solution has been developed that gives patients an alternative to using MLLB, daytime compression garments and wrap compression systems at night-time. JOBST Relax (BSN medical) provides the oedema control that patients need at night-time and when relaxing, as well as the look and comfort that they want. It is indicated for use in the maintenance phase and is designed for individuals who are looking for a garment that will better suit their lifestyle.

JOBST Relax is custom-fit, flat-knit garment, and so is shaped to stay in place. This also ensures its pressure gradient remains consistent. Its textured surface has a micro-massage effect that is designed to stimulate lymph flow. To aid comfort, the garment has a monofilament spacer layer that provides cushioning and can adapt to different sleeping positions.

One of the main issues identified in Whitaker's study was that patients become too warm in bed when wearing a night-time compression product. JOBST Relax is designed to address these issues: it contains breathable Coolmax® yarns, which are knitted into the garment using advanced knitting techniques.

The garment is produced in styles for the upper and lower limb. Available in a range of colours, it is machine washable and can be tumble dried at a low temperature.

JOBST Relax is available in US compression class 1 (15–20 mmHg) for the upper limb and US compression class 1 (15–20 mmHg) and class 2 (20–30 mmHg) for the lower limb, for which there are below-knee and above-knee options. As with all compression garments, it is important to be aware that the compression applied is influenced by many factors, such as the material (both compression class and elasticity) from which the garment is made, the size and shape of the leg, and the activity of the wearer (Rabe et al, 2008). Like all flat-knit, custom-fit garments, the swelling must be reduced as much as possible before JOBST Relax is applied, as the aim is to maintain the reduction and prevent rebound swelling when combined with daytime compression. Failure to do this will result in the garment becoming loose within a short space of time.

To achieve a good clinical outcome, it is essential that it is used on suitable patients, such as those who are prone to rebound swelling and who are willing to wear compression at night-time.

Conclusion

This article has described the evidence on the clinical benefits of night-time compression and the development of a garment specifically designed to facilitate this. The rest of this supplement comprises case studies describing nurses' and patients' clinical experiences of JOBST Relax.

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PATIENT WITH LYMPHOEDEMA EXACERBATED BY A FALL

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A 73-year-old woman developed mild breast cancer-related lymphoedema in her right arm immediately after a mastectomy and axillary node clearance with chemoradiotherapy. The lymphoedema was graded as stage I, according to the International Society of Lymphology (ISL) standards (ISL, 2013). Her comorbidities included arthritis, obesity and hypertension.

The patient was promptly referred to the lymphoedema clinic, where she was instructed how to self-manage her lymphoedema with exercise, skin care and by wearing a circular-knit, graduated compression class 2 (20–30 mmHg) combined armsleeve. After attending a patient education pathway programme at Kendal Lymphology Centre, where she received theoretical and practical advice as well as peer support, she became extremely proactive in her own care and within one year was discharged from the clinic as an 'expert patient'. Following her discharge, she continued to adhere to her lymphoedema management programme in the knowledge that she could access the clinic at any time should problems arise.

In the autumn of 2016, 4 years after her discharge, the patient fell and severely injured the shoulder of her lymphoedematous right arm. The ensuing reduction in arm/shoulder movement impaired her lymph drainage and her lymphoedema deteriorated to become moderate. She was therefore referred back to the clinic.

Due to the increased size (by up to 4 cm in places) and distorted shape of the limb, a 3-week course of decongestive lymphatic therapy incorporating multilayer lymphoedema bandaging, manual lymphatic drainage, skin care and exercise ensued. The limb responded well and a custom-fit, flat-knit, graduated compression class 2 (23–32 mmHg) combined armsleeve with gauntlet was prescribed. In line with current guidance (Template for Practice, 2009), the patient was advised to apply the armsleeve first thing in the morning, when swelling is at a minimum, remove it at bedtime and then use a moisturiser to keep the skin in good condition.

At the one-month follow-up, the arm measurements had increased (*Table 1*) and the tissues were becoming firm and fibrotic, especially on the forearm and dorsum of the hand (*Figure 1*). Despite physiotherapy, she still had difficulty exercising the limb, and the pain and discomfort were exacerbated by having to tug on a compression garment. In addition, the pins and needles in her fingers, which were related to the fall, were becoming troublesome, especially at night. She now required an applicator to don her garment.

To overcome these issues, a ready-to-wear, short-stretch wrap compression system (20–30 mmHg), which is useful for patients with fluctuating/rebound oedema

Fig 1. The limb before JOBST Relax was first used

Table 1. Comparative measurements: before and during therapy with JOBST Relax

	One month after DLT (creeping rebound) (cm)		Before fitting JOBST Relax (cm)		After 10 days of therapy with JOBST Relax (cm)		After 1 month's therapy with JOBST Relax (cm)		After 3 months' therapy with JOBST Relax (cm)	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
Hand	21.5	20.5	22.0	20.6	21.7	20.6	21.0	20.6	20.1	20.6
Wrist	24.0	20.0	24.4	20.1	24.0	20.1	23.5	20.0	23.1	20.1
Forearm	35.2	29.0	36.1	28.8	35.8	28.9	34.9	28.9	34.1	28.8
Elbow	41.0	38.0	41.8	37.9	41.4	38.0	40.6	38.0	40.0	37.8
Upper arm	45.8	41.2	46.5	41.1	46.0	41.1	45.5	41.0	44.6	41.0
Axilla	45.0	42.0	45.9	42.0	45.5	41.9	45.0	42.0	44.1	42.1

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and/or donning and doffing problems, was prescribed. The patient found this easier to apply and was able to adjust the pressure as required. Keen to self-manage her condition, she even wore the wrap compression system at night-time. Unfortunately, she felt it was too bulky and inflexible to wear in bed and, despite feeling that it was helpful, eventually gave up.

Nevertheless, inspired by this and the increasing clinical discussion about the benefits of night-time compression therapy, the patient was urged to try an old ready-to-wear, circular-knit armsleeve overnight. The patient was aware that there was no research or evidence, at that point, to support the use of a night-time compression, and that, as it was an 'old' garment, the compression levels could no longer be guaranteed. She initially found the armsleeve helpful, but was unable to tolerate it for the entire night due to a feeling of excessive tightness, which had not been apparent during the day, and slippage/bunching, which caused constriction. The arm was showing a creeping refill, with a 1 cm increase in all areas.

The patient therefore eagerly accepted an offer to evaluate JOBST Relax. She was prescribed a JOBST Relax custom-fit, compression class 1 (15–20 mmHg) combined armsleeve with gauntlet. The patient immediately enthused about the product: she loved its pink colour, which she considered more attractive and feminine than the usual beige or black, and was delighted by its ease of application. *Figure 2* shows the JOBST Relax in place. Even though the JOBST Relax and her usual day garments (custom-fit, flat-knit, combined armsleeve) had the same measurements, the patient found JOBST Relax easier to don and the applicator was no longer required.

At a follow-up assessment 10 days later, measurements at fixed points on the arm demonstrated a 0.3–0.5 cm reduction in limb size (*Table 1*), and the subcutaneous tissues were more soft and supple, particularly on the forearm. The patient was delighted with these results and keen to continue using the garment, especially when she realised that she could wear it in the evenings when relaxing, as well as overnight.

'At the end of the day, I can't wait to get into my PJs and put my feet up to watch the telly. Now, I can take off my normal compression garment and put on my comfort sleeve [JOBST Relax garment]. *I can really snuggle down and feel as though I'm still doing what I can to help my arm.'*

After one month, the circumferential measurements of the arm continued to show a slight further reduction (*Table 1*). Although these were small differences, there was a notable improvement in the shape and size of the limb. The appearance of the tissues was much improved, especially over the hand and forearm (*Figure 3*). The creeping refill that had been so problematic following her intensive treatment appeared to have been controlled. Her limb function and movement had improved markedly, aided in part by physiotherapy, and the pins and needles had gone.

'I now feel back in control of my lymphoedema, rather than the other way round!'

Fig 2. JOBST Relax fitted and in place

Fig 3. The limb after one month's therapy with JOBST Relax

Fig 4. The limb after 3 months' therapy: the size and shape of the limb had improved, as had the appearance of the fibrotic tissues, especially on the hand and forearm

At the 3-month follow-up, the circumferential measurements had reduced by 1.5–2 cm at various points along the limb. The tissues were softer and the limb function and movement were much improved (*Figure 4*).

While the use of night-time compression for patients with lymphoedema needs further research, this case study demonstrates how beneficial, comfortable and patient-friendly it can be as part of an expert, self-management programme.

International Society of Lymphology (2013) The diagnosis and treatment of peripheral lymphedema: 2013 Consensus Document of the International Society of Lymphology. *Lymphology* **46**(1):1–11

Template for Practice (2009) *Compression Hosiery in Upper Body Lymphoedema*. HealthComm UK, Aberdeen. http://tinyurl.com/y9lm4z9s (accessed 7 August 2017)

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PATIENT UNABLE TO WEAR A DAY ARMSLEEVE FOR WORK-RELATED REASONS

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This case study describes a 56-year-old man with a history of malignant melanoma, for which he underwent node dissection in the left axilla. He had no other relevant past medical history. Before surgery, in accordance with the treatment pathway for patients with this condition, moisture meter readings were undertaken and his limbs and trunk volumes were measured using perometry. The results were within the normal range (*Table 1*). The patient was given verbal and written information about the risk of lymphoedema and advice on skin care and exercise. He was also provided with the contact details of the lymphoedema clinic for self-referral, if necessary.

Within 6 weeks of the operation, the patient developed lymphoedema in his entire left upper limb from the wrist upwards. He contacted the lymphoedema service and subsequent perometry measurements showed that the volume of his left arm had increased by 13% (*Table 1*).

The patient had stage I/II lymphoedema, according to the International Society of Lymphology (ISL) standards (ISL, 2013), which is considered to be mild lymphoedema.

The patient did not complain of any pain, although it was noted that his axilla and post-axillary pouch were numb. The subcutaneous tissues were soft and non-pitting, and the skin was intact and in good condition.

A treatment plan comprising skin care, exercise and compression garment in the form of a ready-to-wear, circular-knit armsleeve was discussed with the patient. However, his job as a hospital healthcare assistant required him to be 'bare below the elbows,' and thus a compression armsleeve that had to be worn during the day was not deemed suitable. It was suggested that he try a night-time garment (JOBST Relax) instead. It was explained that there was not yet any evidence on its use without daytime compression, so the outcome could not be predicted. Nevertheless, he was keen to try it.

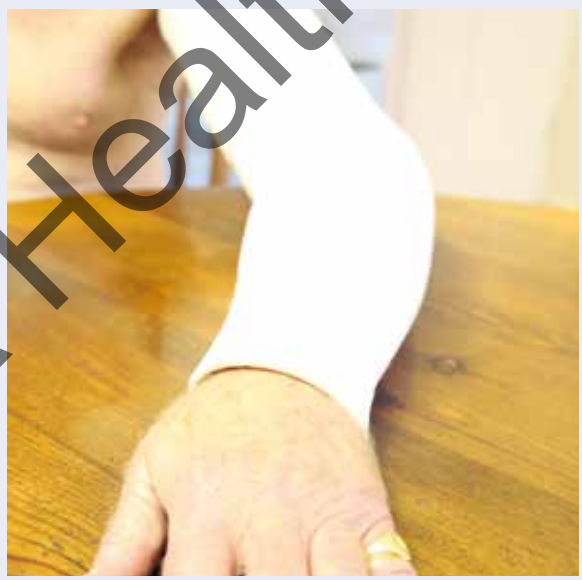

Fig 1. JOBST Relax in place at 3-month follow-up

The patient was measured for a JOBST Relax custom-fit armsleeve, without gauntlet, in compression class 1 (15–20 mmHg). He was instructed on how to apply and remove it, and how to look after it. He agreed to wear it nightly, and to adhere to the recommended skin care and upper limb exercises. A follow-up appointment was arranged for 3 months' time.

Table 1. Comparison of limb sizes

Before surgery	Postoperatively (week 6)	3-month follow-up	Reduction in excess limb volume (postoperative week 6 vs 3-month follow up)
Left arm: 2577 mm Right arm: 2559 mm Excess limb volume: 18 ml (0.7%)	Left arm: 3388 mm Right arm: 2973 mm Excess limb volume: 415 ml (13.9%)	Left arm: 2995 mm Right arm: 2897 mm Excess limb volume: 98 ml (3.4%)	-10.5%

Table 1 shows the limb volume measurements recorded before surgery, postoperatively and after 3 months of therapy with JOBST Relax. Not only had the oedema reduced, but also the patient subjectively reported that his arm felt 'more normal'. He found the garment easy to apply and remove, comfortable to sleep in and a good fit. He would often wear it in the evenings while relaxing and watching television. Prescribing JOBST Relax proved to be a creative and effective way of enabling this patient to self-manage his lymphoedema without impairing his employment prospects.

International Society of Lymphology (2013) The diagnosis and treatment of peripheral lymphedema: 2013 Consensus Document of the International Society of Lymphology. *Lymphology* **46**(1): 1–11

PATIENT WITH EXTREMELY SWOLLEN LEGS CAUSED BY LIPO-LYMPHOEDEMA

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This case study describes a 58-year-old woman with lipo-lymphoedema in both legs (lipo-lymphoedema is lipoedema that has resulted in failure of the lymphatic system). Both her mother and daughter also have lipo-lymphoedema, with the severity relating to age. The patient was a full-time primary school teacher. As she lived on a farm, she also helped with the farm work when at home. She was morbidly obese with a body mass index (BMI) of 57.

In 2014, both of the patient's legs were extremely swollen, with her right leg being the most affected with a limb volume of more than 10 litres (*Table 1* and *Figure 1*). Not only were her legs extremely painful, but she also had arthritic pain in her knees. She subsequently developed a superficial venous leg ulcer and cellulitis in her right leg.

In September 2014, the patient underwent a 19-day course (10 sessions) of decongestive lymphatic therapy (DLT) consisting of intermittent pneumatic compression

Table 1. Comparative reduction in the volume of the right leg reported after the initial course of decongestive lymphatic therapy (2014), at subsequent follow-ups with manual lymphatic drainage and self-management (2015), and during therapy with JOBST Relax (2017)

	Decongestive lymphatic therapy (DLT) (2014)		Self-management without JOBST Relax (2015)	Self-management with JOBST Relax (2017)	
	Initial assessment pre-DLT	Post-DLT		Pre-fitting for JOBST Relax	Week 4 of therapy with JOBST Relax
Limb volume (ml)	10244	6347	6697	6660	5747
Change in volume (ml) vs. the initial assessment (2014)		-3897	-3547	-3584	-4497
Change in volume (ml) since the previous reported measurement			350	37	-913

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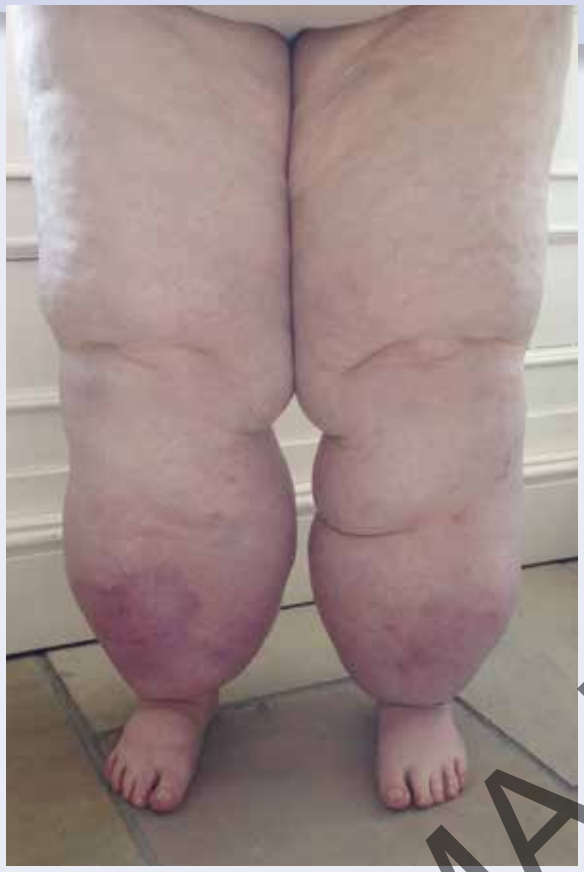

Fig 1. The patient's legs before decongestive lymphatic therapy was undertaken in 2014

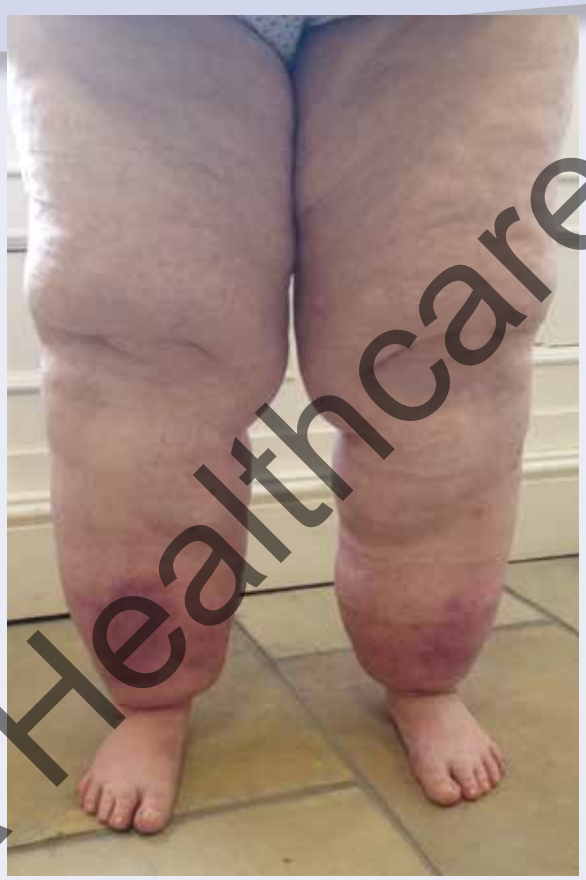

Fig 2. The patient's legs after 10 sessions of decongestive lymphatic therapy

therapy, manual lymphatic drainage (MLD) with a hand-held negative pressure wound therapy device and multilayer lymphoedema bandaging (Whitaker et al, 2015). Over the course of DLT, the limb volume in her right leg reduced from 10244 ml to 6347 ml and she lost 21 kg in weight, with her BMI reducing to 48 (*Figure 2*). After this, she received monthly treatments of MLD and self-managed with custom-fit, flat-knit, RAL compression class 3 (34–46 mmHg) graduated compression tights and a below-knee wrap compression system, which she wore all day until bedtime.

The patient had felt comfortable wearing her multilayer bandages at night while receiving DLT; therefore, at various intervals during the following year, she wore a RAL compression class 2 (23–32 mmHg) below-knee garment at night. Unfortunately, she had to stop wearing this due to funding issues. Despite adhering to her self-management regimen, she was concerned that not wearing compression at night would place her at risk of rebound oedema.

In 2017, after seeing a brochure about JOBST Relax in the lymphoedema clinic waiting room, the patient asked if she could purchase it privately, as it was not on prescription. The patient suggesting evaluating it on just her right leg in the first instance, which was still slightly more swollen, to see if it would be effective.

A JOBST Relax custom-fit, knee-high garment in compression class 2 (20–30 mmHg) was ordered for the patient. The patient agreed to wear this garment at night, but otherwise continue with the same self-management regimen that she had followed in the previous 3 years.

In order to conduct the evaluation, the patient discussed with the lymphoedema nurse consultant how she could measure her legs herself at home. The patient suggested using a permanent marker to place dots at specific locations on her foot, ankle and calf, where the measurements would be taken. With support and advice from the consultant nurse, the patient drew the dots herself at approximately the same locations as would be used to measure for a ready-to-wear garment, as it was thought this would be more likely to result in consistent measurements. The consultant nurse taught her how to do the measurements: stating that she should first measure the middle of the sole of the foot and then the ankle, record the measurements, and then continue up the calf. During the first 4 days of therapy with JOBST Relax, the patient measured both legs in this way each morning and last thing at night.

The results showed that, on day 4, there was a greater reduction in the circumferential measurement of the right leg (*Table 2*). This compared well with the reduction achieved in 2015 with self-management without JOBST Relax.

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Table 2. Reduction in size reported by the patient in her left and right legs during the first 4 days of therapy with JOBST Relax

Date and time		Ankle (cm)		Calf (cm)		Below knee (cm)	
		Left leg	Right leg	Left leg	Right leg	Left leg	Right leg
Day 1	Night	43.0	47.0	57.0	63.0	63.0	67.0
Day 2	Morning	42.0	41.0	54.0	55.5	60.0	61.0
	Night	42.0	44.0	55.0	58.0	62.0	65.0
Day 3	Morning	43.0	42.0	53.0	56.0	60.0	62.0
	Night	41.0	42.0	54.0	59.0	61.0	64.0
Day 4	Morning	44.0	42.0	54.0	55.0	60.0	61.0
	Night	41.0	42.0	54.0	54.0	61.0	62.0
Maximum reduction in size (day 4 vs day 1)		**2 cm**	**5 cm**	**3 cm**	**9 cm**	**3 cm**	**6 cm**

Motivated by these results, the patient decided to keep wearing JOBST Relax on her right leg at night-time. After 4 weeks, she lost nearly one litre of fluid (913 ml) below the knee of her right limb, and the garment started to feel loose.

'It now feels like it fits loose and drops down 4 cm when I walk around.'

Full details on the reduction in limb volume achieved with DLT and self-management with and without JOBST Relax are given in *Table 1*. Measurements were captured using the 4 cm limb volume calculation measurement system (Williams and Whitaker, 2015). As the patient's lymphoedema was bilateral, the effectiveness of treatment could only be determined by measuring the limb volume (ml) and comparing with previous measurements (Williams and Whitaker, 2015).

Previously, the patient had experienced aching and discomfort in both legs at night-time. This disappeared in her right leg while she was wearing JOBST Relax as part of her self-management routine. The left leg continued to be affected.

Figure 3 shows the night-time garment in place. The patient stated that she found JOBST Relax soft and comfortable to wear.

'Most nights I'm aware of my legs aching during the night, but didn't on the right when I wore [JOBST] *Relax.'*

Based on this case, the lymphoedema service will consider using JOBST Relax to increase the reduction in limb size immediately after DLT.

Fig 3. The limb with the JOBST Relax garment in place

'Very soft, comfortable to wear'.
'Felt heavy at first but getting used to it.'
'Didn't stop me getting to sleep.'
'Label does not itch on the seam.'
'Didn't glide through bed sheets – husband complained that they came with me, leaving him without [the sheets]*… ha,ha,ha…'*

Whitaker J, Williams A, Pope D et al (2015) Clinical audit of a lymphoedema bandaging system: a foam roll and cohesive short stretch bandages. *J Wound Care* **24**(3): 83–94

Williams A, Whitaker J (2015) Measuring change in limb volume to evaluate lymphoedema treatment outcome. *EWMA J* **15**(1): 27–32

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BREAST CANCER-RELATED LYMPHOEDEMA AFFECTED BY RECURRENT INFECTIONS

RACHEL DRAGO ADVANCED NURSE PRACTITIONER AND TEAM LEADER LYMPHOEDEMA, ST WOOLOS HOSPITAL, NEWPORT

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This case study concerns a 48-year-old woman who had a modified radical mastectomy and axillary node clearance in 2009 for stage 3 locally invasive ductal breast cancer. Following this, she underwent chemotherapy and radiotherapy, but developed lymphoedema in her left arm during radiotherapy. In 2011, she underwent deep inferior epigastric perforator breast reconstruction.

Since February 2010, she has experienced relapsing and remitting cellulitis in her left arm. On three separate occasions, she was admitted to intensive care with cellulitis in her arm and sepsis, for which she was treated with intravenous antibiotics. In 2016, she was prescribed long-term prophylactic antibiotics (phenoxymethylpenicillin 250 mg), to be taken twice daily, with the aim of preventing further incidents of cellulitis. She also had radiotherapy-induced lung fibrosis, for which she took regular oral antibiotics and occasional short courses of corticosteroid therapy (30mg prednisolone).

The patient had stage II lymphoedema according to the International Society of Lymphology (ISL) standards (ISL, 2013), indicating that she had stable moderate arm and hand lymphoedema. She had slight fibrosis of the proximal tissues and fluctuating pitting oedema in the distal arm and hand. For the past 8 years, the patient had self-managed her lymphoedema, wearing a custom-fit, flat-knit RAL compression class 2 (23–32 mmHg) armsleeve for at least 14 hours a day and, occasionally, a glove, undertaking simple lymphatic drainage and skin care, and keeping her body mass index <30 through diet and exercise.

When she was in her best state of health, with no active infections (skin or lung), the total excess limb volume of her left arm was 18%, but this would increase to 30–35% during episodes of chest infection and/or cellulitis. This increase was mostly caused by her inability to wear a compression armsleeve due to severe pain and because of the tissue swelling resulting from steroid therapy. The patient stated that she usually recovered slowly from episodes of cellulitis, with the increased pain and a feeling of heaviness in her arm lasting for up to 3 weeks after the infection had resolved. During these periods of infection, she would try to wear a custom-fit, flat-knit RAL compression class 1 (15–21 mmHg) armsleeve day and night until she could tolerate a compression class 2 garment during the day.

In April 2017, after JOBST Relax had been made available, the patient evaluated it in the hope that it would help to control her limb volume during these recurrent episodes of chest infection and cellulitis. She would wear her JOBST Relax armsleeve in compression class 1 (15–20 mmHg) overnight.

While objective circumferential limb volume measurements did not show any change in limb volume or tissue pliability following therapy with JOBST Relax, the patient subjectively reported that the distal part of the limb appeared to have decreased in size, there was less pitting in her forearm and the sensation of heaviness had reduced. Most importantly, she felt that her recovery from cellulitis was more rapid and she was able to wear her day garment just a few days after her infection had been bought under control, compared with at least 3 weeks previously. She also found the JOBST Relax compression garment more comfortable and cooler than her usual custom-fit, flat-knit RAL compression class 1 armsleeve in the evenings and at night.

The JOBST Relax garment has enabled this patient to better self-manage her lymphoedema during episodes of infection. This has had an ultimate effect of reducing both the perceived heaviness of her limb and the limb volume. It also enabled her to resume her normal activities of living more quickly than had been possible previously and to return to work, reducing her loss of earnings and costs to her employer.

LOWER LIMB LYMPHOEDEMA THAT RECURRED AFTER DECONGESTIVE LYMPHATIC THERAPY

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This case study describes a 53-year-old man with a history of Graves' disease (overactive thyroid gland) and primary lymphoedema in his left lower leg. The patient had stage III lymphoedema according to the International Society of Lymphology (ISL) standards (ISL, 2013). There was a large amount of fluid in the dorsum of his foot, which had distorted its shape. His skin was sensitive and prone to blistering, and he had previously experienced skin loss and skin breakdown. His calf circumference measured over 65 cm but there was minimal oedema above the knee. There was pitting and the subcutaneous skin had thickened.

The patient was prescribed a custom-fit, flat-knit, RAL compression class 4 (super) (60–90 mmHg) knee-high garment, a custom-fit, short-stretch footpiece and a legpiece wrap compression system (30–40 mmHg) to wear over the top. These were worn 24 hours per day. In addition, the patient underwent multiple courses of decongestive lymphatic therapy (DLT) comprising multilayer lymphoedema bandaging, which is applied daily in clinic over a period ranging from 2 to 4 weeks.

The patient initially wore the wrap compression system for 6 weeks as directed, but then reduced it to daytime wear only as he found it too hot at night. He continued receiving intensive DLT for the next 5 years. Each episode significantly reduced the volume of oedema and improved the shape of his leg and foot, thereby increasing his mobility, but these effects were short lived (6–12 months).

The patient attended follow-up assessments every 4–6 weeks between these courses of DLT. At a follow-up assessment in January 2017, it was observed that the limb volume had increased in size, although the skin was in excellent condition. It was decided to add a custom-fit, night-time compression garment (JOBST Relax) to the patient's therapy in an attempt to reduce the oedema before the next course of DLT. The patient was supplied a beige below-knee garment in compression class 2 (20–30 mmHg) and advised to wear it at night-time after removing his 'day' garments. The patient very much liked the look of the garment. He commented on how cool it was, and that he found it so comfortable that he often forgot he was wearing it.

After one week, the volume of oedema in his left lower leg had reduced (*Table 1*). It continued to reduce for 4-6 weeks. This was the first time this outcome had been achieved for this patient without DLT. However, it became apparent that he was wearing the wrap compression system over the top of the JOBST Relax compression class 2 garment at night. The patient explained that he did not feel that the JOBST Relax garment provided enough compression on its own, and he believed that it was the combined use of the two garments that had reduced his oedema. Interestingly, he did not experience any sensation of increased warmth or heat, as he had done previously when wearing the wrap compression system on top of the custom-fit, flat-knit compression garment. It was not intended that the patient should use JOBST Relax and the wrap compression system in this way. The fact that the

Fig 1. JOBST Relax in place

Table 1. Reduction in limb volume achieved while wearing a JOBST Relax garment in compression class 2 (20–30 mmHg)

Unit of measurement (ml)	Time period
18 238	Before using JOBST Relax
17 395	After 1 week's therapy
16 750	After 1 month's therapy
14 623	After 4–6 weeks' therapy

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patient did this without instruction, illustrates how each patient with lymphoedema poses a unique challenge.

At the time of writing, the patient has been made aware that he no longer requires frequent and time-consuming courses of DLT, which will significantly improve his quality of life. He has said he would recommend the garment to other patients and would use on its own if it were available in a higher class (JOBST Relax is currently only available in a compression class 1 (15–20 mmHg) or class 2 (20–30 mmHg) for the lower limb). Finally, it was noted that the garment supplied correlated extremely well with the measurements recorded on the measurement form. This ensures that the garment fitted well.

International Society of Lymphology (2013) The diagnosis and treatment of peripheral lymphedema: 2013 Consensus Document of the International Society of Lymphology. *Lymphology* **46**(1): 1–11

PATIENT WITH LYMPHOEDEMA IN A PALLIATIVE CARE SETTING

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This case study describes a 68-year-old woman with a 12-year history of secondary lymphoedema in her right arm following a wide local excision and axillary node clearance for breast cancer. In January 2016, she was diagnosed with stage 4 breast cancer. A CT scan showed metastases in the skin, axilla and brachial plexus, plus more distant secondary sites.

She was adherent with self-management techniques such as simple lymphatic drainage, exercise, weight control (her body mass index was 29) and skin care. The patient had stage I lymphoedema according to the International Society of Lymphology (ISL) standards (ISL, 2013), which is indicative of mild lymphoedema. She wore a ready-to-wear, size IV, RAL compression class 1 (15–21 mmHg) circular-knit garment for approximately 10 hours during the daytime each day. Her excess limb volume ranged from 8.8% to 10%, and there was soft tissue on the proximal and distal part of her arm.

These measurements remained stable until June 2016 when, due to the locally invasive nature of her cancer, she gradually developed a severe swelling in her right arm and hand. This was complicated by a paralysis of her arm caused by the metastasis in the brachial plexus, which resulted in limb dependency. The excess volume of her right arm increased from 10% to 90%. This was partly due to the pain, which had prevented her from wearing her usual compression garment, her oral corticosteroid therapy, which had caused disseminated peripheral oedema, and loss of the skeletal-muscle pump function due to the paralysis.

Until her death in May 2017, the patient's treatment programme comprised decongestive lymphatic therapy, which included manual lymphatic drainage, multilayer lymphoedema bandaging (MLLB) using cotton short-stretch bandages and custom-fit, flat-knit graduated compression garments reducing from RAL compression class 2 (23–32 mmHg) to compression class 1 (15–21 mmHg) as her ability to tolerate compression waned. She also tried using a wrap compression system glove and armsleeve. Eventually, she was unable to tolerate even light palliative bandaging with elasticated viscose stockinette and padding. She said that she 'hated' the size of her arm, the feeling of heaviness and the sight of the bandages, all of which reminded her of her diagnosis. She even said she would prefer amputation to further treatment.

When JOBST Relax became available, it was decided to evaluate the garment on the patient in April 2017. The use and cost of the garment was raised with the clinical lead, who responded, 'how can you place a cost on a treatment that might help to palliate a terminally ill patient when all other avenues have proved to be unhelpful?' An advanced nurse practitioner therefore measured the patient and ordered the garment. BSN medical were informed that the patient was receiving palliative care at home, and delivered the garment within the usual delivery time for this garment of 5 working days. After the fitting, the patient said that she found the garment 'tolerable'. Objective measurements and photographs were not taken as these were considered invasive and unnecessary at this stage. However, it is of interest that the patient was able to wear the garment for between 2 and 6 hours most days and derived some support from it, finding it comforting; the word she used was 'soothing'.

The lymphoedema service has since used JOBST Relax on two other palliative patients, both of whom found it easy to use, restful and supportive.

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PATIENT WITH BREAST CANCER-RELATED LYMPHOEDEMA AND A PAINFUL, PITTING ARM

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This case study describes a 61-year-old woman with a history of diverticular disease and breast cancer of the left breast, for which she underwent mastectomy and axillary lymph node clearance, followed by chemotherapy and radiotherapy. Postoperatively, she developed an encapsulated seroma on her left chest wall and axilla which, despite drainage, never fully resolved. Her medications comprised anastrozole, pregabalin, haloperidol, naproxen and omeprazole.

During a routine follow-up, the oncology team referred the patient to the lymphoedema service. Initial assessment revealed breast cancer-related lymphoedema in the left upper arm, which had been present for 2 weeks. There was swelling in the anterior chest wall, across the mastectomy scar line and in the post-axillary pouch. The patient also had pins and needles in her left hand, a dull aching in her upper arm and a sharp pain in her axilla.

Fig 1. JOBST Relax in place at one-week follow-up

Moisture meter readings of the trunk were normal, but perometry readings of the upper limbs revealed mild lymphoedema (less than 20% excess limb volume) (Lymphoedema Framework, 2006). The patient's treatment plan comprised skin care, exercise and a ready-to-wear, circular-knit compression class 2 (23–32 mmHg) combined armsleeve. She was also prescribed a course of manual lymphatic drainage (MLD) to relieve the discomfort in her axilla.

When the patient attended the clinic one month later for MLD, the subcutaneous tissues had thickened throughout the left arm and erythema was present over the entire underside area of her upper arm. Although there was a blister where the top of the armsleeve had been rubbing, cellulitis was excluded as the patient was apyrexial and feeling well. She was advised to continue with skin care and exercise, but the combined armsleeve was replaced with a custom-fit, flat-knit, compression class 2 (23–32 mmHg) combined armsleeve (with gauntlet). Following discussion, she also agreed to undergo 2 weeks of sequential pneumatic compression (SPC) at home.

At the patient's next consultation in clinic 2 weeks later, assessment revealed that her arm had become more oedematous and painful, and the tissues were firmer. In addition, there was pitting on her wrist and forearm. SPC was discontinued and MLD was resumed, which now included the arm as well as the trunk. She continued with the skin care and exercise, and wore the custom-fit, flat-knit combined armsleeve.

There was no particular reason why this treatment regimen was not effective, but the presence of the seroma on the anterior chest wall was unusual and might have contributed in some way.

Decongestive lymphatic therapy (DLT) comprises skin care, exercise, MLD and reduction/reshaping of the limb, usually using multilayer lymphoedema bandaging. This intensive treatment typically lasts for 2–4 weeks and requires frequent visits to a clinic. Due to personal circumstances and family commitments, which involved caring for her mother with dementia and supporting her daughter who had a young baby, the patient declined

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Table 1. Comparative measurements (before and after one week's therapy with JOBST Relax)

Location (measurement point)	Before using JOBST Relax (cm)	One week after wearing JOBST Relax (cm)
A Hand	19.0	18.0
B Hand	21.0	20.5
C Wrist	19.0	19.0
C1 Wrist	20.0	20.0
D Forearm	27.5	25.5
E Elbow	30.5	29.0
F Upper arm	35.3	32.5
G Top of arm	39.0	33.0

DLT. Instead, she attended the lymphoedema clinic once a month for MLD. Keen to try a new product that might help her lymphodoema, in January 2017 she was fitted with a JOBST Relax custom-fit, compression class 1 (15–20 mmHg) combined armsleeve and gauntlet garment (at present, JOBST Relax is only available in compression class 1 for the upper limb) to be worn at night.

Within one week, almost all of the patient's circumferential measurements at the custom-fit measurement points had reduced, with a significant reduction of 6 cm at the top of the arm (*Table 1*). The tissues were softer due the micro-massaging effect of the garment and her arm felt much more comfortable.

The patient commented that the new garment looked expensive, and that she loved its colour (rose pink). She valued having a garment that was supplied in its own bag and stated that she wanted to take care of it. She washed the garment several times, as she felt it needed to return to its original shape and size, and commented that it washed well. She found the garment very light and comfortable at night, and not hot as anticipated.

JOBST Relax armsleeves are available with and without a zipper: the patient had a sleeve without the zipper, and required some assistance to don it. In hindsight, a garment with a zipper might have been more appropriate.

Following one week's therapy with JOBST Relax, MLD no longer needed to be prescribed as the subcutaneous tissues remained soft and the reduction in limb volume was sustained. At the time of writing, the patient was wearing a custom-fit, flat-knit compression class 2 (23–32 mmHg) combined armsleeve with gauntlet during the day and her JOBST Relax combined armsleeve at night-time. She continues to perform her own skin care and is extremely active.

JOBST Relax has avoided the need for DLT, which requires a significant commitment from both the patient and the lymphoedema service in terms of time and resources.

Lymphoedema Framework (2006) *Best Practice for the Management of Lymphoedema. International Consensus.* MEP, London

STRATEGY FOR MAINTAINING THE EFFECTS OF DECONGESTIVE LYMPHATIC THERAPY

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In October 2013, a 43-year-old woman with left sided breast cancer developed lymphoedema in her left arm following a radical mastectomy and axillary node clearance. She underwent radiotherapy and chemotherapy, followed by long-term treatment with trastuzumab. She was also diagnosed with secondary tumours in her brain, which were treated with radiotherapy and steroids but, unfortunately, she required palliative care.

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In early 2015, the patient was referred to the lymphoedema service, where an initial assessment identified mild lymphoedema (International Society of Lymphology (ISL) stage II (ISL, 2013)) in multiple sites: hand, arm and chest wall. She also had swelling in her head and neck due to oral steroids. She was measured for a RAL compression class 1 (15–21 mmHg) combined armsleeve and glove, and underwent a course of manual lymphatic drainage (MLD). The lymphoedema remained stable until she had a further course of chemotherapy in 2015 and developed cellulitis in her left arm. The size of her left arm increased, and was now 59.9% larger than her right arm (a total difference of 1388.8 ml). As the lymphoedema was now moderate to severe, intensive treatment was required (Lymphoedema Framework, 2006). As the main aim was now to reduce both the limb size and the risk of further episodes of cellulitis, the patient underwent a 2-week course of decongestive lymphatic therapy (DLT), which is a combination of MLD, multilayer lymphoedema bandaging, skin care and exercise.

Following this, the excess limb volume reduced to 35%. The patient was fitted with a custom-fit, flat-knit RAL compression class 2 (23–32 mmHg) combined armsleeve and glove to wear during the day, as well as a ready-to-wear arm wrap compression system (20–30 mmHg) and a ready-to-wear, circular-knit compression class 1 (15–21 mmHg) glove for use at night. After 3 weeks, the excess limb volume had reduced to 32%.

The patient adhered to her self-management regimen, which included skin care, exercise, simple lymphatic drainage (SLD) and both daytime and night-time use of compression garments and a wrap compression system. On examination she had soft, non-pitting lymphoedema in her left arm and hand. There were no signs of swelling in her head and neck, her chest wall lymphoedema had remained stable due to simple lymphatic drainage (SLD), and she had not experienced any episodes of cellulitis in the past 8 months.

In a routine 12-week post-DLT follow-up appointment, the upper aspects of her hand and forearm had mild, soft pitting oedema, but the limb volume had remained stable. However, she had usually removed the night garment and wrap compression system during the night as she found them warm and uncomfortable.

JOBST Relax is made from low-profile material, making it lightweight and slim. Furthermore, it contains Coolmax® yarn, which the manufacturer states has a cooling effect. The Macmillan lymphoedema advanced practitioner considered prescribing this night-time garment for the patient, but was concerned it was more expensive than the wrap compression system and glove. She was unsure how it would fit or, indeed, if it would benefit the patient as it was a new product. However, given the patient's comments, it was considered necessary to try an alternative garment.

The advanced practitioner therefore ordered a class 1 (15–20 mmHg) JOBST Relax custom-fit, combined armsleeve and gauntlet in rose; this has a similar compression level to the wrap compression system (20–30 mmHg). The garment arrived quickly (7 days) and, following application, the patient immediately commented how comfortable it felt.

Seven days later, the advanced practitioner telephoned the patient, who was very impressed with the garment, stating,

'I am finding it very comfortable to wear. It is so easy to apply and my forearm and top of hand have started to softened slightly.'

The patient also stated that she kept the garment on all night as it never felt warm. As she found it so comfortable, and it did not restrict her movement or feel bulky, she wore it during the day when she was at home relaxing. The patient continued her 'day' therapy, wearing her custom-fit, flat-knit combined armsleeve and glove during the daytime.

At the next follow-up, 6 weeks after the fitting, the patient stated that she was still very happy with the JOBST Relax. Her hand and forearm were now soft and non-pitting, and the excess limb volume had reduced by 10%, with a 22% difference to her non-affected arm. The patient was convinced that the night-time garment was the main reason for this reduction as it was the only change in her self-management regimen.

The patient was extremely delighted with these results as she was about to be a bridesmaid at her sister's wedding. The reduction in her limb volume made her feel more confident about this.

Due to the visible reduction in swelling achieved with the JOBST Relax garment, and the patient's preference for it, the advanced nurse practitioner subsequently ordered this garment for another two patients. She has found it very easy to measure for and easy to fit. In addition, delivery was prompt. Although the night-time garment is more expensive than a wrap compression system, the advanced practitioner has found it more cost effective as patients have been more likely to wear it, thereby promoting adherence with treatment. More importantly, in all three patients it has achieved a significant reduction in limb size, improved the condition of the skin and, due to its cooling effect, resulted in greater patient satisfaction.

International Society of Lymphology (2013) The diagnosis and treatment of peripheral lymphedema: 2013 Consensus Document of the International Society of Lymphology. *Lymphology* **46**(1):1–11

Lymphoedema Framework (2006) *Best Practice for the Management of Lymphoedema. International Consensus.* MEP, London

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AVOIDING THE NEED FOR REPEATED DECONGESTIVE LYMPHATIC THERAPY

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This case study describes a 59-year-old woman who was diagnosed in 2006 with left sided breast cancer. She initially declined treatment, but underwent a mastectomy in 2008. In 2011, following a diagnosis of recurrent disease to the scar line, she underwent a wide local excision and lymph node dissection. Histology reports showed that two of the seven nodes were positive. In March 2012, the patient underwent chest wall and axillary radiotherapy. Three years later, she developed lymphadenopathy and swelling on the right side of her neck, and was diagnosed with further recurrence and superior vena cava obstruction (SVCO), which was stented. In 2017, pulmonary and liver disease progression was diagnosed, and in June 2017 she commenced second-line endocrine treatment with everolimus and exemestane

The patient's history of lymphoedema dated back to 2011 when she developed the condition in her left

Fig 1. The patient's arms on the first day of therapy with JOBST Relax

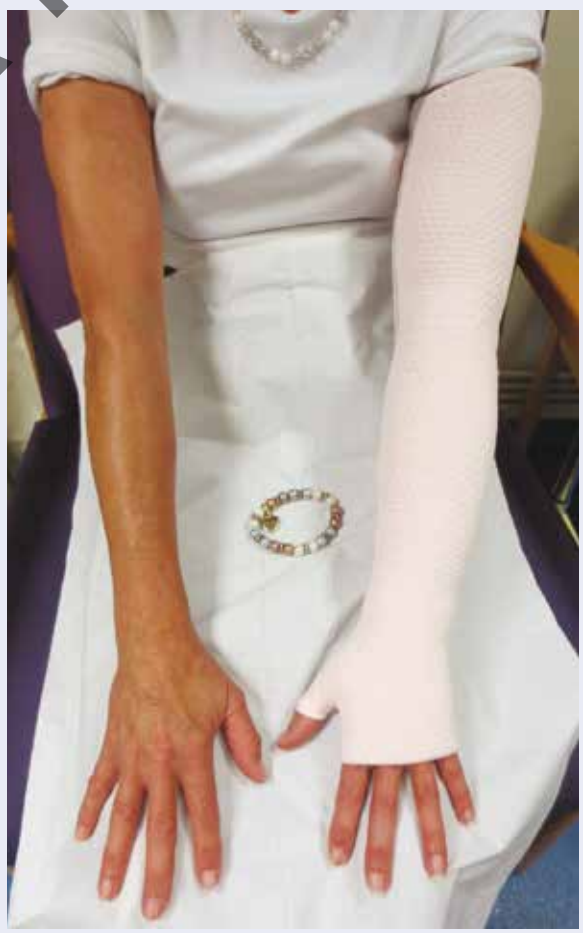

Fig 2. JOBST Relax in place

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Table 1. Limb volumes when JOBST Relax was fitted and at each follow-up

	Left arm volume (ml)			Right arm volume (ml)			Excess limb volume (ml)
Date	**Proximal**	**Distal**	**Total**	**Proximal**	**Distal**	**Total**	
8 June 2017 (measured for JOBST Relax)	1177	827	2004	830	629	1459	545 (37%)
18 July 2017*	1005	805	1810	797	664	1461	349 (24%)
2 August 2017	1051	851	1902	831	705	1536	366 (24%)

*JOBST Relax was fitted on 5 July, and these measurements were reported at the first subsequent assessment, 13 days later

wrist following axillary surgery. A health professional from the hospital prescribed an armsleeve (full details were not reported, but it is likely to have been a circular knit, ready-to-wear compression class 1 or 2 garment). At a follow-up in the radiology department, it was documented that she wore the armsleeve intermittently. In July 2015, following the insertion of stents for the SVCO, the swelling in her left arm increased. Her limb volume kept increasing and, in February 2016, she was referred to her local lymphoedema service.

Between February 2016 and 6 April 2016, following daily wear of a ready-to-wear, circular-knit compression class 2 (20–36 mmHg) glove and 20–30 mmHg wrap compression system armpiece, the volume of her arm reduced by 384 ml, with the excess limb volume decreasing from 114% to 89%. However, at the next review 3 weeks later, this had increased by 399 ml, increasing the excess volume to 111%.

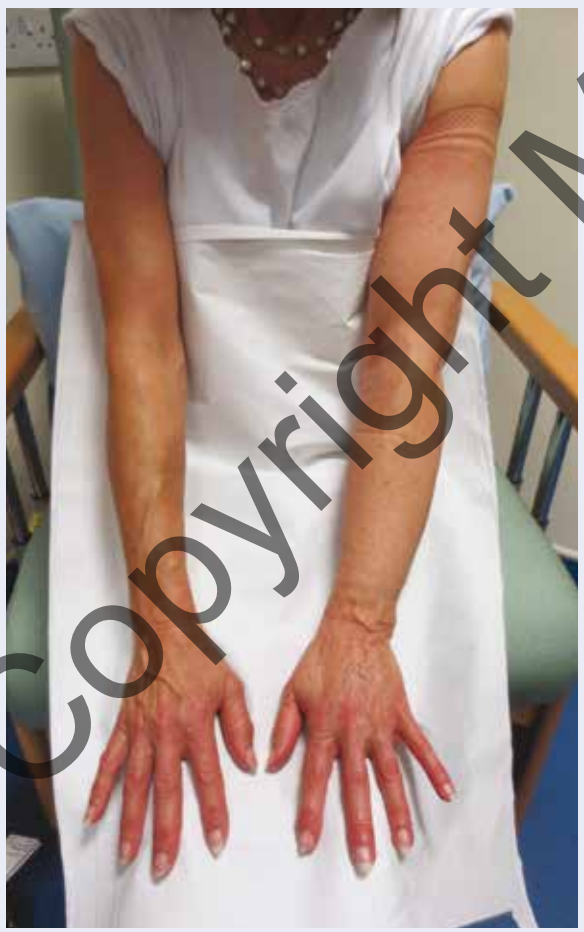

Fig 3. The patient's arms on the 10th day of therapy with JOBST Relax

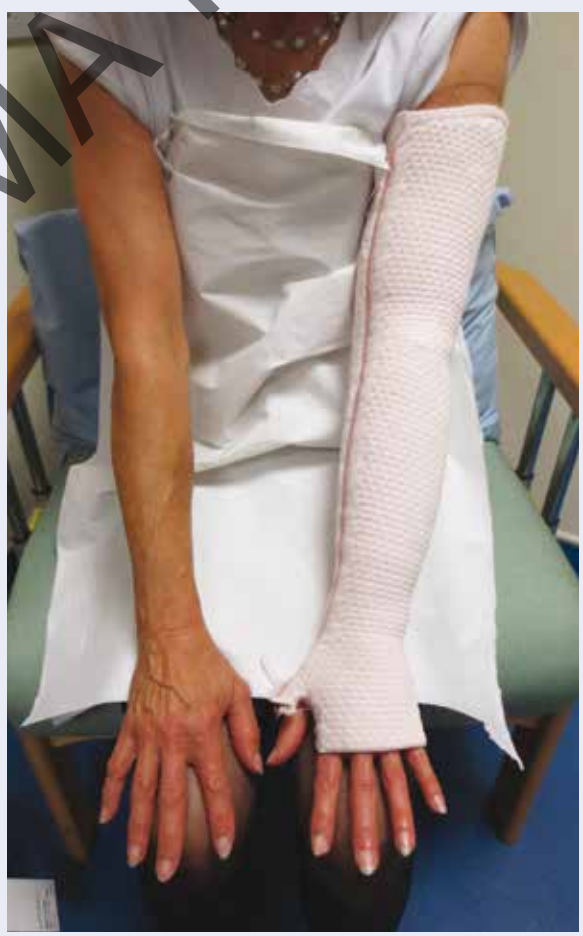

Fig 4. JOBST Relax in place after 10 days of therapy

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Her entire left arm was enlarged, and the digits and dorsum of her hand were bulging. The subcutaneous tissues were densely pitted and, while her skin was intact, it was extremely shiny and taught. The patient was struggling to put her clothes on, and was becoming increasingly self-conscious about her arm, saying it was affecting her relationship and mood. In addition, the heaviness and aching in her arm was preventing her from carrying out activities of daily living.

Circumferential limb measurements showed that the patient's left arm had an excess volume of 114% (1750ml). Lymphovenous oedema secondary to SVCO, with underlying secondary lymphoedema resulting from breast cancer surgery, were diagnosed.

In May 2016, the patient underwent a 2-week course of decongestive lymphatic therapy (DLT) comprising intermittent pneumatic compression and multilayer lymphoedema bandaging. Following this, the excess limb volume reduced to 47% (719 ml). She was fitted with a custom-fit, flat-knit RAL compression class 2 (23–32 mmHg) armsleeve and a custom-fit, flat-knit compression class 2 (23–32 mmHg) glove, and advised to wear them 24 hours a day for 6 weeks and thereafter during the daytime only.

At the 6-week follow-up, it was found that the distal forearm had refilled, with a 51 ml distal increase in the affected arm, and the tissues were firmer and non-pitting. However, the increase was thought to be partly due to the hot weather. Nevertheless, use of these garments alone had not been effective in maintaining the results of the DLT. The patient had been adherent with the compression therapy, and only occasionally wore the wrap compression system when her arm felt larger and she was unable to tolerate the armsleeve. She was keen to reduce the limb volume further, stating that her arm still did not feel 'normal'.

In April 2017, the patient started a second course of DLT, after which the excess limb volume reduced from 59% (953 ml) to 27% (429 ml). She was advised to continue the same maintenance regimen as before. However, following a discussion about JOBST Relax, she agreed to try it. When her limb was measured for the garment, it was found that her excess volume had increased to 37% (545 ml), despite her adherence with the standard maintenance regimen. The entire arm was enlarged, particularly in the distal region, but the tissues were soft and the skin was intact.

Figure 1 shows the patient's arm on the day that JOBST Relax custom-fit, combined armsleeve and gauntlet (15–20 mmHg) was fitted, *Figure 2* shows the garment in place. *Table 1* gives the limb volumes. The garment was a good fit, except for the thumb stall, which was a little too tight, and the top of the garment, which was slightly loose, although this might have been due to changes in the limb size that occurred between measuring and fitting.

The patient wore her compression garments everyday: she put on her day garment when she woke up and kept it on until 9.00pm. She then donned JOBST Relax and wore it until 5.30am. The JOBST Relax garment did not disturb her sleep. With the aid of an applicator, she was able to apply the night-time garment with ease. She found the garment comfortable and easy to care for and remove.

According to the patient, there were no significant changes in her limb size in the mornings, and her skin looked dimpled. *Figures 3 and 4* shows the arm after 10 days of therapy with JOBST Relax.

After 2 weeks of wearing JOBST Relax, the excess limb volume had reduced from 37% to 24% (*Table 1*). While the entire arm was still enlarged, the tissues had remained soft and the skin was still intact. Smaller garments were ordered for both daytime and night-time use. At the next follow-up, 2 weeks later, the reduction in volume had been maintained, and the tissues were still soft and the skin intact.

The patient considered that JOBST Relax had 'helped manage' her arm and that its looser proximal fit, when compared with her day garment, was beneficial: she also felt this has helped improved the shape of the top part of her arm.

At the last review to date, after 4 weeks of therapy with JOBST Relax, the patient felt that the results of DLT had been maintained in terms of limb size and the appearance and texture of the tissue. This compared well with the previously disappointing results of maintenance treatment after DLT reported at the 6-week follow up. Her forearm was generally soft, although on some days it became firmer, but the skin stayed intact and well hydrated. A bilateral increase in size was observed, but this was evenly distributed throughout the limb (ie, both distally and proximally) and the excess limb volume remained unchanged. As the patient reported that she had not gained any weight, this could not be attributed to weight gain.

JOBST Relax provided the patient with comfortable night-time compression, which in turn has facilitated better maintenance of intensive treatments. The cost of the garment is a fraction of that incurred by repeated courses of DLT, and its benefits lasted longer. Therefore, JOBST Relax is likely to be a useful addition to ensure better long-term outcomes for patients.

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Ask Ronnie Relax about the benefits of night compression in lymphoedema management

- Reduced swelling[1]
- Improved pain management[1]
- Comfort and sense of relief[1]

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MORE THAN JUST A GOOD NIGHT'S SLEEP

Source 1: Whitaker, J (2016) 'Lymphedema management at night: views from patients across five countries', British Journal of Community Nursing, 21 (Sup10) pp. S22-S30

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