Challenges of venous leg ulcer management

made easy

© Wounds International | April 2022 www.woundsinternational.com

Introduction

Venous leg ulcers can cause severe morbidity to patients in terms of complications with wound healing and the wider impact of a highly exuding wound on all aspects of daily life. Although exudate contains components that support healing, excessive exudate impairs healing and increases the risk of infection and periwound maceration (WUWHS, 2019). Optimal management of the challenges is therefore a priority to achieve faster healing times and limit patient morbidity. This Made Easy offers examples of solutions to achieve optimal outcomes for patients, including periwound skin protection, exudate management, infection identification and management and compression therapy.

Definition and aetiology

A venous leg ulcer (VLU) is an open skin lesion that usually occurs on the medial aspect of the lower leg between the ankle and the knee as a result of chronic venous insufficiency (CVI) or ambulatory venous hypertension, and shows little progress towards healing within 4-6 weeks of initial occurrence (Harding et al, 2015).

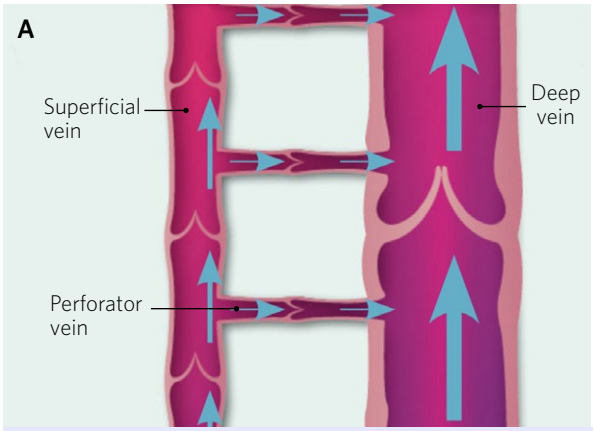
CVI is the result of damage to the valves in the veins of the legs, associated with varicose veins or venous thrombosis. The damaged valves interrupt the normal functioning of the veins; as a result, impaired venous drainage from the legs and chronic venous hypertension cause the leg capillaries to leak fluid, blood cells and proteins into local tissue. This triggers an inflammatory response that further exacerbates venous hypertension, damages leg tissues and restricts skin oxygenation (Harding et al, 2015; Figure 1).

Challenges of VLU exudate management

VLUs can be difficult to heal due to poor management of the underlying condition, which leads to high rates of reoccurrence – 55% of healed VLUs reoccur within the first 12 months of closure (Finlayson et al, 2018).

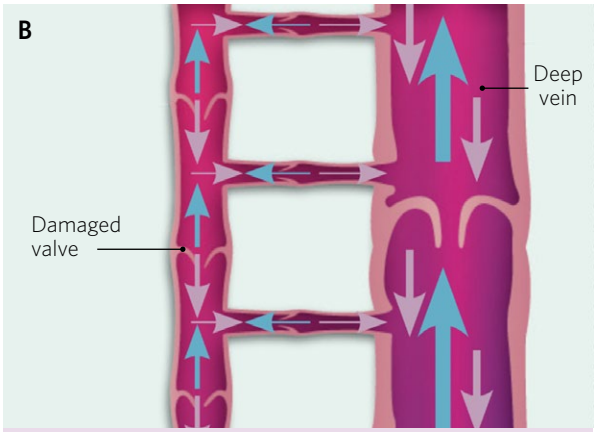
The key challenges in VLU management can be summarised into four main areas:

1. Exudate management
2. Periwound skin maceration
3. Infection risk and presence of infection
4. Patient compliance.



Healthy working valves

In healthy individuals, venous blood flows from the superficial veins, through perforator veins to the deep venous system from where it returns to the heart assisted by the action of the calf muscle pump.



Compromised venous system

When valves are damaged or compromised (made incompetent) this system fails, venous reflux (backward flow) occurs and pressure in the veins fails to fall adequately on exercise causing venous hypertension. Over time this causes progressive skin damage.

Figure 1: A) Venous return in individuals with working valves; B) Compromised venous return in individuals with incompetent venous valves (adapted from Vowden and Vowden, 2012; Vowden et al, 2020)

1. Exudate management
Exudate is both a problem and a benefit in wound management. Exudate contains components that are necessary for would healing, such as electrolytes, nutrients, proteins, inflammatory mediators, matrix metalloproteinases (MMPs), growth factors and other cells and molecules (White and Cutting, 2006).

Exudate originates in serous fluid leaked by the capillaries into surrounding tissues. Normally, about 90% of the leaked fluid is reabsorbed by the capillaries and 10% returns to the circulation via the lymphatic system. However, when a wound is present, additional fluid is produced by the capillaries and enters the wound bed where it forms exudate to help heal the wound (Wounds UK, 2013).

An excess of exudate is involved in a number of interrelated problems. Excess exudate increases the risk of bacterial colonisation, infection and biofilm of the wound; causes protein loss, and fluid and electrolyte imbalance; precipitates maceration of the periwound skin; and causes malodour, discomfort and pain, all of which increase the patient's pain and distress (Wounds UK, 2013; WUWHS, 2019).

Poorly managed exudate contributes to periwound maceration, which is associated with infection, as well as with oedema and lymphoedema (Sandy-Hodgetts et al, 2020). Poorly fitting bandages can also lead to exudate leakage, which is a problem for patients and contributes to periwound skin damage.

2. Periwound maceration
Wound healing requires the epidermal margins of the wound to migrate across the wound bed, followed by maturation of the skin to protect the wound site from future damage. If the wound bed is prepared effectively, the best conditions will be created for successful re-epithelialisation (i.e. debridement of non-viable tissue, management of excess exudate).

The periwound epidermis of VLU is typically thickened and highly keratinised (Schultz et al, 2005). It should therefore be carefully removed to promote migration of the wound edges to close the wound (Dowsett and Newton, 2005).

3. Infection risk and presence of infection
Bioburden is one of the most serious barriers to wound healing, and can be life threatening. Infection and associated inflammation not only cause the individual pain and discomfort, but also delay healing, and increases the cost and number of interventions needed to treat the wound, exacerbating the impairment of the patient's quality of life. Biofilm, present in greater than 70% of chronic wounds, causes persistent inflammation and poor wound healing (WUWHS, 2016; Malone et al, 2017).

It is believed that a contributing factor of impaired healing in chronic leg ulcers is an increase in inflammatory mediators rather than a deficiency of growth factors (Trengove et al, 2000).

4. Patient compliance and quality of life impact
Leg ulceration has a severe impact on a patient's work and social life, and activities of daily living, including personal hygiene. Ulceration can have a profound emotional and psychological impact including shame, embarrassment, loneliness, anxiety and depression, as a result of risk of malodour, exudate leakage and discomfort (Green et al, 2014; González de la Torre et al, 2017; Platsidaki et al, 2017). One systematic review found that wound pain, malodour and exudate, and the pain involved in treatment had significant negative impacts on quality of life, including sleep, mobility and mood (Phillips et al, 2018).

These challenges in wound healing delay VLU healing, alongside other factors such as inadequate or incomplete assessment of the wound and the person's needs, poor dressing selection and use, and ineffective use of compression therapy (Guest et al, 2018). Best, evidence-based practice not only helps to reduce resource use and staff time, but also greatly eases the impact on patients' quality of life.

Solutions

Accurate diagnosis and assessment
It is important to distinguish VLU from other kinds of lower limb ulceration, such as arterial leg ulcers, mixed-aetiology ulcers and diabetes-related ulcers and identify the underlying cause of the ulcer – in this case, CVI (Harding et al, 2015). Wound assessment should pay attention to location, duration and size of the wound, exudate levels, the condition of the wound bed and surrounding skin and limb (Harding et al, 2015).

Management

Best practice in VLU healing and local wound management requires the following:

- Skin protection
- Preparation of the wound bed to manage biofilm/bioburden
- Optimisation of the wound environment to manage exudate and support granulation, protect skin integrity, restore damaged skin and promote re-epithelialisation, and control exudate and infection.
- Therapeutic compression.

Alongside local wound management, consider the individual's need for vascular intervention to reduce risk of ulcer recurrence. **Figure 2** includes examples of solutions from the 3M range that can be used as part of a holistic VLU management regimen.

3M™ solutions for VLU management

Provide therapeutic compression

3M™ Coban™ 2 Two-Layer Compression System

3M™ Coban™ 2 Lite Two-Layer Compression System

Protect skin

Routine skin protection

3M™ Cavilon™ No Sting Barrier Film

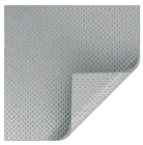
At-risk or damaged skin protection

3M™ Cavilon™ Advanced Skin Protectant

Prepare wound bed

Manage biofilm/bioburden

3M™ Silvercel™ Non-Adherent Hydro-Alginate Antimicrobial Dressing



or 3M™ Kerracontact™ Ag Dressing

Provide collagen

3M™ Promogran Prisma™ Wound Balancing Matrix

Optimise wound environment

Manage exudate

3M™ Kerramax Care™ Super-Absorbent Dressing

3M™ Tegaderm™ Silicone Foam Dressing

3M™ Tegaderm™ High Performance Foam Dressing

3M™ Snap™ Therapy System

Supports granulation

3M™ ActiV.A.C.™ Therapy System

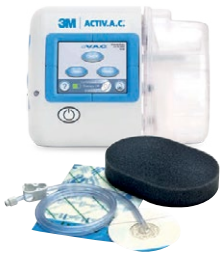


Figure 2: Solutions for VLU management using examples from the 3M™ range

Skin protection

The wound and surrounding tissues need to be in the best condition to promote wound healing. They need to be carefully assessed and managed to limit a prolonged inflammatory response, reduce the risk of infection and promote re-epithelialisation.

Skin damage, such as maceration, erythema and weeping, are often associated with VLUs. Research supports routine protection of the periwound skin and at-risk, compromised skin from excess exudate and mechanical trauma as essential parts of wound management and wound bed preparation (Bryant et al, 2016). Use of non-sting barrier film (e.g. 3M™ Cavilon™ No Sting Barrier Film) has been shown to lead to significantly greater wound size reduction compared to use of a barrier cream or not using a skin protectant at all (Guest et al, 2012). The retrospective data analysis also suggests that using a non-sting barrier film may facilitate the healing of larger wounds without increasing costs.

Preparation of the wound bed to manage infection, biofilm and bioburden

The first step in preparing the wound bed is identifying the related signs and symptoms of infection, biofilm and bioburden. The clinical signs of local wound infection are new, increased or altered pain and delayed healing. Additional signs are periwound oedema, bleeding or friable granulation tissue, malodour or change in odour, discoloration of the wound bed, increased or altered purulent exudate, induration, pocketing and bridging (WUWHS, 2009).

The management of bioburden should be focused on two critical areas:

1. The optimisation of the patient's ability to fight infection. This includes optimising hydration and diet and addressing systemic promoters of infection, such as sub-optimal management in diabetes.
2. The reduction of bacterial load in the wound to prevent further wound contamination or cross-contamination and promote wound drainage. The wound bed should be debrided to remove non-viable tissue (e.g. necrotic tissue and slough) to leave the wound bed with functional extracellular matrix proteins and optimal characteristics for healing (Dowsett and Newton, 2005).

Optimising wound environment

The TIME framework is recommended for assessment and management of VLU (Harding et al, 2015). The TIME framework offers an evidence-based approach, which pays close attention to four aspects of wound bed preparation: tissue management, the control of infection and inflammation, management of moisture and exudate, and re-epithelialisation at the edge of the wound (Schultz et al, 2004).

Dressing selection for biofilm or bioburden

Biofilm or bioburden may be managed with a non-adherent antimicrobial dressing containing silver (e.g. 3M™ Silvercel™ Non-Adherent Hydro-Alginate Antimicrobial Dressing or 3M™ Promogran Prisma™ Matrix [Vin et al, 2002; Wollina et al, 2005; Cullen et al, 2017; Smeets et al, 2008]). Applying a super-absorbent dressing (e.g. 3M™ Kerramax Care™ Super-Absorbent Dressing) may help remove excess exudate from the wound bed while also isolating and locking away harmful bacteria and MMPs away from the wound bed (Gibson et al, 2009).

Dressing selection for exudate management

Selecting products that help maintain an optimal environment through exudate management, provide protection from outside contaminates, and enable easy application and removal are important to wound healing.

Appropriate dressing selection is a critical factor in the management of exudate (Table 1). However, the most effective tool for reducing excess exudate is sustained and appropriate compression therapy (Harding et al, 2015). In complex cases of VLUs that persist unhealed despite optimal wound bed preparation and compression therapy, advanced tools such as negative pressure wound therapy should be considered (Harding et al, 2015).

Therapeutic compression

Compression therapy is the gold standard for VLU management and has been shown to increase the rate of healing compared to no compression therapy. Research indicates that a bandage or multi-layer compression system that is capable of creating an inelastic sleeve provides stiffness that effectively supports venous pump mechanisms (e.g. 3M™ Coban™ 2 Two-Layer Compression System; Partsch, 2005; Mosti and Partsch, 2010).

Compression works by enclosing the leg with a garment – a bandage, hosiery or wrap system – that produces evenly distributed pressure within. As external pressure rises, fluid is forced out of the limb. Firm but flexible compression with high stiffness produces a massaging effect that promotes venous return better than elastic systems (Partsch, 2003).

Additional haemodynamics effects of compression therapy include (Partsch and Mortimer, 2015; Partsch and Moffatt, 2015; Moffatt et al, 2012; Mosti, 2018):

- Reduced venous ambulatory hypertension and venous pooling
- Improved venous and lymphatic return
- Reduced chronic oedema and inflammation
- Reduced leg pain.

Challenges of venous leg ulcer management made easy

Table 1. Guide to product and dressing selection for venous leg ulcers

Step 1	Skin protection		Barrier film	3M™ Cavilon™ No Sting Barrier Film
Step 2	Maceration treatment		Durable, long-lasting barrier film	3M™ Cavilon™ Advanced Skin Protectant
Step 3	Infection control		Antimicrobial dressing short-term	3M™ Kerracontact™ Ag Dressing, 3M™ Silvercel™ Non-Adherent Hydro-Alginate Antimicrobial Dressing, 3M™ Promogran Prisma™ Wound Balancing Matrix
Step 4	Wound dressing	Exudate low	Adherent dressing	3M™ Tegaderm™ Absorbent Clear Acrylic Dressing
		Exudate moderate	Conformable, absorbent dressing	3M™ Tegaderm™ High Performance Foam Dressing
		Exudate high	Alginate, other gelling fibre, or foam dressing	3M™ Tegaderm™ Silicone Foam Border Dressing
		Exudate very high	Super-absorbent dressing	3M™ Kerramax Care™ Super-Absorbent Dressing
Step 5	Therapeutic compression		Compression bandaging	3M™ Coban™ 2 Two-Layer Compression System (ABPI >0.8) 3M™ Coban™ Lite 2 Two-Layer Compression System (ABPI ≥0.5–0.8)

A full assessment of the VLU and patient must be conducted before prescribing compression, including assessment of arterial circulation. An ankle–brachial pressure index (ABPI) measurement must be carried out by an appropriately qualified practitioner. Patients with an ABPI <0.8, with diabetic foot ischaemia or neuropathy, or cardiac failure must be referred for specialist assessment before compression therapy can be considered (Wounds International, 2013).

Supporting supported shared care and beyond

A key component of encouraging the use of therapeutic compression is to support patients and their carers to wear their garments at home. Box 1 includes practical tips to encourage patient compliance and supported shared care with regard to wound care and compression therapy.

Conclusion

Good exudate management relies on a careful assessment of the signs that indicate high levels of exudate, such as the presence of maceration and excoriation of the periwound skin, and the presence of malodour. Management of the challenges of VLU management requires the following:

- Attention to assessment of the wound at dressing changes
- The selection of the most appropriate and effective wound care products to treat the condition of the wound and exudate, to minimise the risk of maceration and to suit the individual's psychosocial preferences
- Prompt response to changes in condition of the wound or appearance of the signs of infection
- Engagement from staff with up-to-date knowledge to support patient concordance with therapeutic compression.

Box 1. Practical tips when engaging the individual and/or their carers in supported shared wound care

- Explain the underlying disease
- Discuss the clinical goals of the treatment
- Provide a full explanation of the treatment
- Describe compression as 'firm' not tight — this can really make a difference!
- Offer pain relief prior to any treatment
- Avoid changing the dressing choice frequently — decide on a treatment plan and follow it unless the wound condition deteriorates
- Remind the individual they need to wear footwear
- Encourage good skin care with emollients
- Once healing is achieved, ensure compression stockings are worn as a preventative measure.

The results and outcomes of the case study should not be interpreted as guarantee or warranty of similar results. Individual results may vary depending on the patient's circumstances and condition.
NOTE: Specific indications, contraindications, warnings, precautions, and safety information exist for these products and therapies. Please consult product labelling prior to use. Please consult a clinician and product instructions for use prior to application. Rx only. This material is intended for healthcare professionals.

Authors
Maria Hughes,
Independent Tissue Viability Consultant, Queen's Nurse, North Wales, Wales
Dr Bram Balduyck,
Thoracic and vascular surgeon, St. Jozef Hospital Bornem, Belgium

This Made Easy supplement was supported by an educational grant from 3M
© Wounds International 2022

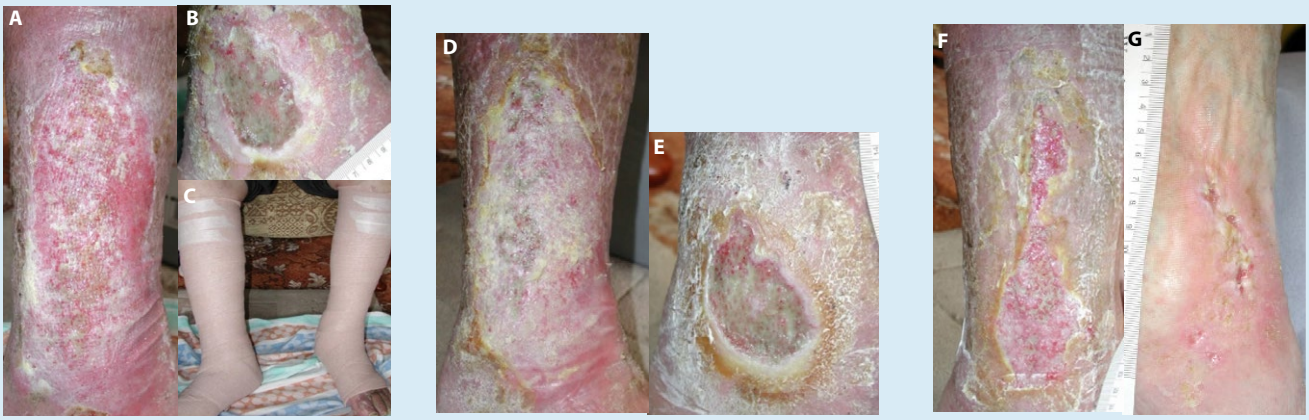
3M Science. Applied to Life.™

Case Study: Use of 3M™ Kerramax Care™ Super-Absorbent Dressing and 3M™ Coban™ 2 Two-Layer Compression System in an individual with bilateral leg ulcers. Patient data and photos courtesy of Maria Hughes.

A 65-year-old male presented with extensive bilateral leg ulceration present for several months. Previous medical history included type 2 diabetes, fractured right hip and long-term smoking. Previous wound treatment included foam dressings, iodine and absorbent padding with daily dressing changes. However, the wounds did not improve, and the foam dressings did not adequately manage the high level of wound exudate.

At presentation, the lateral left leg and right medial malleolus wounds showed extensive ulceration, dry skin, excoriation and maceration, oedema and evidence of venous disease (Figures A-B). Cleansing and emollient therapy was prescribed to improve the health of the surrounding skin. The patient's ankle–brachial pressure indexes (ABPIs) were 0.92. Due to the high levels of wound exudate, KerraMax Care Dressings was initiated. As the patient showed limited healing with extensive oedema, compression therapy using Coban 2 Compression System was applied over the dressing (Figure C). Dressing changes occurred twice weekly. Wound size reduction and periwound skin improvement were observed after 2 weeks of KerraMax Care Dressing and Coban 2 Compression System use (Figures D-G). After 4 weeks, dressing changes were reduced to once per week. A wound infection at week 11 was resolved with topical antimicrobials and oral antibiotics. The wounds healed after 15 weeks. The patient received ongoing care to reduce the risk of recurrence, which included daily application of emollients by relatives, wearing of bilateral hosiery socks, and the monitoring of his ABPI.

The patient reported improved satisfaction with the KerraMax Care Dressing and Coban 2 Compression System use compared to the previous treatment, especially with the reduction of dressing changes from daily to twice a week to once a week. The patient also reported improved exudate management and reduced lower extremity pain with this treatment combination.



A. Lateral left leg wound at presentation. **B.** Right medial malleolus wound at presentation. **C.** Application of KerraMax Care Dressings and Coban 2 Compression System. **D.** Lateral right wound after 2 weeks of KerraMax Care Dressings and Coban 2 Compression System use. **E.** Left malleolus wound after 2 weeks of KerraMax Care Dressings and Coban 2 Compression System use. **F.** Lateral right wound after 9 weeks of KerraMax Care Dressings and Coban 2 Compression System use. **G.** Lateral right wound after 13 weeks of KerraMax Care Dressings and Coban 2 Compression System use.

References

Bryant R (2016) Types of Skin Damage and Differential Diagnosis. In: Bry ant BA, Nix DP. In: *Acute & Chronic Wounds; Current Management Concepts (fifth edition).* Elsevier Mosby, St. Louis, MO: 82-108
Chen WY et al (1992) *J Invest Dermatol* 99(5): 559-64
Cullen BM et al (2017) *Adv Skin Wound Care* 30(10): 464-8
Dowsett C, Newton H (2005) *Wound bed preparation: TIME in practice*. Wounds International, London
Falanga V (2000) *Wound Repair Regen* 8: 347–52
Finlayson K et al (2018) *Int Wound* 2018: 1–9
Gibson D et al (2009) *MMPs Made Easy.* Wounds International, London
González de la Torre H et al (2017) *Int Wound J* 14(2):360–8
Green J et al (2014) *J Wound Care* 2014; 23(12): 601–12
Guest JF et al (2012) *J Wound Care* 21(8):389–98
Guest JF et al (2018) *Int Wound J* 15(1): 29–37
Harding K et al (2015) *Simplifying venous leg ulcer management. Consensus recommendations.* Wounds International, London
Leaper D et al (2012) *Int Wound J* 9(Suppl 2): 1–19
Malone M et al (2017) *J Wound Care* 26: 20–5
Marston W, Vowden K (2003) Compression therapy: a guide to safe practice. In: *EWMA Position Document. Understanding compression therapy.* MEP Ltd, London
Moffatt C et al (2012) *Compression Therapy. A position document on compression bandaging.* The International Lymphoedema Framework, London
Mosti G, Partsch H (2010) *Int Angiology* 29(5): 421–5
Mosti G (2018) *Phlebologie* 47(01): 7–12
NICE (2021) *Clinical Knowledge Summaries: Leg Ulcer – Venous.* NICE, London
Partsch H (2003) Understanding the pathophysiological effects of compression. In: *EWMA Position Document. Understanding compression therapy.* MEP Ltd, London
Partsch H (2005) *Dermatol Surg* 31: 625–30
Partsch H, Moffatt C (2015) An overview of the science behind compression bandaging for lymphoedema and chronic oedema. In: *Compression Therapy: A Position Document on Compression Bandaging.* International Lymphoedema Framework in Association with the World Alliance for Wound and Lymphoedema Care. 12-22
Partsch H, Mortimer P (2015) *Br J Dermatol* (173): 359–69
Petherick ES et al (2013) *PLoS One* 8(3): e58948
Phillips Pet al (2018) *J Adv Nurs* 74(3): 550–63
Platsidaki E et al (2017) *Wounds* 29(10): 306–10
Sandy-Hodgetts K et al (2020) *International Best Practice Recommendations for the Early Identification and Prevention of Surgical Wound Complications.* Wounds International, London
Schultz GS et al (2004) *Int Wound J* 1(1): 19–32
Schultz G et al (2005) *Extracellular matrix: review of its role in acute and chronic wounds.* World Wide Wounds, London
Smeets R et al (2008) *Int Wound J* 5(2):195-203
Stephen-Haynes J et al (2019) *Wounds UK* 15(4): 34–9
Trengove NJ et al (2000) *Wound Repair Regen* 8(1):13-25
Vin F et al (2002) *J Wound Care* 11(9): 335-41
Vowden P et al (2020) *Demystifying mild, moderate and high compression systems – when and how to introduce "lighter" compression.* Wounds International, London
Vowden K, Vowden P (2012) *Wound Essentials* 7
White RJ, Cutting K (2006) *Modern exudate management: a review of wound treatments.* World Wide Wounds, London
Widener JM (2015) *J Vasc Nurs* 33(2): 60–7
Wollina U et al (2005) *Int J Low Extrem Wounds* 4(4): 214–24
World Union of Wound Healing Societies (2009) *Consensus Document. Wound infection in clinical practice.* Wounds International, London
World Union of Wound Healing Societies (2016) *Position Document. Management of Biofilm.* Wounds International, London
World Union of Wound Healing Societies (2019) *Consensus Document. Wound exudate: effective assessment and management.* Wounds International, London
Wounds International (2013) *Principles of compression in venous disease: a practitioner's guide to treatment and prevention of venous leg ulcers.* Wounds International, London.
Wounds UK (2013) *Effective exudate management. Best Practice Statement.* Wounds UK, London