TIME for an update: The versatility of Flaminal® demonstrated in a large-scale clinical evaluation

KEY WORDS
- Wound
- Wound assessment
- Dressings
- Framework

This article follows on from the 2018 Jones and Oates publication 'TIME to assess wounds - a clinical evaluation of Flaminal' (Jones and Oates, 2018). It details the wound assessment tools that are used across the UK to ensure a patient receives the appropriate and timely holistic care, exploring specifically the TIME(s) framework. It features the findings of a large-scale evaluation captured over 22 months of 1657 patients treated with Flaminal® (an Enzyme Alginogel by Flen Health). The clinical effectiveness in debridement, preventing infection, managing moisture and protecting wound edges are explored. The results strengthen that of the 2018 publication, highlighting the clinical efficacy and versatility of Flaminal in a real-world community setting.

JEANETTE KING
Tissue Viability Specialist Nurse, The Walton Centre NHS Foundation Trust

with case studies provided by

JEANETTE KING
Tissue Viability Specialist Nurse, The Walton Centre NHS Foundation Trust

KATHARINE ROLLAND
Tissue Viability Specialist Nurse, NHS Lothian

In England, the annual cost of wound care is estimated to be £8.3 billion; with non-healing or delayed healing cited as the principle contributing factors. The burden of wounds on the NHS in 2012/2013, an update study by Guest et al (2020), estimated that in 2017/2018, the NHS was managing 3.8 million patients with wounds. Additionally, the data showed that during the study year, resource use associated with managing healed wounds accounted for 30% of the total cost (£2.7 billion), with a cost per wound ranging from £358 to £4684, as opposed to the 70% of unhealed wounds (£5.6 billion), with a cost per wound range from £831 to £7886. 81% of the total annual NHS cost was incurred in the community.

The number of patients with complex and non-healing wounds continues to rise worldwide as a result of multiple contributing factors, such as an ageing population and a rise in obesity, diabetes and cardiovascular disease. Likewise, there is an interrelationship between the psychosocial issues, for example, immobility, reduction of bodily functions, social isolation and an impairment of the individual's quality of life (Azevedo et al, 2020).

It is widely acknowledged that there is a disparity in wound treatment across healthcare settings, with a notable underuse of evidence-based practice (Guest et al, 2020). It could be argued that the clinician's ultimate goal is to achieve successful wound healing whenever possible. The wound healing process, on the other hand, is both intrinsic and dynamic and achieving this goal is dependent on the healthcare provider's knowledge base and approach to wound management. The National Wound Care Strategy Programme (NWCSP) was inaugurated in 2018 to promote excellence in wound prevention, assessment and treatment, as well as to provide a framework of core capabilities to support healthcare providers in delivering the best care. It promotes standardisation in the field of wound care, which healthcare professionals at every level can effectively utilise whilst encompassing evidence-based practice (NWCSP, 2018).

WOUND ASSESSMENT

Wound assessment is bolstered with the gathering of accurate information using observation, physical examination, clinical investigations and the recording of wound characteristics. These include wound dimensions, wound bed status, exudate levels, condition of the periwound skin, odour, pain and the effectiveness history of previous dressings (Vowden and Vowden, 2016). This process forms the foundations of the wound management plan.

The Department of Health (2016) identified wound assessment as a key objective of the Commissioning for Quality and Innovation

Table 1: Wound assessment frameworks		
TWA	Triangle of Wound Assessment	This tool divides the wound assessment into three areas: the wound bed, the wound edge and the periwound skin and it should be used in conjunction with a holistic assessment
SWAAG	Scottish Wound Assessment and Action Guide (Health Improvement Scotland, 2021)	This guide is to aid wound assessment and management and should be used in line with local policy/guidelines
BESSSOP	Bed, Exudate, Site, Size, Surrounding skin, Odour and Pain (Health and Social Care, 2020)	This acronym provides baseline data on which to evalu te the wound status or progress and the efficacy of the treatment regime
T.I.M.E.	Tissue, Infection/Inflammation, Moisture balance and Wound Edge	A systematic approach to wound a management. This acronym uses a structured approach to wound bed preparation (Schultz et al, 2003).

(CQUIN) in 2017-2018. The core generic wound assessment minimum data set (MDS) was established as a result of this government initiative. It embraces five domains including general health information, wound baseline information, wound assessment parameters, wound symptoms and a surgical field; encompassing 37 core generic MDS elements that are distributed across the domains (Coleman et al, 2017).

Although there are numerous wound assessment tools available, not all are comprehensive and incorporate the fundamentals outlined in the MDS. There are, however, a variety of wound assessment frameworks and acronyms that can support practitioners achieve effective wound management (Table 1).

A survey conducted at the European Wound Management Association (EWMA) 2018 conference demonstrated that from 196 respondents, T.I.M.E. was universally the most commonly used assessment tool (Ousey et al, 2018). The T.I.M.E. clinical decision support tool has evolved with the contribution of international experts to facilitate more widespread use, and it can be utilised in either a non-product specific or product driven tool format (Swanson et al, 2019).

T.I.M.E.

The T.I.M.E. assessment tool encompasses the MDS element of wound tissue type **(T)** and specifies the use of percentages to demonstrate fundamental information to guide dressing selection and wound progress. The tissue type is ordinarily defined as necrotic, sloughy, granulating and epithelialising. Following that, signs of infection/inflammation **(I)** are considered. It is imperative that the clinician can distinguish between a normal wound healing inflammatory response to that of inflammation indicating infection; a holistic assessment will support this process. Moisture balance **(M)** is the next element of assessment and incorporates exudate evaluation and management; this should include documentation of consistency, amount, colour, type and if there is malodour. The assessment is completed by wound edge progression **(E)**, which focuses on the preservation and encouragement of epithelialisation and healthy periwound skin. The periwound skin is often defined as dry, excoriated, inflamed or macerated.

FLAMINAL: A VERASATILE DRESSING FOR ACUTE AND CHRONIC WOUNDS

Flaminal® (Flen Health) is a type of primary wound dressing called an Enzyme Alginogel. Flaminal consists of hydrated alginate polymers in a polyethylene glycol matrix embedded with a patented antimicrobial enzymatic complex of glucose oxidase and lactoperoxidase that are stabilised by guaiacol (White, 2006). These enzymes are commonly found in breast milk and tears as a natural defence against microbes. Due to this unique composition, Flaminal continuously debrides the wound, provides antimicrobial protection, absorbs excess exudate while maintaining a moist healing environment and protects the wound edges and epithelial cells (Beele et al, 2012).

Flaminal comes in two compositions, Flaminal Hydro® for slightly to moderately exuding wounds, and Flaminal Forte® for moderate to highly exuding wounds, both of which are highly conformable to a wound bed (Beele et al, 2012). Flaminal's enzyme system has a broad-spectrum antibacterial activity without cytotoxicity (De Smet et al, 2009), and reduces the bacteria released from biofilms, preventing biofilm reformation (Cooper, 2013).

Flaminal has also been shown to reduce pain in a variety of wounds (Durante, 2012; Jones and Williams, 2017). Flaminal is an ideal solution for addressing several aspects of wound bed preparation in conjunction with a structured wound bed assessment, simplifying the need for multiple dressings (White, 2014).

The key objectives of this article are twofold: to emphasise the importance of accurate wound assessment using T.I.M.E., coupled with the reporting of results from the stated large-scale evaluation that was undertaken in relation to the effectiveness of the product Flaminal in wound management. In addition to the study findings, two case studies will be presented to demonstrate the effectiveness of appropriate dressing selection and the use of a structured approach to wound management in a real-world setting.

CASE STUDY 1: BILATERAL LEG ULCERS

A 59-year-old male was admitted to the hospital by ambulance after experiencing two days of sudden onset bilateral oedema and skin rash to the lower limbs, as well as extreme acute pain. The patient's lower limbs were initially erythematous, and the patient had experienced increasing shortness of breath over a three-week period, resulting in reduced mobility. The patient's medical history included chronic obstructive pulmonary disease, psoriasis, and smoking.

The initial diagnosis indicated right zone cavitating *Staphylococcus Aureus* pneumonia, renal failure and an unknown aetiology rash to the lower legs, of which vasculitis was confirmed by an expert team during admission.

Vasculitis is an autoimmune disorder characterised by inflamed blood vessels, which give rise to a wide variety of presentations; cutaneous vasculitis refers to skin involvement (Stanway 2016). It is clinically recognised that ulceration can be a secondary manifestation of vasculitis (Shanmugam, 2017).

Case study 1

Figure 1A

Figure 1B

Figure 1C

Figure 1D

Within 16 days, the rash had ulcerated, with initial dimensions of 21.5cm in length by 6cm in width and extending over the posterior aspect of the right lower leg and heel (Figure 1A). The tissue **(T)** was composed of 60% slough, 30% granulation, and 10% necrotic tissue. There was no evidence of infection **(I)**, minimal serous exudate **(M)** and the wound edges were healthy **(E)**.

Management of the symptomatic ulcer was required, with treatment aiming to promote autolytic debridement of the devitalised tissue, reduce the risk of infection, and allow prompt application of negative pressure wound therapy (NPWT).

To prepare the wound bed, Flaminal Hydro was used along with a secondary silicone foam adhesive that was renewed every 3 days; debridement was achieved after ten days and NPWT was commenced (Figure 1B). Following 8 weeks of NPWT, the ulcer had decreased in size, measuring 16cm in length by 4cm in width and the ulcer bed consisted of 70% granulation, 10% slough and 20% epithelialised tissue.

At this point, the NPWT was discontinued and Flaminal Forte primary dressing was reintroduced along with a secondary silicone foam adhesive and compression bandaging (Figure 1C). The patient then shortly progressed into hosiery, and from this point on, the patient was able to self-care with Flaminal to regain some independence. Figure 1D shows the wound progress at 24.5 weeks.

CASE STUDY 2: POSTSURGICAL CRANIAL WOUND FOLLOWING A DEEP BRAIN STIMULATOR IMPLANTATION

A 65-year-old man with a medical history of type 2 diabetes, chronic obstructive pulmonary disease, hypertension, and ischaemic heart disease. The patient was readmitted to the hospital three days after a deep brain stimulator (DBS) implantation due to an exuding cranial wound and bilateral orbital swelling.

At the time of admission, there were no systemic signs of infection, however, there was some surrounding erythema and bullous blistering near the incision line. The initial plan included obtaining wound swabs, blood tests and a CT head scan with contrast; the surgical team prescribed a topical application of chloramphenicol ointment (a historical practise before enrolment of Tissue Viability Nurse). The ultimate goal was to preserve the DBS.

Deep brain stimulation is a type of neurosurgical treatment for Parkinson's disease that is most effective at improving associated dystonia, a range of movement caused by involuntary muscle contractions that can be either sustained or intermittent (Kupsch et al, 2006). DBS involves implanting fine electrodes into a specific area of the brain (Thalamus and the subthalamic nucleus) that controls movement and modifies brain activity with a constant electric pulse.

The average price of the DBS system in the UK is £18,500, plus the additional cost that is associated with the hospital admission and surgery cost (Mandybur, 2022).

The patient was referred to a Tissue Viability Specialist Nurse for evaluation, who determined that the surgical wound remained closed **(T)**, that there was slight erythema **(I)**, moderate serous exudate **(M)**, and that the wound edges were healing **(E)**.

The main aim was to reduce the risk of infection and avert the need to remove the DBS device, which would have a negative impact on the patient's quality of life.

Case study 2

Figure 2A

Figure 2B

The admission wound treatment was immediately discontinued, and the commencement of Flaminal Forte primary dressing started, which was applied directly to the incision line daily, cleansing every third day was advised. A secondary dressing was not advised. After two applications, there was a reduction in erythema, and exudate levels had decreased by day four, so the sister product Flaminal Hydro was commenced. The incision line remained intact (Figures 2A and 2B) and infection-free until the suture removal date. The treatment aim was achieved and the DBS was successfully preserved, which saved a significant cost to the NHS trust and maintained the patient's quality of life.

CLINICAL EVALUATION OF FLAMINAL: METHODOLOGY

Similar to the 2018 publication by Jones and Oates including 356 evaluations (Jones and Oates 2018), district nurses were asked to complete one evaluation form per patient to document the performance of Flaminal (Forte and Hydro) in managing a variety of wounds. The questions were related to the T.I.M.E. framework. Following the collection of all evaluation forms, the data was analysed using a standard 'binomial test' with 95% confidence interval (CI) to calculate the Wilson score CIs and one-tailored p-value.

RESULTS

The survey was conducted in the United Kingdom between February 2019 and November 2020, and a total of 1657 responses were collected. The

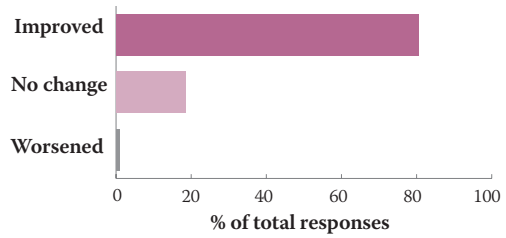
findings revealed a wide range of wound types, including some of the most commonly treated in the wound community, such as leg ulcers, pressure ulcers, diabetic foot ulcers, moisture lesions and burns.

66% of patients used Flaminal Forte, 31% used Flaminal Hydro and the remaining 3% used a combination of both formulations, which is also reflected in the analysis of wound exudate. Of the wounds that were treated, only 5% had no exudate, as assessed by the physician, while 68% had moderate to high exudate levels, explaining the higher use of Flaminal Forte.

As previously demonstrated in the earlier Flaminal product evaluation, the survey results show that Flaminal addresses all aspects of the T.I.M.E. framework in wound management.

Following the T.I.M.E. framework, the first step is to remove necrotic tissue, and 1211 respondents (81%) reported that Flaminal resulted in an improved wound bed (Figure 3), while 292 (19%) reported no change/worsened. The difference was statistically significant, $p<0.0001$, 95% CI 78.24-82.71%, indicating that the treating

Figure 3. Removal of slough/necrotic tissue



physician reported an improvement in the wound bed due to tissue debridement that was higher than compared to the frequency expected by chance (50%).

According to the T.I.M.E framework, question 2 inquired about Flaminal's ability to deal with infection and critical colonisation [Figure 4]. Of the 1528 responses collected, 1114 (72.9%) reported an improvement, while 414 (27.1%) reported no change or worsening. This result is statistically significant with $p<0.0001$ and 95% CI intervals of 70.22%-75.45%, indicating that the improvement in infection signs was greater than would be expected by chance.

Another aspect of the T.I.M.E. framework was

Figure 4. Signs of infection

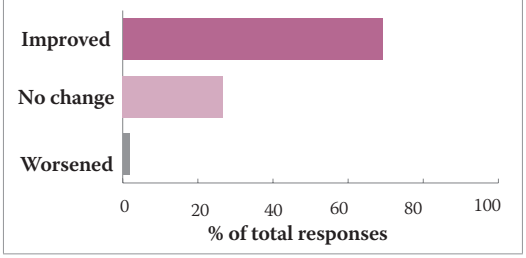
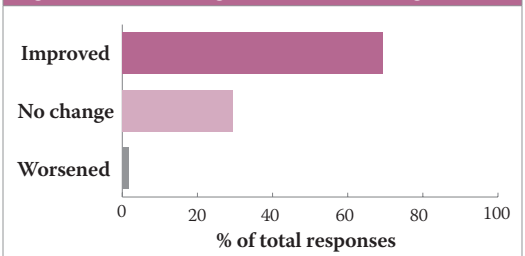


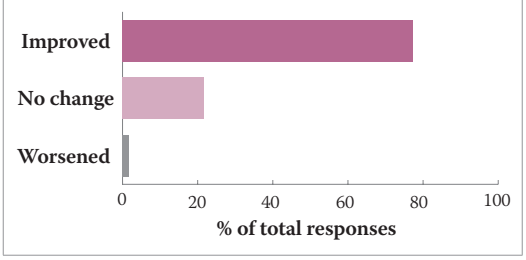
Figure 5. Wound edges and surrounding skin



addressed in question 3 (Figure 5) concerning the wound edges and surrounding skin. To advance wound healing, an optimal wound environment must be provided. Of the 1624 responses, 1124 (69.2%) noted an improvement of the wound edges and surrounding skin after treatment with Flaminal compared to 500 (30.8%) who reported no change or a worsening of the condition. This result is statistically significant, $p<0.0001$ and 95% CI intervals of 66.66%-71.85%, highlighting that the number of people who saw improvements in their surrounding skin was greater than the frequency expected by chance.

Question 4 aimed to understand the effect of Flaminal on granulation tissue (Figure 6), which showed an improvement in 1230 (77.5%) of those who responded compared to 357 (22.5%) who did

Figure 6. Granulation tissue

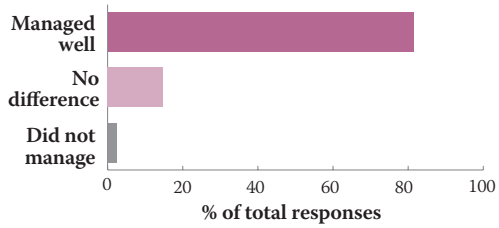


not see a change/worsened. This difference was statistically significant, $p<0.0001$, 95% CI 75.08-

79.75%, stating that the number of responses that reported an improvement in the granulation tissue was greater than expected by chance.

Given that approximately two-thirds of the treated wounds in this evaluation had moderate to high exudate levels, it was critical to have the treating physicians report on Flaminal's ability to manage moisture in question 5 (Figure 7). Of the 1599 respondents, 1321 (82.6%) reported that the moisture was well managed, while only 278 (17.4%) noted not seeing a difference or that moisture was not managed. The difference between the calculated and expected value of 50% was statistically significant, $p<0.0001$, 95% CI intervals of 80.47-84.56%, highlighting that Flaminal performed much better than would have been expected by chance in terms of moisture balance.

Figure 7. Moisture balance



Question 6 was concerning pain management. Patients were asked if they noticed any changes in pain while receiving Flaminal treatment. Of the 1571 responses, 830 (52.8%) reported an improvement, while 741 (47.2%) reported no change or worsening pain. This difference was not statistically significant with $p=0.4149$ and 95% CI intervals of 49.41-56.22%.

The final questions asked the treating physician if they would recommend usage of Flaminal to a colleague and if they were satisfied with its performance. 98% of physicians would recommend it and for 94% Flaminal met or exceeded expectations, identical results to the earlier publications where 356 responses were collected compared with 1657 in this current evaluation.

DISCUSSION

A structured wound assessment is required at the initial patient contact with a documented holistic framework, including photographs and measurements. Care planning is necessary with the patient (and/or carers) developing goals and aims towards effective wound healing (Wounds UK 2018). The results of this evaluation of Flaminal use, which consists of 1657 responses, strengthened the outcome presented in Jones and Oates (2018) previous publication, where only 357 evaluation forms were collected but the results are nearly identical. This highlights the ongoing performance of Flaminal in addressing the T.I.M.E. framework which contributes to the effective treatment and care of patients. The questions asked in the evaluation all reflect an important factor in managing the barriers to healing and the results shown are significant to relate to real-world practice and the need for a suitable and cost-effective dressing regime. With an increase in shared and self-care in recent years, enabling a patient to self-care can play a large part in the holistic patient management plan (White, 2016), so a dressing that is easy to use but effective, is becoming more and more important. Flaminal fits this description; being commonly used for a self or shared care treatment plan due to the ease of use, as demonstrated in the later stages of case study 1.

Pain management plays an important role in wound care but due to its complexity, it is often difficult to score and/or understand appropriately (Jones and Williams, 2017). This survey simply asked if the patients noticed any change in pain during the treatment with Flaminal. This question did not take into account any pain medication taken prior to or during the treatment phase, nor was it assessed using a well-developed pain-assessment tool such as the visual analogue scale. This is clearly a limitation of the current assessment and will be addressed in a future product evaluation

The case studies provide real-world examples to validate the importance of a structured assessment approach to wound management. They demonstrate the multifaceted ability of Flaminal to provide antimicrobial protection and autolytic debridement, that also supports secondary advanced wound closure.

CONCLUSION

'Sandwiching' dressings can cause complications in practice and result in increased costs. Therefore, a dressing that can solely address the many barriers to wound healing will undoubtedly benefit the patient, the healthcare professional and the NHS, in terms of cost-effectiveness and ease of use. Flaminal's characteristics promote autolytic debridement **(T)**, antimicrobial protection **(I)**, moist wound healing whilst offering absorption of excessive exudate **(M)** and wound edge protection **(E)**. This ultimately makes Flaminal an ideal dressing with the versatility to be used throughout the wound healing continuum.

Declaration of interest

This work was supported by an educational grant from Flen Health.

REFERENCES

Azevedo MM, Lisboa C, Cobrado L et al (2020) Hard-to-heal wounds, biofilm and wound healing: an intricate interrelationship. *Br J Nursing* 29(5):S6–13. https://doi.org/10.12968/bjon.2020.29.5.s6

Beele H, Durante S, Keriheul J et al (2012) Expert consensus on a new enzyme alginogel. *Wounds UK* 8(1): 64–73

Cooper RA (2013) Inhibition of biofilms by glucose oxidase, lactoperoxidase and guaiacol: the active antimicrobial component in an enzyme alginogel. *Int Wound J* 10(6): 630–7

Coleman S, Nelson EA, Vowden P et al (2017) Development of a generic wound care assessment minimum data set. *J Tissue Viability* 26 (4):226–40. https://doi.org/10.1016/j.jtv.2017.09.007

De Smet K, Van den Plas D, Lens D, Sollie P (2009) Pre-clinical evaluation of a new antimicrobial enzyme for the control of wound bioburden. *Wounds UK* 21 (3):65–73

Department of Health (2016) Commissioning for Quality and Innovation (CQUIN) guidance for 2017-2018. https://www.england.nhs.uk/publication/commissioning-for-quality-and-innovation-cquin-guidance-for-2017-2019/ (accessed 2 February 2023)

Durante CM (2012) An open label non-comparative case series on the efficacy of an enzyme alginogel. *J Wound Care* 21(1):22–8

Guest JF, Fuller GW, Vowden P (2020) Cohort study evaluating the burden of wounds to the UK's National Health Service in 2017/2018: update from 2012/2013. *BMJ Open* 10(12):e045253. https://doi.org/10.1136/bmjopen-2020-045253

Health and Social Care (2020) Northern Ireland Wound Care Formulary 3rd Edition Available at: https://niformulary.hscni.net/formulary/ (accessed 5 February 2023)

Health Improvement Scotland (2021) Scottish Wound Assessment Action Guide Available at: https://www.healthcareimprovementscotland.org/our_work/patient_safety/tissue_viability_resources/wound_assessment_action_guide.aspx (accessed 5 February 2023)

Jones J, Oates D (2018) TIME to assess wounds –a clinical evaluation of Flaminal. *Wounds International* 14(3): 63-69

Jones J, Williams H (2017) Wound management should not be a pain. *Br J Community Nurs* 22(9): 38-S46

Kupsch A et al (2006) Pallidal deep-brain stimulation in primary generalized or segmental dystonia. *N Engl J Med* 355(19): 1978-1990

Mandybur G (2022) Deep Brain Stimulation (DBS) Mayfield Brain and Spine. Mayfield Clinic, Ohio. https://mayfieldclinic.com/pe-dbs.htm (accessed 28 February 2023)

National Wound Care Strategy Programme (NWCSP; 2018) National Wound Care Core Capabilities Framework for England. https://www.skillsforhealth.org.uk/wp-content/uploads/2021/05/Wound-Care-Framework-2021.pdf (accessed 27 January 2023)

National Wound Care Strategy Programme (NWCSP) and Skills for Health, 2021. Available at: www.skillsforhealth.org.uk/info-hub/national-wound-care-core-capability-framework-for-england/ (accessed 24/01/2022)

Ousey K, Gilchrist B, James H (2018) Understanding clinical practice challenges: a survey performed with wound care clinicians to explore wound assessment frameworks. *Wounds International* 9(4):58–62

Stanway A (2016) Dermnet – All about the skin. Available at: https://dermnetnz.org/topics/cutaneous-vasculitis (accessed 5 February 2023)

Schultz GS et al (2003) Wound bed preparation: a systematic approach to wound management. *Wound Repair Regen* 1:S1-28

Shanmugam VK, Angra D, Rahimi H, McNish S (2017) Vasculitic and autoimmune wounds. *J Vasc Surg Venous Lymphat Disord* 5(2): 280-292

Swanson T, Duynhoven K, Johnson D (2019) Using the new T.I.M.E Clinical Decision Support Tool to promote consistent holistic wound management and eliminate variation in practice at the Cambourne Medical Clinic, Australia: Part 1. *Wounds International* 10(2): 28–39

Vowden P and Vowden K (2016) Clinical care delivery implications of the 'Burden of Wounds' study. *Wounds UK* 12(3): 12–21

White R (2006) Flaminal: a novel approach to wound bioburden control. *Wounds UK* 2(3): 64–9

White R (2014) The alginogel Flaminal: an overview of the evidence and use in clinical practice. *Wounds UK* 10(3): 22–5

White R (2016) Patient self-help in the management of chronic wounds. *Wounds UK* EWMA Special: 8-9

Wounds UK (2018) Best Practice Statement: Improving holistic assessment of chronic wounds. London: *Wounds UK*