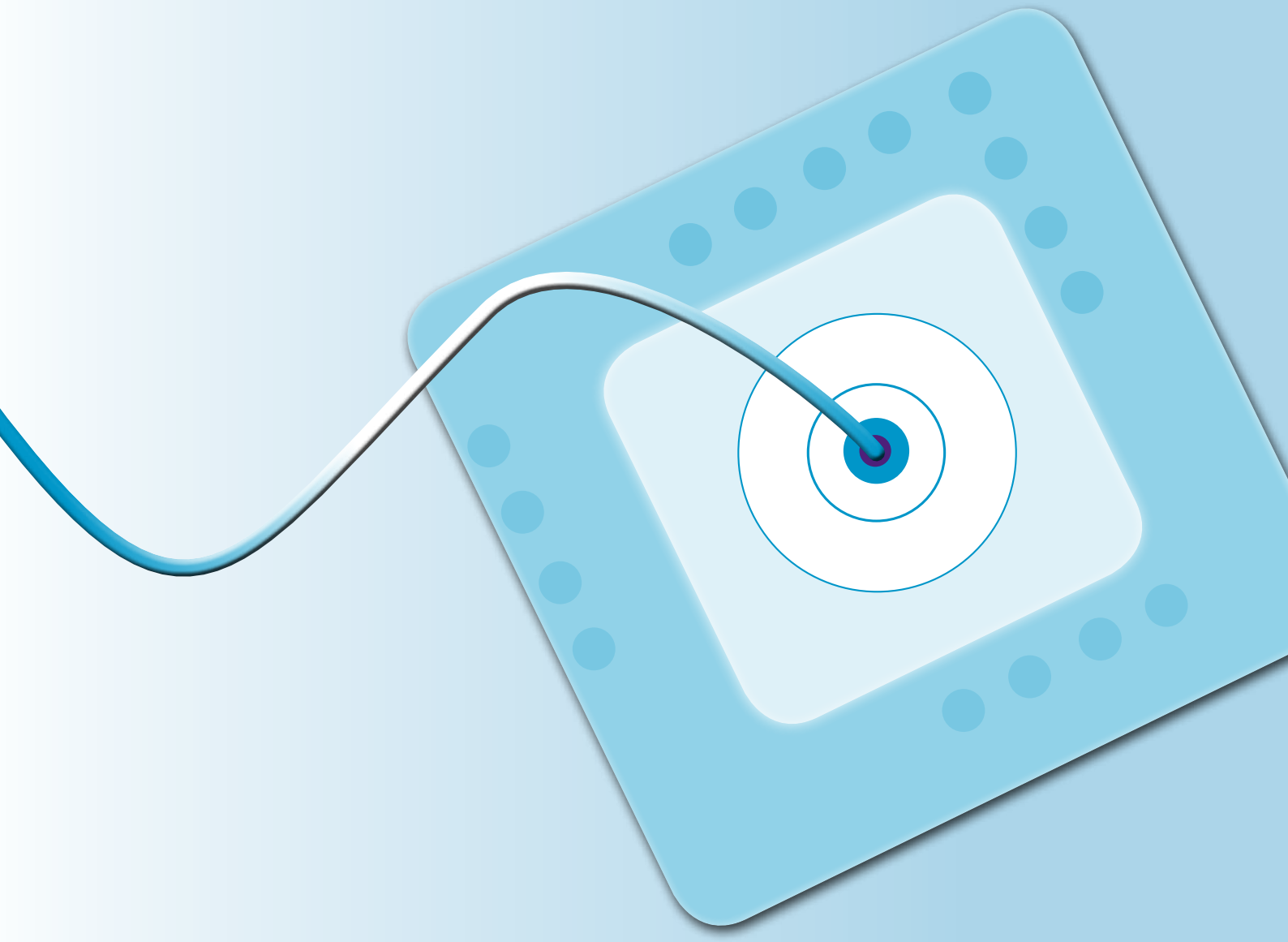
ROUND TABLE DISCUSSION

Using Nanova™ Therapy System in Practice



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FOREWORD

This document discusses the economics and care of hard-to-heal wounds, as well as how they impact patient quality of life. The evidence demonstrates that there is a role for innovation to play in improving outcomes for patients with hard-to-heal wounds, and that advanced wound care therapies (i.e. interventions that are used when standard wound care has failed) are needed to better manage the varying clinical goals necessitated by hard-to-heal wounds.

The Nanova™ Therapy System is a new, advanced therapy that combines an absorbent dressing with negative pressure wound therapy. A group of experts met in June 2015 to discuss the clinical implications of this novel wound management product and set out to:

- Understand what the Nanova™ Therapy System is and how it differs from other similar wound care products on the market
- Agree the patient, wound and environmental considerations that influence the decision to use the Nanova™ Therapy System
- Develop recommendations for use of the Nanova™ Therapy System and develop a decision-making pathway to guide clinical practice.

The ever-increasing costs of hard-to-heal wounds are detailed in Section 1 (p1). Factors that lead to hard-to-heal wounds, as well as their assessment and management, are covered in Section 2 (p3). Section 3 (p6) describes why the Nanova™ Therapy System was developed, how it works, and how it differs from existing wound therapy devices. Section 4 (p8) looks at implementing the Nanova™ Therapy System in practice, presenting the group's recommendations for use of the Nanova™ Therapy System, when to discontinue use, and tips for application. Finally, Section 5 (p13) describes its use in a number of patients using a case study approach.

The goal is to provide clinicians with the information they need to appropriately select and use the Nanova™ Therapy System in practice.

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Economics of hard-to-heal wounds

Healthcare providers — in the UK and worldwide — are facing substantial pressure to impose cost savings, balancing the cost of care with quality of care; however, funding is unlikely to keep pace with demand (Wounds International, 2013). Clinicians must therefore look for opportunities to provide effective care regimens whilst also being time- and cost-efficient.

COST OF TREATMENT

The cost of treating chronic wounds is estimated to exceed £5 billion in the UK in 2016, and this will continue to grow, due in part to an aging population and increased prevalence of comorbid conditions (Department of Health, 2014) (Figure 1, page 2). In fact, patients with multiple long-term conditions, such as diabetes, vascular disease and obesity, are becoming the norm rather than the exception; the number of people with comorbidities in England is set to continue increasing from 1.9 million in 2008 to 2.9 million by 2018 (Department of Health, 2012).

DURATION OF CARE

Wounds that are hard-to-heal are more likely to develop complications, which contribute to longer and more intensive treatment, extended hospital stays, readmissions, and specialist medical or surgical interventions (Dowsett, 2015). In a retrospective study exploring the clinical impact and economic burden of hospital-acquired infections (HAIs), costs and length of hospital stay were both significantly higher in patients with HAIs compared with patients without HAIs (Glance et al, 2011); median length of stay was approximately 2–fold higher in patients with HAIs ($p<0.001$) and costs were 2– to 2.5–fold higher compared with patients without HAIs ($p<0.001$) (Glance et al, 2011).

These costs may further rise if hospital stays are prolonged due to a lack of systems to facilitate early discharge, or there is a "perceived or actual lack of capacity and capability to manage more complex wounds in the community setting" (Dowsett, 2015). When patients are discharged into the community, hard-to-heal wounds may pose further costs, impacted by the duration of treatment required. The longer the time to healing, the greater the need for regular dressing changes, which require a substantial amount of community and practice nurse time (Dowsett, 2015). In one earlier study in Sweden, in a community of 288,000 with a typical wound prevalence of 2.4 per 1000, the equivalent of 57 full-time nurses were required for dressing changes alone (Lindholm et al, 1999).

COST TO PATIENT WELLBEING

The cost of hard-to-heal wounds to patient quality of life should not be overlooked. Hard-to-heal wounds can have a devastating impact on patient wellbeing, compounding healthcare costs and reaching far beyond the healthcare system (Wounds International, 2012):

- **Physical wellbeing**: reduced mobility, avoidance of social contact, poor nutrition, and sleep disturbance or fatigue may affect wound status (EWMA, 2008; Herber et al, 2007)
- **Mental wellbeing**: anxiety and depression are associated with delayed healing. Poor symptom management can result in patients becoming non-concordant with their care, which has a knock-on effect on resource use (i.e. through unused dressing products)
- **Social wellbeing**: patients living with a wound may experience social isolation (Fagervik-Morton and Price, 2009).

Although patients living with a wound are concerned with long-term healing, in the short term they may be more focused on priorities such as reducing pain or odour, covering up unsightly strikethrough, preventing dressing leakage, or concerns about bulky dressings that prevent them from wearing their regular clothing and performing daily activities (Wounds International, 2012).

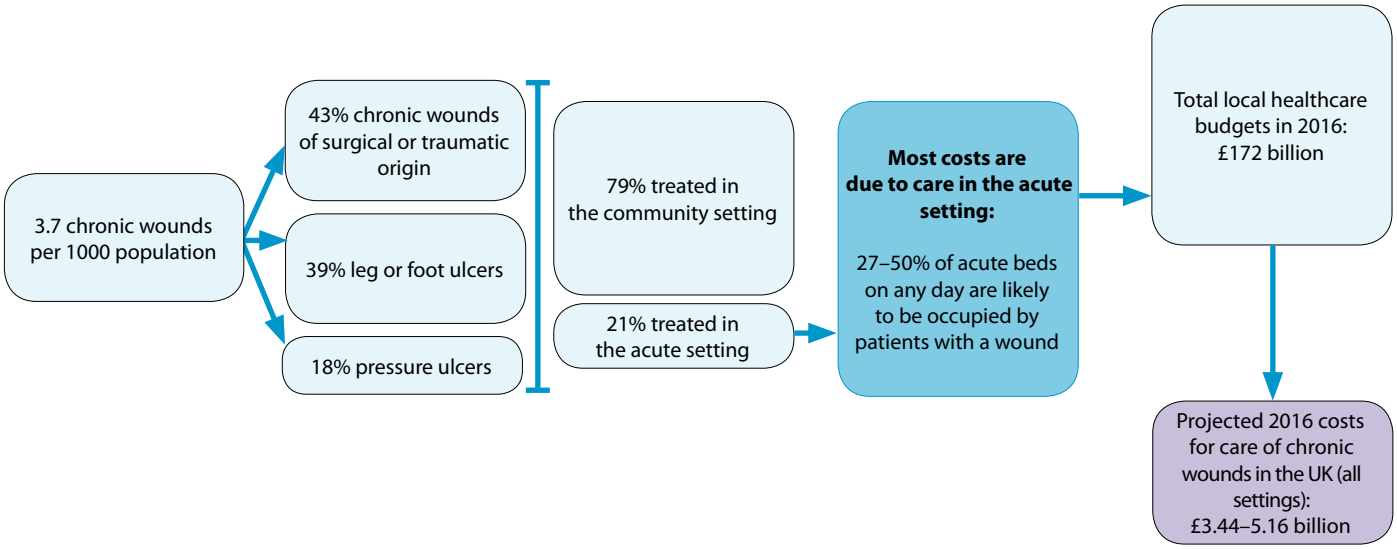


Figure 1: Costs of treating chronic wounds (adapted from Posnett et al, 2009; HM Treasury, 2015)

When patients are able to be actively involved in their own care — including understanding their treatment options, making the decision to initiate a particular therapy, or self-manage — outcomes improve (Wounds International, 2012). It is, therefore, critical, particularly when being mindful of costs, to involve patients and choose treatments that they or their carers are able to manage as independently as possible. Clinicians should look for existing capabilities and work with patients to support their everyday activities (Wounds International, 2012).

DRESSING AND DEVICE ECONOMICS

Historically, dressing costs have been assessed on a per-unit basis: this has led to the development of formularies that promote more cost-effective individual dressings. However, the least expensive dressing is not always the most cost- or clinically-effective. Therefore, dressing and wound management options must not only impart clinical benefits at a reasonable cost — for example, early control of symptoms and promotion of wound closure — but should also provide benefits that exceed those that would be gained if the resources were used elsewhere (i.e. cost-effective) and improve patient quality of life (Wounds International, 2013).

If innovative, advanced dressing technologies can improve healing times, there will be cost savings well beyond the 'higher' short-term spend. However, to balance shorter healing times with the higher per-unit costs of many advanced dressings, health systems need to implement appropriate decision-making pathways that incorporate prevention efforts, provide clear guidance for when to start and discontinue an advanced dressing and when to step down to another therapy, and shape care around the patient (Wounds International, 2013).

Understanding hard-to-heal wounds

A hard-to-heal wound is one that fails to heal in an orderly and timely manner with standard therapy (Troxler et al, 2006). This definition applies equally to both acute and chronic wounds, independent of wound type or aetiology (Vowden, 2011). The determination of whether a wound should be considered 'hard-to-heal' is based on the presence of complicating factors, which may be due to local wound-related problems or to systemic issues. Complicating factors increase the likelihood of a wound stalling in a particular phase of healing, typically the inflammatory phase. These factors result in a wound becoming hard-to-heal and extend the duration of treatment, increasing associated costs (Table 1, page 4) (Vowden, 2011).

Wounds that do not heal can be distressing for patients, causing pain, immobility and reduced quality of life. The longer a wound remains unhealed, the higher the risk of infection, which can lead to further deterioration of the wound bed and periwound skin, with a potential increase in wound-related morbidity (i.e. it becomes even more difficult to close the wound, or surgical intervention may be necessary) (Dowsett et al, 2012). To ensure effective use of resources, there is a drive to move patients out of hospital and back into the community as soon as is safely possible, and to reduce the number of patients from the community being admitted or readmitted to hospital.

Management of hard-to-heal wounds is therefore key to ensuring a smooth and efficient cycle of care that allows patients to be treated in the community, maintaining their daily activities and moving towards healing (Dowsett, 2015).

Advanced wound therapies can, if used appropriately, promote healing by removing the barriers to closure. This has the potential to result in long-term savings despite initial treatment costs.

ADVANCED THERAPY OPTIONS

A large number of advanced wound dressings are available with a wide range of physical performance characteristics (e.g. size, adhesion, conformability and fluid handling properties). If used in an appropriate manner, these products lead to early control of symptoms (e.g. exudate), promote wound healing and improve patient wellbeing (Vowden, 2011). Appropriate wound dressings need to be selected based on a holistic assessment of the patient, the wound and the environment. However, the wide variety of dressings available often makes this difficult.

The efficacy of negative pressure wound therapy (NPWT) is widely accepted (Huang et al, 2014). This can be shown to reduce oedema, improve vascular perfusion, and promote granulation tissue formation by allowing cell migration and proliferation, and so facilitate wound closure (WUWHS, 2008). In addition, faster treatment times are seen with NPWT — for example, 29 days with NPWT versus 45 days with other standard therapies was demonstrated in a study examining average healing times in venous leg ulcers (P=0.0001) (Vuerstaek et al, 2006). Indeed, since hard-to-heal wounds can be either acute or chronic in nature, advanced treatments such as NPWT are now considered much earlier in the wound-healing continuum. See Case Study 4, page 16.

TABLE 1: Common complicating factors in hard-to-heal wounds (Guo and DiPietro, 2010; Hess, 2011; Vowden, 2011; Cutting et al, 2015)	
Complicating factor	**Explanation**
Wound-related factors	
Large or expanding size/depth	New wounds that are large in size (e.g. abdominal surgical wound) or depth (e.g. pilonidal sinus), or existing wounds that are increasing in size and/or depth may be more difficult to heal
Anatomical location (e.g. natal cleft)	Anatomy more likely to trap moisture may lead to increased skin breakdown, and dressings may be more difficult to apply securely in some locations
Poor wound bed condition	The presence of non-viable tissue (e.g. necrotic tissue, slough) in the wound bed will prevent granulation and wound epithelialisation from occurring
Higher-than-expected exudate levels	Chronic wound exudate can break down the cell-supporting extracellular matrix and lead to maceration, with enlargement of the wound
Critical colonisation/local infection	Excess bioburden and infection can cause the wound to break down, increase in size and become chronic
Inflammation	A chronic inflammatory state can delay healing and may be associated with biofilm
Patient-related factors	
Long-term conditions (e.g. diabetes, coronary artery disease, peripheral vascular disease)	Inadequate blood and oxygen flow to the tissues impede healing, while altered sensations (e.g. neuropathy) can increase risk of trauma and complications
Obesity	The presence of comorbidities and poor blood supply to adipose tissue increases the risk of wound complications (e.g. skin infection, dehiscence, haematoma and seroma)
Immunosuppression and radiotherapy	Disease, medications or age can alter the body's ability to regenerate cells and heal. Radiotherapy may alter the skin and cause irritation and breakdown
Nutritional status	Nutritional deficiencies make healing more difficult
Previous history of chronic wounds	Can signal that a new or existing wound may also be challenging to heal
Lifestyle issues (e.g. smoking tobacco, drinking alcohol)	Smoking tobacco and consuming alcohol beyond recommended limits decrease the body's ability to heal
Lack of mobility	Patients who spend long periods of time sitting or who are bedbound are at increased risk of pressure ulcers and worsening vascular disease

TECHNOLOGICAL ADVANCES IN NPWT THERAPY

The development of portable NPWT devices has facilitated treatment in the community setting. There are distinct economic benefits associated with the growing use of NPWT in this setting:

- Earlier hospital discharge for patients who would otherwise have been treated with NPWT in hospital; this continuity of care from hospital to home is likely to lead to a reduction in the cost of wound care compared with keeping a patient in hospital for a day (with the average cost of an inpatient stay estimated to be £288 per day) (Vowden et al, 2009)
- Reduction in resource use, where the alternative to NPWT would require higher levels of resource; for example, reduction in the frequency of dressing changes for patients with high levels of exudate may lead to reduced nursing time and quantity of consumables used
- Potential for prevention of high-risk complications such as emergency hospital readmissions for grafting or amputation; the incidence of these complications is reduced in patients with diabetic foot ulcers who receive NPWT (Blume et al, 2008)

These benefits translate to substantial cost savings: compared with the use of NPWT in the acute setting, NPWT in the community was estimated to save £4,814 per patient across the duration of their care (average duration: 20.4 days) (Dowsett et al, 2012).

The development of a new generation of wound care products creates opportunities to improve access to advanced therapies by broadening their applicability and making them easier to apply and manage. The goal is to minimise the effect of wounds on patient quality of life and encourage patients to participate in their care at home, while improving clinical outcomes — all of which reduce the economic burden on the healthcare system (Dowsett, 2015).

Understanding the Nanova™ Therapy System

The Nanova™ Therapy System, an absorbent dressing enhanced by negative pressure, is part of a new generation of wound management options (Box 1).

INDICATIONS

The Nanova™ Therapy System is indicated for use on patients with hard-to-heal wounds, both acute and chronic, with low-to-moderate exudate, including shallow acute, traumatic, sub-acute and dehisced wounds, partial thickness burns, chronic ulcers (such as diabetic, venous or pressure), flaps and grafts.

It may be used as an alternative to standard dressings to promote healing (where standard dressings are not facilitating normal healing), and can be used in any care setting — including primary care, nursing home, wound clinic and hospital. Some patients may be able to self-manage at home due to the ease of application and removal. However, there may be instances where it is difficult for the patient to manage their treatment at home; for example, patients with conditions such as rheumatoid arthritis, which limit their ability to depress the pump, or dementia, where cognitive impairment may inhibit the patient's ability to self-manage. As such, all patients should be reviewed for their ability and willingness to self-manage.

KEY COMPONENTS

There are four components to the Nanova™ Therapy System (Figure 2, page 7) that work together to provide the functionality of an advanced absorbent dressing with negative pressure to encourage wound healing.

BOX 1: What makes the Nanova™ Therapy System different?

1. The Nanova™ Dressing is low profile: it may encourage concordance in patients who might benefit from NPWT, but are reluctant to use larger powered devices.

2. Once connected to the dressing tubing, one to three depressions of the easy-to-use therapy unit evacuates air through the pressure distribution layers, delivering continuous negative pressure of -125mmHg.

3. When air is evacuated the dressing collapses, creating a negative pressure environment that is not provided by traditional absorbent dressings. If the seal is lost at any time, negative pressure can be easily restored by resealing the dressing and depressing the therapy unit; there is no need for a nurse visit to fix the unit.

4. Exudate is absorbed into and retained within the dressing's absorbent pad. Since the pressure distribution and absorptive layers are independent of one another, as the dressing absorbs exudate, negative pressure is maintained. Absorption continues even if the NPWT seal is lost, unlike with conventional powered NPWT devices.

5. Due to the unique structure of the dressing, the pressure pathway is maintained regardless of orientation, so the dressing can be rotated or placed off-centre, without compromising functionality, even in difficult-to-dress patients. Each dressing is supplied with an 8cm x 8cm V.A.C.® GranuFoam™ wound filler. Use of the wound filler is at the clinician's discretion, and the foam should be cut to fit within the wound margins.

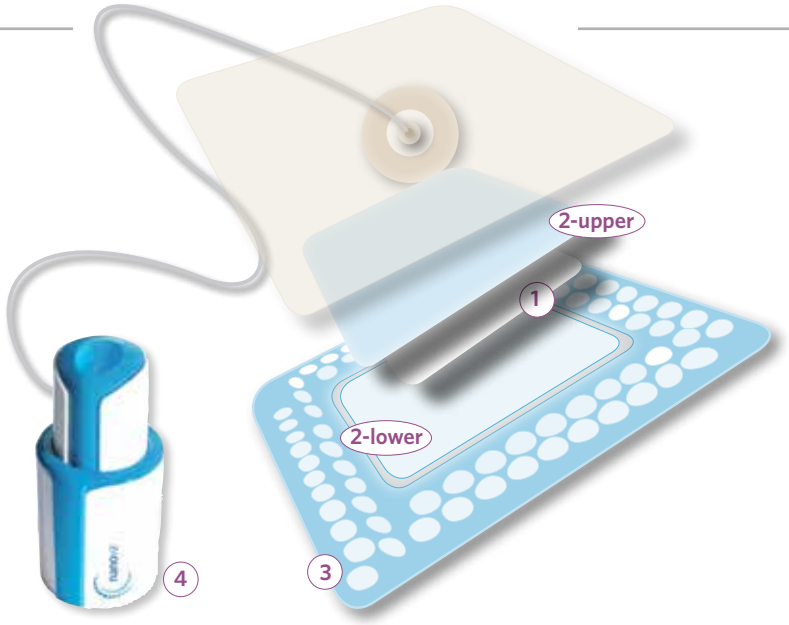


Figure 2: Key components of the Nanova™ Therapy System

Absorbent dressing (1)

The absorptive core of the dressing retains exudate, removing the need for a separate fluid reservoir. The core locks in exudate to minimise risk of maceration, and will continue to absorb fluid even if negative pressure has been lost. The dressing is suitable for use on wounds with low-to-moderate levels of exudate.

Negative pressure distribution layers (2)

The Nanova™ Therapy System has both upper and lower pressure distribution layers to ensure that negative pressure is maintained regardless of the amount of wound fluid absorbed. The functions of absorption and pressure transfer are independent of one another. Once an effective seal is achieved, one to three compressions of the therapy unit will deliver continuous negative pressure (-125 mmHg). The therapy unit can be compressed at any time to maintain negative pressure.

DermaTac™ Protective Seal Technology (3)

Nanova™ Therapy System's DermaTac™ Protective Seal Technology combines silicone and acrylic/polyurethane adhesives to produce and maintain a seal for negative pressure while minimising potential trauma to the skin and pain on removal. The wound contact layer is 100% silicone, preventing adhesion to the wound, and is perforated to allow fluid to pass through to the absorptive core. The primary contact layer on the border is also silicone, which is perforated to expose windows of acrylic adhesive that aid in maintaining the seal necessary for effective negative pressure.

Nanova™ Therapy Unit (4)

The therapy unit is manually activated, rather than being mains or battery powered. Its operation is intuitive, with one to three compressions of the plunger needed to deliver regulated negative pressure. There is a visual indicator (a yellow line), which is not visible once negative pressure is achieved; if the line reappears, the plunger needs to be compressed to restablish negative pressure. The unit can be manually re-primed at any time. This reduces the need for specialist training, allowing patients or carers to manage the system between clinician visits (if the patient is self-managing). The robust therapy unit is silent, lightweight and small (it can be put into a pocket), and can be used on a single patient for up to 30 days, with regular dressing changes.

The Nanova™ Therapy System in practice

HOLISTIC ASSESSMENT

Use of the Nanova™ Therapy System must be based on a holistic assessment of the patient, their wound and their living environment. This will inform goals of treatment, with monitoring and review guided by pathways that include best practice recommendations. A holistic assessment to establish suitability for the Nanova™ Therapy System should include:

- A full patient, medical and surgical history to establish underlying cause/s, any comorbidities and previous history of the wound
- A wound assessment to identify the aetiology of the wound, and assess condition of the wound and surrounding skin
- A psychosocial assessment to understand the patient's needs, as well as their living circumstances, and ability and willingness to use the device.

USING THE NANOVA™ THERAPY SYSTEM IN PRACTICE

The Nanova™ Therapy System care pathway provided in Figure 3 (page 9) should be used to determine appropriate implementation of the system and course of care for the patient.

Indications

Use of the Nanova™ Therapy System may be considered in wounds displaying one or more of the following characteristics:

- Longer-than-expected duration for the wound type (e.g. longer than 4 weeks of standard wound care)
- Thin- to medium-viscosity exudate (low-to-moderate levels)
- Presence of slough with or without granulation tissue
- Wound bed not granulating
- Wound bed granulating but not epithelialising
- Shallow cavity wounds, in particular.

Contraindictions and special precautions

The Nanova™ Therapy System should not be used:

- On wounds contraindicated for NPWT
- On infected or necrotic wounds (should be treated prior to initiating Nanova™ Therapy)
- Over articulating joints or where a seal cannot be adequately created and maintained (e.g. on the knee or side of the foot)
- Where the periwound skin is very fragile and may be compromised by the placement of the dressing
- In the presence of significant oedema.

Use of the Nanova™ Therapy System on patients taking anticoagulation medication is not contraindicated; however, appropriate care should be taken to ensure there is no increased bleeding. Wound-related pain is not a contraindication, but clinicians should perform regular pain assessments using a validated scale and take appropriate measures to minimise pain at dressing-related procedures (WUWHS, 2004). Nanova™ Therapy can be used where exudate levels are not sufficiently high for standard NPWT, but where other dressing options are not able to manage exudate effectively.

Figure 3: Nanova™ Therapy System care pathway

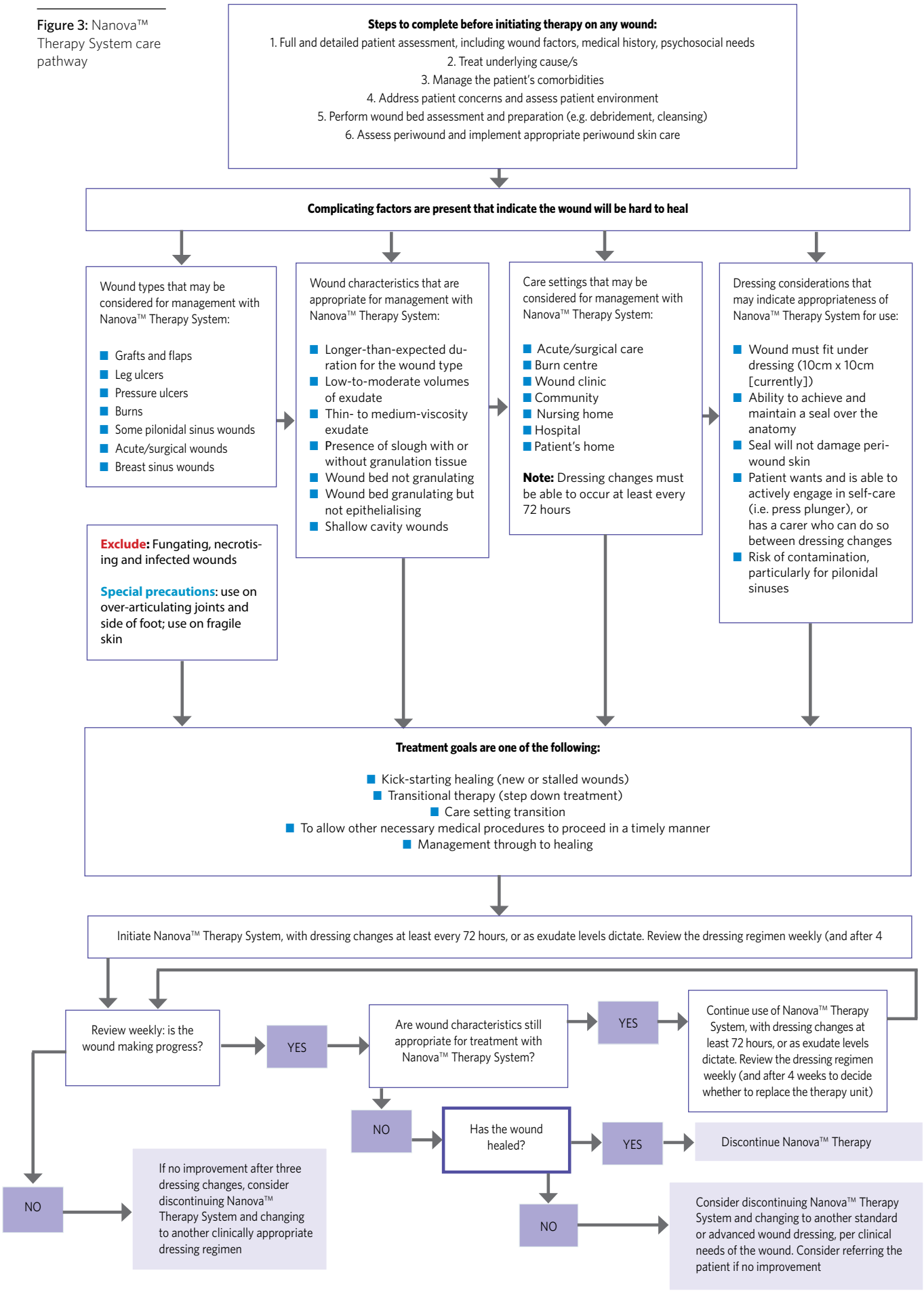
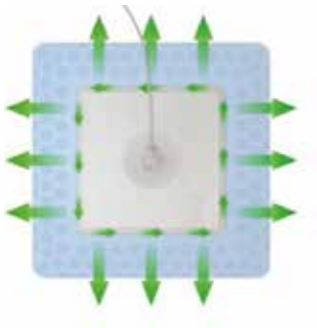


Figure 4: Sealing the dressing



TREATMENT GOALS

There are several different treatment goals for the Nanova™ Therapy System in appropriate wounds and patients:

- Kick-start healing (in new and non-healing wounds) — where complicating factors are present, to prevent the wound becoming stalled, and to speed transition to standard wound care; or where complicating factors have led to a stalled wound or have stopped the initial progress of a wound, to encourage vascularisation and granulation, and to move the wound towards healing
- Transitional therapy — where use of a conventional NPWT system is no longer practical (at discharge), but where the patient would still benefit from negative pressure, the Nanova™ Therapy System can be used as a step-down treatment
- Care setting transition — to aid transition from an acute setting to the community (e.g. hospital to nursing home, or to the patient's own home)
- Allow other procedures to be expedited — where the speed of wound closure is paramount to the patient's overall wellbeing because the presence of the wound is preventing another procedure, such as chemotherapy or orthopaedic surgical procedures
- Manage through to healing — where the wound is slow to heal and patient has multiple underlying comorbidities, in order to maintain an optimal environment for wound healing (e.g. effective exudate management).

PRACTICAL TIPS FOR USE

Before application

- Prior to use of the Nanova™ Therapy System, treat any underlying cause/s, manage patient comorbidities and address any concerns, and consider limitations of the patient environment
- Prepare the wound bed according to the principles of TIME (Tissue, Inflammation/infection, Moisture, Edge of the wound) (Dowsett 2005). Consider the use of a barrier film to protect vulnerable periwound skin. Apply only to intact, dry skin; creams (i.e. moisturising cream) should only be used after the dressing has been applied and a seal obtained, as these will make it difficult to achieve an initial seal
- Consider the dressing size (10cm x 10cm; additional sizes currently in development), shape and ability to maintain a seal over the anatomy. Also, consider the depth of the wound, using GranuFoam™ as wound filler where necessary (at the clinician's discretion). Cut the GranuFoam™ so it is slightly smaller than the wound, in order to enhance inward epithelial migration. The absorptive pad should never be cut.

During application

Sealing the dressing: mould the dressing to the contours of the anatomy and smooth out the border of the dressing, eliminating any creases (Figure 4). Run a finger around the central pad to seal the adhesive edge to the skin.

Positioning the dressing: Rotate the dressing over the wound for optimal positioning. In many instances, it is easier to maintain a seal when the dressing is placed in a diamond orientation over the wound (Figure 5, page 11). The dressing does not need to be centred as there is a wicking layer that disperses fluid throughout the dressing.

If applying close to joints, take care to ensure that the dressing will not be creased in a tissue fold, orienting the dressing to minimise the amount of dressing extended over joints. Nanova™ should not be used where a seal cannot be adequately created and maintained; for example,

Figure 5: Positioning the dressing

achieving an adequate seal in diabetic foot ulcers with Nanova™ Therapy System can be difficult due to anatomical challenges.

Connecting and securing the unit:

- Connect the dressing to the therapy unit and ensure that the tubing is secured to prevent snagging during expected range of patient activity
- Depress the Nanova™ Therapy Unit plunger to achieve negative pressure. Check the seal is intact. Check for the presence of a yellow line throughout — the yellow line is not visible once negative pressure is achieved; if the line reappears, the plunger needs to be compressed to restablish negative pressure
- Secure excess tubing to the skin or dressing with some simple tape. If necessary, recommend a mechanism for carrying the Nanova™ Therapy Unit (e.g. a bag or belt loop).

3

Dressing change

Wear-time is dependent on the level of exudate, but the dressing should be changed at least every 3 days. The dressing becoming fully absorbed is an indication of the need for change (Figure 6). With the application of negative pressure, it is normal to observe dimpling in the skin that corresponds with the perforations in the dressing; this does not negatively impact healing and resolves spontaneously. Dimpling of the skin may be more pronounced in situations where Nanova is used under compression, but this will resolve spontaneously. Use medical adhesive remover at dressing change if the patient has delicate skin or pain.

4

Review and monitoring

Check the dressing and wound at each change for signs of improvement. Clinical signs of improvement include:

- Increase in granulation tissue/epithelialisation
- Reduction in level of exudate
- Reduction in slough
- Reduction in wound size
- Reduction in pain levels.

5

Discontinuation or suspension

Treatment should be reviewed once per week, and again after 4 weeks (this is when the Nanova™ Therapy Unit should be replaced if treatment is continued). If no improvement is seen after three dressing changes, Nanova™ Therapy should be discontinued. An exception to this would be if healing is not the intended outcome, but palliative management of symptoms is instead the primary goal.

If the skin becomes irritated or an allergic reactions occurs, discontinue Nanova™ and treat the skin accordingly; if re-starting treatment with Nanova™ Therapy, consider a no-sting barrier film to protect the skin.

If there is an increase in pain, there should be a high index of suspicion for infection. If signs and symptoms of localised infection appear, discontinue the Nanova™ Therapy System and treat with a suitable antimicrobial dressing, resuming when signs and symptoms have resolved. Look for indicators of increasing bacterial load other than pain (such as increased malodour), as pain may not always be present.

Treatment should be reconsidered if the patient has fragile skin or there are surrounding skin problems due to the acrylic adhesive in the border of the dressing or if the negative pressure seal is regularly lost.

Figure 6: Dressing *in situ*, showing when to change the dressing

Integrating the Nanova™ Therapy System into practice

The need for cost-effective and efficacious solutions to manage hard-to-heal wounds makes the Nanova™ Therapy System a key addition to any wound care formulary.

NPWT provides numerous benefits, including improved time to healing, reduced wound healing costs, and reduced nurse care time (Vuerstaek et al, 2006), all likely to lead to cost benefits. The Nanova Therapy System is easy to use and simplifies the delivery of NPWT, making it accessible not only in terms of cost, but also logistics and patient mobility.

Indeed, the Nanova™ Therapy System is practical and does not get in the way of everyday life. The unit is lightweight and can fit in a pocket, allowing it to be easily carried; it also does not require battery or mains power, and operates silently. In patients who have Nanova™ Therapy on a limb, a doubled retention bandage is appropriate to retain the pump, meaning it is less likely to be disturbed; alternatively, the pump can be taped to the outside of the retention bandage.

Moreover, although competency will be required to assess and evaluate the wound, minimal training is required to apply, administer and remove Nanova™ Therapy. The unit is manually activated, and one to three compressions delivers regulated negative pressure that can be re-primed at any time. Pressure is maintained at -125mmHg once activated.

This practicality and ease of use is likely to increase acceptability for patients, with improved concordance resulting in better outcomes. The potential benefits of the Nanova™ Therapy System, based on the clinical experience of the group, are summarised in Box 2.

BOX 2: Potential benefits of using Nanova™ Therapy System

Wound management

- Maintains moist wound environment, which helps wound bed preparation through autolysis
- Manages exudate — can be used in any wound where a foam dressing would be appropriate
- Incorporates NPWT, which has proven benefits including improved time to healing, reduced wound healing costs, and reduced nurse care time (Vuerstaek, 2006).

Practical factors

- Easy to manage in the community — similar application to modern dressings (minimal training needed for device application)
- Allows patient mobility (can be carried in a pocket, on a belt or in a bag)
- Facilitates early discharge from hospital and continuity of care with NPWT, increasing cost efficiencies
- Can be used under compression.

Patient quality of life

- Allows patients to continue with normal activities to the fullest extent possible
- Patients have the option to home- or self-care, giving them more control over their schedules
- Instills confidence that exudate will be controlled even if negative pressure is lost, preventing embarrassing leakage or soiling
- Portable, easy to use and discrete, giving patients a sense of control and independence.

Case studies

CASE STUDY 1: LONG-STANDING BURN INJURY TO FOREARM

Tanya Brandon, Plastics Nurse Specialist, St John's Hospital, Livingston, Edinburgh

Background
Mrs EK is a 52-year-old female who had suffered a burn to the left forearm 48 years prior. However, the wound had broken down repeatedly over the years, and she had a history of sarcoidosis and burn contractures. The patient was seen in the outpatient plastic surgical department in advance of another skin grafting procedure. She had recently undergone several debridement procedures, and the wound had been treated with a foam dressing.

However, due to the high risk of the wound becoming stalled, the Nanova™ Therapy System was initiated to aid healing of the wound without undue pain and use of bulky machinery. At this time, wound measured 12cm x 7cm; the wound bed comprised 80% granulating (of which approximately half was active) and 20% sloughy tissue; and there were moderate levels of serosanguinous exudate. The patient rated pain as 5 out of 10 on the visual analogue scale (VAS). A hydro-desloughing fibre dressing was used in conjunction with Nanova™ Therapy System. The dressing was placed diagonally to accommodate the wound and dressing changes were scheduled for every 3 days.

Week 1 review: The wound size had reduced slightly, to 12cm x 6.5cm (7% reduction in wound area from baseline), and the wound bed was now 90% granulating (of which approximately two thirds was active granulation) and 10% sloughy tissue. The patient reported no pain during dressing wear or at change, and the application of the dressing and achievement of negative pressure took less than 5 minutes. Nanova™ Therapy and dressing change frequency were continued unchanged.

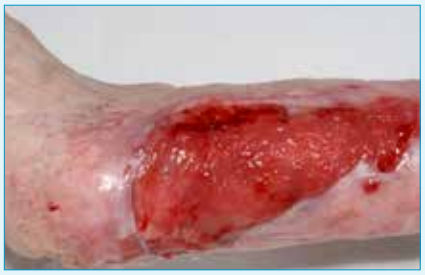
Week 2 review: The wound showed signs of critical colonisation, and periwound skin had become macerated. However, wound size had decreased to 11.5cm x 6cm (18% reduction from baseline), and the wound bed was 100% granulating. Exudate levels remained moderate. Due to the progress in the wound, as well as patient comfort and dressing ease of use, the Nanova™ Therapy System was continued in conjunction with an antimicrobial dressing to reduce bacterial burden.

Week 3 review: The wound remained critically colonised, but continued to improve in terms of size, decreasing to 10.5cm x 4.5cm (44% reduction from baseline). Periwound skin appeared dry and flaky, and exudate levels were moderate. The patient and clinician expressed high satisfaction with Nanova™ Therapy System's ease of use and comfort. Because of steady progress in the wound, the Nanova™ Therapy System was continued, this time in conjunction with an antimicrobial dressing to reduce infection risk.

Week 4 review: The wound was still critically colonised, with moderate exudate and the periwound skin remained macerated. However, there was a further reduction in wound size, to 10.5cm x 4cm — a 50% reduction from baseline. The patient continued to report no pain during dressing wear and change. Because of these factors, and the steady positive progress in the wound, Nanova™ Therapy System was continued beyond the study period.

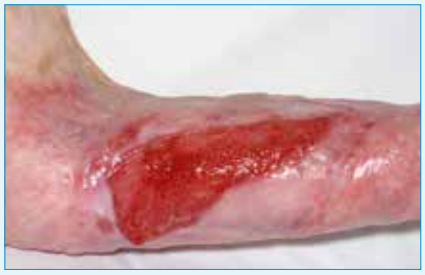
Note: The use of other wound care dressings in combination with the Nanova™ Therapy System has not been clinically evaluated by the manufacturer

Baseline: 16/2



Week 1: 23/02

Week 3: 10/3



Week 4: 16/3

Summary

- Recurrent, long-standing burn injury sustained 48 years prior
- 50% reduction in wound volume by week 4 (44% at 21 days)
- Nanova™ Therapy was continued beyond study period to maintain steady wound progression prior to skin grafting

CASE STUDY 2: NATAL CLEFT WOUND OF 12 MONTHS' DURATION

Caroline Dowsett, Nurse Consultant Tissue Viability, East London NHS Foundation Trust

Background

Mrs IM is an 82-year-old female who presented to the community dressing clinic with a wound of unknown origin in the natal cleft. It had recently increased in size and had been present for 12 months. She had arthritis and had undergone coronary artery bypass graft surgery 10 years prior.

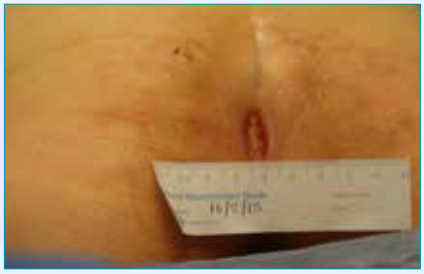
The wound had previously been treated with a silver primary dressing and a hydrocellular foam bordered dressing, with dressing changes twice weekly. There had also recently been a 2-week trial of a further antimicrobial dressing and 3-day wear time. At presentation on 16 February, the wound measured 2cm long x 1cm wide x 1cm deep and was painful — rated 4 out of 10 on the visual analogue scale (VAS). It comprised 50% granulation tissue and 50% slough, with a moderate level of serous exudate. The periwound skin was assessed to be healthy. The Nanova™ Therapy System was considered due to the lack of response to previous treatments and a reluctance to admit the patient to hospital due to her advancing years and frailty. Dressing change was scheduled to be every 3 days.

Week 1 review: The wound had a moderate level of exudate and its overall condition had improved, with 100% granulating tissue as well as a small reduction in depth, to 0.7cm (15.7% reduction in wound volume from baseline). Changing the Nanova™ Therapy Dressing took 2 minutes and took just two presses of the plunger to achieve negative pressure. The patient had experienced discomfort during the previous dressing changes, and was reluctant to take analgesia. Despite the lack of pain control, pain during wear time was rated as a 4 and pain at dressing change as a 5 out of 10 on the VAS.

Review 2: There was good improvement in the wound; the surrounding skin appeared healthy and exudate levels were moderate. Nanova™ Therapy System was therefore discontinued on 26 February (10 days) and a standard dressing applied.

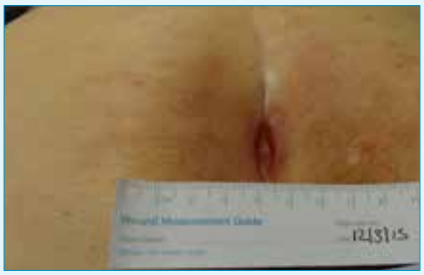
Review 3: On 12 March, the wound had deteriorated, although there had been a small reduction in depth, to 0.5cm; the wound bed comprised 20% granulating and 80% sloughy tissue. It was decided to restart Nanova™ Therapy and application took just 2 minutes, with three depressions of the plunger needed to achieve negative pressure. The patient rated pain during dressing change as 3 out of 10 on the VAS. Dressing changes took place every 3 days.

Review 4: One week later, the wound had improved, with 80% granulation tissue and 20% slough. There was also a further reduction in size, to 1.8cm by 0.5cm by 1cm (a 55% reduction in size from baseline). Periwound skin was healthy. The dressing remained very easy to use from both the patient and clinician perspectives. The Nanova™ Therapy System was discontinued as the goals of therapy had been achieved.



Baseline: 16/2

Nanova™ Therapy System in situ



Review 3: 12/3

Review 4: 19/3

Summary

- Natal cleft wound of 12 months' duration in a patient with few treatment options available
- 55% reduction in wound volume over the course of treatment
- Nanova™ Therapy allowed the patient to be treated in the community and avoided the need to admit her to hospital

CASE STUDY 3:
BREAST SINUS WOUND THAT STALLED FOR 18 MONTHS

Rosie Callaghan, Tissue Viability Nurse Specialist, Worcester Health and Care Trust, Worcester

Background

Mrs SW is a 26-year-old female who had a breast abscess; she was visiting a practice nurse for dressing changes and was able to continue to work in the retail industry. The patient was fit and well, with no comorbidities or relevant medical history. After the breast abscess developed, it was surgically drained. Although initial progress was good, the wound became stalled. The patient was referred to the tissue viability (TV) team at 18 months due to non-healing of the abscess.

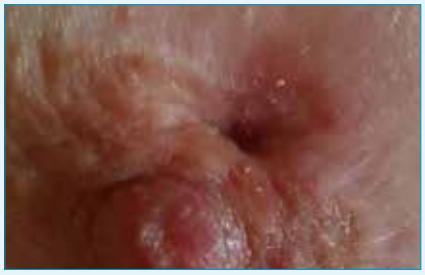
On referral to the TV team, the abscess measured 1cm long x 1cm wide x 5cm deep. It was not painful and the wound bed was epithelialising. There was slight malodour and daily dressing changes were required to manage the moderate level of serosanguinous exudate. The patient had been on antibiotics on and off for 12 months, including at the time of referral. The TV team consulted with a microbiologist who suggested stopping the antibiotics and cleansing the wound daily for a week with an octenidine-containing solution. As the patient was independent and active, and exudate levels were moderate, Nanova™ Therapy System was initiated 1 week later to restart healing. Dressing change was scheduled for 3 days later.

Review 1: At day 3, the wound had not changed in size, measuring 1cm x 1cm, but depth had reduced to 3cm (40% reduction from baseline), and the wound bed was now 100% granulating. The patient continued to have no pain and malodour had resolved. Exudate levels were still moderate, but there was no leakage; the patient reported being 'pleasantly surprised' that it had coped where previous dressings had not. Periwound skin was healthy. Application, set-up and use of the Nanova™ Therapy System was rated as 'very easy' — it took 5 minutes from start to finish, and only two depressions of the pump were required to achieve negative pressure. The patient reported high levels of comfort during wear. Nanova™ Therapy System was continued, with dressing changes scheduled every 3 days.

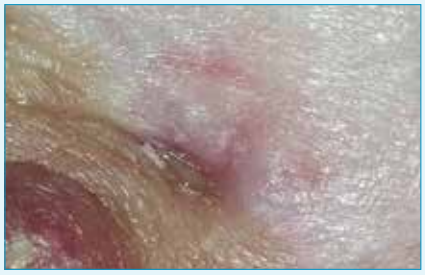
Review 2: At day 6, the wound size remained unchanged. However, exudate levels were noticeably lower, and periwound skin remained healthy. Patient comfort and clinician ease of use were both highly rated. Because the wound was improving, Nanova™ Therapy was continued, with changes every 3 days.

Review 3: Six days later, the wound still measured 1cm x 1cm, but depth had reduced to 2cm (60% reduction in wound depth from baseline). Exudate levels were still low, and surrounding skin remained healthy. Satisfaction with comfort and ease of use remained high, and the patient reported being 'so happy' that the wound appeared to be healing after such a long time. Nanova™ Therapy was continued with changes every 3 days.

Review 4: One week later (week 3), the wound had continued to decrease in size, now measuring 0.5cm x 0.5cm (a 75% reduction in wound area from baseline) x 0.5cm deep (a 90% reduction in wound depth from baseline). The wound bed was epithelialising, exudate levels were low, and periwound skin remained healthy. The patient reported high levels of comfort during wear with no reports of wound-related pain, which had a huge impact on the patient's wellbeing. All parameters for ease of set-up, application and use were rated 'very easy'. The Nanova™ Therapy System was discontinued as all treatment goals had been met and the patient was given a simple wound dressing.



At the start of Nanova™ Therapy



At week 3

Summary

- Breast abscess of 18 months' duration in young female
- 60% reduction in wound depth by 12 days
- Difficult-to-dress area with almost complete healing achieved at week 4 with Nanova™ Therapy and good comfort levels

CASE STUDY 4: BLUNT TRAUMA WOUND FROM A RUGBY MATCH 6 WEEKS PRIOR

Pat McCluskey, Advanced Nurse Practitioner in Wound Care, Cork University Hospital

Background

Mr GM is a 25-year-old male who presented with a trauma wound to the right upper tibial area. He had sustained the injury during a rugby match 6 weeks earlier. Fourteen days after injury, he presented to A&E with cellulitis, which was treated for 14 days with antibiotics and an absorbent carboxymethylcellulose (CMC) fibre dressing, which was changed daily. The cellulitis had resolved at 2 weeks. The wound was treated for a further 2 weeks with the CMC dressing and compression therapy (the latter is used as standard therapy for all lower limb wounds with cellulitis).

Despite this treatment and the presence of clean granulation tissue, the wound had stalled and remained deep. Upon presentation to the outpatient dressing clinic, the wound measured 3.8cm long x 2cm deep and 2.5cm wide; despite the deep cavity, the wound bed was 100% clean. There was a moderate level of serosanguinous exudate, and the patient reported no wound-related pain.

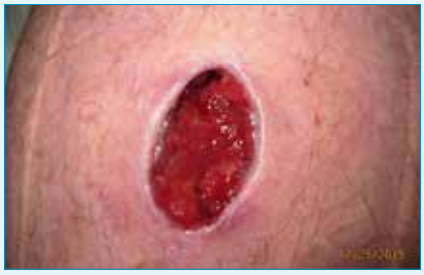
The decision was made to initiate Nanova™ Therapy System to resolve the depth of the wound; compression was continued. Dressing changes were scheduled for every 2 days.

Week 1 review: Over the course of the first 8 days of treatment (fourth dressing change), the wound had improved considerably. It now measured 2.8cm x 0.5cm x 1cm, a 93% reduction in wound volume from baseline. The wound bed had begun to epithelialise, and the remaining tissue was healthy and granulating. The patient was highly satisfied with the progress of the wound and the discreteness of the pump. Because there was still a moderate level of exudate, the decision was made to continue with Nanova™ Therapy System and compression, with dressing changes every 3 days.

Week 2 review: The wound had continued to progress towards healing, with 40% epithelialisation and 60% granulation tissue. The wound measured 1.5cm x 0.3cm x 0.8cm — a 98% reduction in wound volume from baseline. Exudate levels were low. The Nanova™ Therapy System was 'very easy' to use, and the patient rated comfort and satisfaction with the progress of his wound highly. The Nanova™ Therapy System and compression were continued with review scheduled at 7 days.

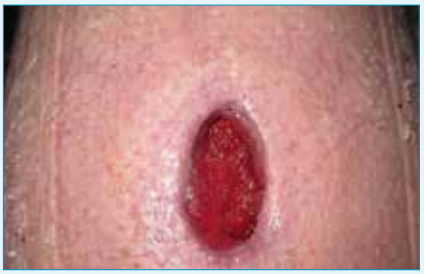
Week 3 review: The wound measured 1.1cm x 0.1cm x 0.5cm (over 99% reduction in volume from baseline), and the wound bed was composed of 90% epithelialising and 10% granulating tissue. Exudate levels remained low. Because of the comfort of dressing wear and ease of use, the regimen of Nanova™ Therapy System plus compression was continued for another week.

Week 4 review: The wound had healed fully. The patient reported he was 'delighted' with the result. Nanova™ Therapy System was rated highly by the patient on comfort of application, comfort during normal activities, ease of identifying when to depress the plunger and ease of pressing the plunger. From a clinician perspective, the dressing was fast (typically 5 minutes) and easy to use. The goals of therapy with Nanova™ Therapy System were achieved to high satisfaction for patient and clinician alike.

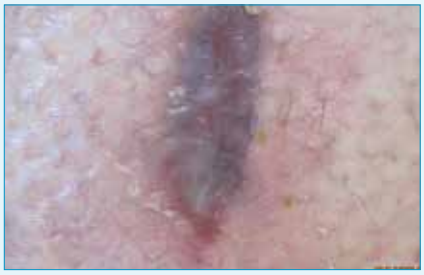


Baseline 7/05

Nanova™ Therapy System in situ



Week 1: 14/05



Wound healed: 4/6

Summary

- Trauma wound of 6 weeks' duration
- 93% reduction in wound volume after 8 days
- Complete wound healing achieved at 4 weeks with Nanova™ Therapy

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