



# Wounds

## INTERNATIONAL

An online practice based journal for clinicians worldwide  
Vol 5 | Issue 3 | September 2014

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Wounds digest



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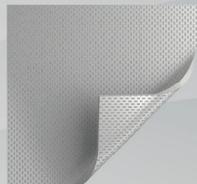
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# Adding a new perspective: learning from patient stories



Suzie Calne  
Editor, *Wounds International*

**I**t is always extremely thought-provoking when patients are overheard describing their experience of living with wounds. At this year's European Pressure Ulcer Advisory Panel (EPUAP) annual conference in Stockholm at the end of August, the delegates were silenced by the first two speakers; Ronny Persson and Claes Hultling told the audience exactly how it is to live with a wound and shared the real impact that developing a pressure ulcer has had on their lives.

Ronny Persson, a world champion sit-skier, had sustained spinal injuries in his teens. Now in his 40s, he described his remarkable experiences as a Paralympian, showing photographs and evidence of his high achievements. However, when he developed a sacral pressure ulcer, he became critically ill and required major surgery. Ronny talked about the misery of having to 'offload every 15 minutes' and the severe emotional effect that having a pressure ulcer had on his day-to-day living. For example, odour from the wound was a major problem, which made him feel very isolated, impacting on his quality of life. This presentation gave a stark reminder to the audience of both the physical and psychological effects that living with a wound has on the individual concerned.

Claes Hultling was paralysed from his chest down in a diving accident three weeks before his wedding. He offered the singular perspective of being both doctor and patient. Working as a doctor on the rehabilitation unit where he himself was initially treated, has enabled him to influence developments and to share valuable insights to make improvements. He stressed that the aesthetic environment for patients who require bed rest is hugely important and the design and layout of hospital rooms and wards requires careful consideration.

Having developed a pressure ulcer on his heel, Claes gave a strong take-home message to the delegates attending the meeting that the key intervention needs to be offloading. Pressure ulcer prevention is high on all our agendas, as clinicians strive to prevent such costly wounds in terms of financial and human suffering.

Repositioning requires skill and a good understanding of related anatomy and physiology. In an article on this topic on pages 6–9, Zena Moore and Menno Van Etten provide a clear and visual guide showing how to correctly reposition

***He talked about the misery of having to 'offload every 15 minutes' and the severe emotional effect the pressure ulcer had on his day-to-day living.***

a patient to achieve effective pressure relief. In this issue of *Wounds International*, the International Wound Infection Institute has once again produced an excellent 'Ten Top Tips' paper, this time on the topic of surgical site infection (SSI), see pages 13–18. I have no doubt this will become a seminal piece as it provides such a clear synopsis on another core topic for those involved in wound management. The authors emphasise that the main burden of care in many geographies now falls within the realms of the community and the advice given for preventing and managing SSI will be welcomed by many.

It is clear from the descriptions I have given above that patient stories offer unique insight and understanding for those involved in healthcare. With this in mind, *Wounds International* is delighted to launch a new series, where patients themselves record their own experiences of having a wound, focusing on particular issues that were of individual concern.

Mark Rippon, who has worked for 25 years in research and development for the wound dressings industry, provides the first patient story to be published in *Wounds International*, see pages 21–23. Following cardiac surgery, Mark found that the exit site wounds were unexpectedly painful and he describes the importance of dressing selection in making good choices for products that effectively secure drains and tubing. Mark has a strong background in the science of wound dressings, giving him an unusually educated and insightful perspective. He remarks on the range of techniques that were used to remove dressings and, interestingly, he shows how he found the sight of the actual wound very distressing; again this is a blunt reminder of the psychological impact of living with a wound.

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Suzie Calne  
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If you would like to contribute to a future issue of the journal, please contact Suzie Calne, Editor, *Wounds International*, at: [suzie.calne@woundsgroup.com](mailto:suzie.calne@woundsgroup.com)

# Ten top tips: repositioning a patient to prevent pressure ulcers



Authors:  
Zena Moore and Menno van Etten



**H**aving an understanding of the exact cause of pressure ulcers helps place the role of repositioning into context. As such, a pressure ulcer is defined as localised injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated<sup>[1]</sup>. It can thus be seen that the causative factors related to pressure ulcer development are pressure and shear, with the intensity and duration of pressure/shear being of significant importance. Healthcare professionals can help to control the intensity of pressure/shear by changing the support surface and reducing the duration of pressure through the use of repositioning. The top tips presented here address the key considerations when using repositioning as a component of pressure ulcer prevention strategies.

**1 Understand the effect of pressure/shear on tissues:** Traditionally, it was felt the main impact of externally-applied mechanical forces on tissues was that they caused localised ischaemia, thereby altering the perfusion of the affected area. However, it is now thought that ischaemia alone is insufficient to explain how pressure ulcers develop<sup>[2]</sup>. To this end, the focus of research has shifted from the traditional aetiological factor to that of the interplay of a number of mechanisms, including ischaemia, reperfusion injury, impaired lymphatic function and sustained cell deformation<sup>[3]</sup>.

When muscle cells are under pressure, their metabolism changes immediately to an anaerobic state<sup>[4]</sup>. Cells under pressure are destroyed by two main mechanisms: waste products suffocate the cells and cell deformation changes the osmotic process, with death occurring as quickly as between 2 and 4 hours<sup>[5]</sup>. Cell deformation can also be extreme, leading to permanent destruction of the muscle cell, resulting in deep tissue injury<sup>[6]</sup>.

**2 Know who is at risk:** Healthy individuals regularly change their position while seated or recumbent. Indeed, there are normally a number of stimulators, during sleep and while

awake, that motivate the individual to move<sup>[7,8]</sup>. This is, however, affected by the individual's ability to feel pain and his or her actual physical ability to move or reposition him- or herself<sup>[7]</sup>. Those who cannot reposition themselves are, therefore, at risk of pressure ulcer damage because they are unable to relieve pressure/shear over bony prominences, resulting in ongoing cell deformation and inevitable tissue damage<sup>[5,9,10]</sup>. Indeed, Mino et al<sup>[11]</sup> found a 4.09 greater relative risk for the development of pressure ulcers in patients who have an inability to turn over in bed.

Furthermore, Papanikolaou et al<sup>[12]</sup> compared the probability of pressure ulcer occurrence among patients with varying levels of mobility and found that pressure ulcer development was five times more likely among those with limited mobility (odds ratio [OR] 5.41,  $p=0.001$ , 95% confidence interval [CI] 2.00–14.63). This work is supported by Moore et al<sup>[13]</sup>, who noted that those who were repositioned more frequently during the night were four times less likely to develop a pressure ulcer compared with those repositioning less frequently (3 hourly versus 6 hourly) (OR 0.243,  $p=0.034$ , 95% CI 0.67–0.879).

It seems reasonable to suggest that reduced activity and mobility are the key factors that expose the individual to pressure and shear over time. Indeed, a recent systematic review of pressure ulcer risk factors by Coleman et al<sup>[14]</sup> supports this assertion. Risk assessment should, therefore, begin with an assessment of activity/mobility status and, if problems are identified, a full risk assessment should ensue.

**3 Understand what you can do about pressure ulcer risk:** The prevention of pressure ulcers involves a myriad of different interventions, including nutritional care<sup>[15]</sup>, pressure-reducing/-relieving surfaces<sup>[16]</sup>, and skin and wound care<sup>[17]</sup>. Repositioning patients is also an important component in the prevention of pressure ulcers<sup>[18]</sup> as it is used to remove or redistribute pressure from a particular part of the body<sup>[8]</sup>. Indeed, international best practice advocates the use of repositioning as an integral component of a pressure ulcer prevention strategy<sup>[11]</sup>. Repositioning involves a change in position of the lying or seated individual with the purpose of relieving or redistributing pressure



Figure 1. Patient in the 90° lateral rotation position.



Figure 2. The 30° tilt position.



Figure 3. Soft fill, newly positioned.



Figure 4. Soft fill after 2 hours.

The patient has moved due to lack of support.

and enhancing comfort, undertaken at regular intervals<sup>[1]</sup>. If the individual does not have the ability to reposition him- or herself, he or she requires assistance with this activity of daily living.

**4 Choose the best patient position for pressure ulcer prevention:** There is consensus that certain patient positions are not useful in terms of pressure ulcer prevention<sup>[19–22]</sup>. The 90° lateral position [Figure 1] has been shown to decrease blood flow and transcutaneous oxygen tension to near anoxic levels and to increase interface pressures. The 90° lateral position should therefore be avoided<sup>[1]</sup>.

The 30° tilt is a patient repositioning technique that can be achieved by rolling the patient 30° to a slightly tilted position with pillow support at the back [Figure 2]<sup>[19]</sup>. Moore et al<sup>[13]</sup> compared pressure ulcer incidence among older individuals repositioning using the 30° tilt ( $n=99$ ) compared to the 90° lateral rotation ( $n=114$ ). A statistically significant difference in pressure ulcer incidence was noted between the groups, with just three patients (3%) developing a pressure ulcer in the 30° group and 13 patients (11%) developing a pressure ulcer in the 90° group (chi square 5.347,  $p=0.021$ ).

The 30° position is thought to be the most appropriate for the patient, as there is less pressure applied to the bony prominences and therefore, blood supply to the weight-bearing area is not completely occluded<sup>[19–22]</sup>. When using the 30° tilted position, however, check to see that the sacrum is off the bed. Obese patients may need to be turned to a higher angle (45°) in order to offload the sacrum.

**5 Understand the ideal frequency of repositioning:** There are currently five studies that have explored the timing of repositioning on the incidence of pressure ulcers<sup>[7,13,23–25]</sup>. Two trials compared the 30° and 90° tilt positions using different repositioning frequencies (2–3 hourly, 3 hourly and 6 hourly), whereas three trials compared alternative repositioning frequencies (2, 3, 4 or 6 hourly). These trials had conflicting results in terms of pressure ulcer incidence, with some showing no statistical differences between the study groups<sup>[23–25]</sup>.

Conversely, others noted a statistically-significant difference in pressure ulcer incidence among those turned every 3 hours versus 6 ( $p=0.021$ )<sup>[13]</sup> or 4 hours on a viscoelastic foam mattress versus standard care ( $p=0.003$ ; OR 0.13; 95%CI 0.03–0.48)<sup>[7]</sup>. A recent Cochrane

systematic review concluded that although there is uncertainty around the evidence, this does not mean these interventions are ineffective, since all comparisons included in the review were grossly underpowered (the Bergstrom study was not included in this review)<sup>[26]</sup>. Thus, more robust studies are required to clarify the exact repositioning frequency required to prevent pressure ulcers.

The joint European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP) guidelines<sup>[1]</sup> recommend that repositioning frequency should take into account the type of support surface the individual is laying on (in terms of its pressure redistribution qualities) and the individual's response to the repositioning frequency. When choosing a repositioning schedule, however, it is important to remember that cell death can occur as quickly as in 2 to 4 hours<sup>[5]</sup>.

**6 Consider the health-related quality of life of the individual in all decision making regarding repositioning:** The monitoring of quality of life is widely accepted as a means of measuring the effectiveness of social policies, welfare programmes and healthcare<sup>[27]</sup> and, therefore, should be a prime concern in planning healthcare interventions. Repositioning is intrusive on the individual, and it is really important it is targeted at those who need it, and also that it is used appropriately. Furthermore, the correct use of preventative strategies has important implications for both healthcare efficiency and effectiveness<sup>[28]</sup>.

The Eurobarometer Qualitative Study<sup>[29]</sup> suggests that patient involvement in their healthcare is fundamental to enhancing the quality of healthcare received. Indeed, the benefits of patient involvement include enhanced motivation to adhere to particular treatment regimens arising from a greater understanding of their specific illness, in addition to a feeling of greater empowerment over self-monitoring of their health status<sup>[29]</sup>.

Patient involvement often includes their relatives and carers, who can help to bridge the communication barrier between the health professional and the patient, as seen in the 1,000 Lives campaign in Wales ([www.1000livesplus.wales.nhs.uk/home](http://www.1000livesplus.wales.nhs.uk/home)), thereby helping to ensure that the wishes of the patient are paramount in all decision making.

EPUAP and NPUAP<sup>[1]</sup> suggest there may be certain situations where the patient's condition precludes the use of repositioning, for example, where moving the patient causes severe pain



Figure 5. Firm fill, newly positioned.



Figure 6. Firm fill, after 2 hours. The position remains unchanged and the patient is still comfortable.

and suffering. In these cases, pain control is a priority in order to facilitate movement. Thus, consideration of the overall goals of care, including the wishes of the patient, are important in planning care that is person-centred and focussed on the needs of the individual<sup>[30]</sup>.

## 7 Position the individual to ensure stability:

In a 30° side lying position, the fill in the cushions used to support the patient has the biggest influence on the patient's stability. The fill should be firm enough to keep the patient in position, yet soft enough to follow the body contours and to ensure patient comfort. In many facilities, (head) pillows are used to position and stabilise the patient. Under the pressure of body weight, these (fibre-based) pillows will lose air, changing shape; thus the patient's position will alter, meaning the patient will become unstable<sup>[31]</sup> [Figures 3, 4].

In Figure 4, note how the patient has moved onto his back due to the failure of the pillow to support him in the original position; the position of the feet was changed by a carer due to patient discomfort). When positioning with soft materials, the patients' position changes after a short period of time. This instability will make the patient feel insecure and uncomfortable, thereby increasing the need for frequent repositioning<sup>[31]</sup>. In this situation, one should also suspect that shear forces have increased. Conversely, positioning with firm but soft materials enables the person to maintain his or her position with just a few cushions, avoiding instability and the potential increase in shearing<sup>[31]</sup> [Figures 5, 6].

## 8 Position the individual to ensure comfort:

In a lying supine position, one of the most important ways of creating comfort is to ensure that the shoulder and pelvic positions are aligned, with the spine in a straight line. This is true for any lying position – in supine, 30° side-lying and 90° side-lying<sup>[31]</sup> [Figures 7, 8]. A patient in this shoulder–hip–spine-aligned position will be comfortable and stable over a longer period of time. In addition, the legs should be positioned in a slightly flexed, slightly abducted and outwardly rotated position<sup>[31,32]</sup> [Figure 9].

## 9 Position the individual to ensure security:

Repositioning may cause tissue stretch (shear strain)<sup>[31]</sup>. This shear can cause discomfort and a lack of security. As a result, the patient will strive to change his or her position to become more stable; however, the reverse more often occurs, where the individual's stability decreases

and thereby the risk of shear increases<sup>[31]</sup>. The patient should, therefore, feel secure in the position adopted to avoid shearing forces.

## 10 Monitor the outcomes of all repositioning the interventions and document findings in a timely fashion:

Documentation of repositioning practice within the individual's clinical notes provides evidence that repositioning has occurred<sup>[13]</sup>. Furthermore, inclusion of the assessment of outcomes of the repositioning plan also provides evidence for the continuation or alteration of the care plan<sup>[13]</sup>.

The importance of this is multi-fold: to ensure the provision of safe clinical care for the patient, to act as a means of communication between team members, and to fulfil the legal and ethical responsibilities of staff<sup>[33]</sup>. Indeed, documentation is a fundamental component of clinical practice, with the quality of documentation considered to be an indicator of the quality of care delivered<sup>[34]</sup>.

Additionally, this is the only means by which the healthcare professional provides evidence that care has been planned, implemented and the outcomes assessed<sup>[34]</sup>. Healthcare professionals should, therefore, be aware of their legal and professional obligations in the provision of clinical care. Documentation is an integral component in the assessment of quality of care; if there is no written record, then there is no evidence of care provision<sup>[33]</sup>.



Figure 7. Pelvis–shoulder–spine alignment in the supine position.



Figure 8. Pelvis–shoulder–spine alignment in 30° side-lying position.



**Figure 9.** Pelvis–shoulder–spine alignment. Legs slightly flexed and abducted, rotating outwards.

## Conclusion

Pressure ulcers are common and costly, and impact negatively on the individual's health-related quality of life and on the ability of the health service to deliver a cost-effective, efficient service. Pressure ulcers can be prevented by identifying those who are most at risk and following this up with the implementation of effective prevention strategies.

This article has provided an outline of the top ten tips pertaining to repositioning as a component of pressure ulcer prevention strategies. At the outset, an understanding of the impact of pressure and shear is essential.

Following this, the identification of those at risk will provide guidance on the need for repositioning. Choosing the best position and frequency of repositioning are the next considerations, and these will be influenced further by the assessment of quality of life issues pertaining to the individual. Repositioning itself is based on the three principles of stability, comfort and the creation of a feeling of security for the person being repositioned.

Finally, it is essential to document the practice of repositioning within the individual's clinical notes. This should also include an evaluation of the impact of the repositioning on the individual and his or her tissue viability.

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# Clinical innovation: wound management in an outpatient setting



Author:  
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Wound healing is an evolving specialty with wound care practitioners facing many challenges, including rising healthcare costs and difficulties in ensuring access to and quality of care. Current US delivery models are mainly hospital-based and hospital-centered. We describe our outpatient model, which addresses these challenges by streamlining safe, cost-effective and easily accessible care for patients. We outline different models of health care and describe how our model is an effective example of a patient-centered model.

Rising healthcare costs are an ongoing concern for employers, insurers, patients and governmental agencies in the USA. In 2012, healthcare spending increased by 3.7% to approximately \$2.8 trillion. Of this, \$882.3 billion was attributed to hospitals.<sup>[1]</sup> Growth in spending from Medicare, Medicaid, and private health insurance providers all accelerated in 2012 compared to 2011, influenced by growth in both prices and non-price factors including the use and intensity of services.<sup>[1]</sup>

### Outpatient model attributes

One of the advantages of an outpatient wound-healing centre is that it lowers healthcare costs overall. An outpatient setting requires less overhead expenses which reduces costs dramatically. By centralising all wound care services under one roof, without the size and space required by a hospital, the costs more accurately reflect the services and procedures for which the patient is paying. Since the outpatient facility is generally smaller, the staff is reduced and the result is more cost-effective wound treatment for the patient. According to the 2014 Medicare National Fee schedule for instance, the application of a wound matrix product in a hospital setting is four times the cost than if that service had been performed in an outpatient centre.<sup>[2]</sup>

In addition to cost concerns of hospital-based wound care, hospital-acquired infections are an unfortunate by-product of hospital care. According to a survey conducted by the Centers for Disease Control and Prevention,<sup>[3]</sup> one in 25 US patients has at least one infection contracted during the course of their hospital care, adding up to about 722 000 infections in 2011. That

same year, approximately 75 000 patients with healthcare-associated infections died during their hospitalisations.<sup>[3]</sup>

A study completed by the Centers for Disease Control and Prevention in Atlanta, Georgia, suggests that the rate of resistance in nosocomial pathogens to a variety of antimicrobials commonly used to treat nosocomial infections is significantly higher in the hospital setting than in the outpatient setting.<sup>[4]</sup>

These nosocomial infections are more likely to become resistant to antibiotics owing to the number of healthcare providers and ancillary workers situated in the hospital setting, who are charged with transporting the pathogens. Conversely, outpatient wound centres dramatically reduce these risks since fewer workers staff them.

Another disadvantage to hospital-based care is the lack of access that patients may have to their physicians and the continuity of care that can suffer because of it. In our clinical experience of treating patients from hospitals, we've noted that too many doctors working different shift times creates gaps in patient treatment timelines, which also creates confusion for the patient. Who should the patient contact with questions? What if that doctor is unavailable? The physician who is finally reached then has the formidable task of deciphering a plethora of doctors' notes. Patients then have to wait while important details get lost in translation, and care is compromised. In an ideal outpatient centre, one expert physician oversees all treatment and the patient receives seamless care at each visit, thereby ensuring complete continuity of care.

There may also be issues around quality of care in hospital-based wound treatment. Since

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there are numerous factors that contribute to wounds not healing, patients often have to visit several hospital departments to receive comprehensive treatment. For example, a patient might have to visit the lymphoedema department, the hyperbaric centre, and then see the infectious diseases specialist. In contrast to this, a woundcare centre with hospital-level equipment houses everything for wound management under one roof.

This model is similar to that of outpatient parenteral antimicrobial therapy (OPAT), which takes intravenous (IV) therapy out of the hospital and delivers care in an outpatient setting. Today, this is a standard modality for patients with many infections requiring long-term IV antibiotic therapy. OPAT delivery now occurs in physicians' offices, hospital clinics, specialist infusion centres, and most often in patients' homes with self-administration.<sup>[5]</sup>

Until now, wound care services outside of the US hospital most often involved an administrative service company that was in contracted partnership with a hospital to capitalise on facilities such as hyperbaric oxygen chambers, gather the available physicians and create a billing-based outpatient wound centre. Creating outpatient services out of a hospital-centered inpatient business, however, is not satisfactory, since patients still suffer fragmented care, having to move from one area of medicine to another, often on and off the hospital site. Thus, the same considerable barriers still exist as outlined above.

#### A specialist outpatient centre

Our outpatient wound care centre, Encompass HealthCare and Wound Medicine in Michigan, USA, was opened in 2010. This centre is an expansion of the OPAT practice, which opened in 1994, addressing the problems highlighted above in addition to addressing the more complicated issues surrounding why some wounds do not heal, regardless of present infection. The centre staffs nine, treats patients from all over the metropolitan Detroit and surrounding areas, and can accommodate up to 20 patients at a time.

Encompass HealthCare is located on the ground floor and the centre features three monoplace hyperbaric oxygen chambers, an IV antibiotic suite, venous ablation, wound debridement, and an in-house pharmacy. The centre also has a small surgical room, a lift system to help paraplegics and quadriplegics get on and off examination tables, an indirect calorimeter machine, a roll-in bathroom with shower, several treatment areas, and a nutrition bar. All of these modalities allow us to treat patients with very complicated wounds, such as outlined in the case study below.



**Figure 1.** Case study photos of patient treated in the Encompass HealthCare and Wound Medicine centre before (1a; 1b) and after (1c; 1d) treatment.

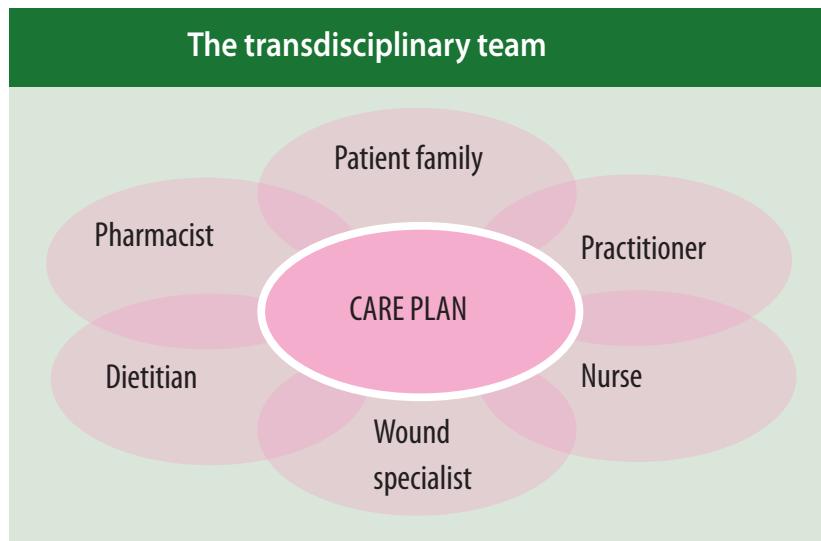
#### Case study

A 65-year-old man with diabetes was urgently referred to our centre by his primary care physician for the evaluation and treatment of an acute infection that developed from a blister on his right, second toe. On initial assessment, the patient had soft tissue gangrene, abscess, and open areas probing to bone [Figure 1a, 1b]. His glucose was 340 mg/dl and he was insensate.

Cultures were taken and IV vancomycin and IV ertapenem were administered. Excision of dead tissue and drainage of abscess was accomplished in this visit. In addition, hyperbaric oxygen therapy was initiated for treatment of the wet gangrene noted on initial exam and continued for 40 dives owing to Wagners grade 3 ulcer, which is associated with clinically suspicious osteomyelitis. The patient completed 6 weeks of specific IV antibiotics for meticillin-resistant staphylococcus aureus (MRSA), *Bacteroides*, and *Escherichia coli*. The patient was given a specialised boot to promote offloading. His nutritional status was assessed and protein supplements of 40 additional grams daily were provided during his daily treatment in our centre. His wound had completely healed at the end of this treatment [Figure 1c; 1d].

#### Four models of wound care

Recently, four proposed organisation models for wound care were suggested by Scarborough,<sup>[6]</sup> and they can be seen in current practice. The first is the unidisciplinary team whereby the healthcare provider works with the patient to establish the healthcare plan without any input from other healthcare providers. The second model is the multidisciplinary team, in which team members work to establish a plan, but each team member works independently to achieve discipline-specific goals. However, team members may not directly communicate with each other. The third approach is the interdisciplinary team



*Figure 2. An adaptation of the transdisciplinary team model proposed by Scarborough<sup>[6]</sup>*

model. In this model, the team expands the multidisciplinary team approach by including collaborative communication and shared information between team members.

The fourth approach is the transdisciplinary team model. This model represents the highest level of collaboration, in order to create the most communication and collaboration possible. This model transcends each of the individual discipline's perspective, putting the patient at the centre of the model [Figure 2]. We suggest our woundcare centre uses this fourth model. This approach has helped us achieve a near-100% success rate, using the following criteria to measure success: resolved infections, healed wounds, maximal patient satisfaction and communication, and the patient returning to a 'pre-injury' productive self.

### The future

Taking the outpatient concept further, WellStar Health System in Georgia has built a healthcare 'mall' where members of the same family can make all of their medical appointments in one location. For instance, mothers can get their mammograms while fathers get their cardiac ultrasounds, all in the same facility. The Marietta, Georgia-based system has spent \$109 million building two health parks with these characteristics, and opened the first in July 2012.<sup>[7]</sup>

Clearly, the trend in health care seems to be moving away from hospital-based care to the more centralised outpatient models that have benefitted patients in the areas of intravenous antibiotics, and now, wound management. Encompass HealthCare and

Wound Medicine is an example of such an outpatient model, which puts the patient at the centre of care.

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# Ten top tips: managing surgical site infections



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The definition of surgical site infection (SSI) by the Centres for Disease Control and Prevention (CDC)<sup>[1]</sup> of North America [*Table 1*] is the most commonly used and comprehensive. Leaper and Fry<sup>[2]</sup> state that an SSI is the most preventable healthcare-associated infection. According to hospital data in Canada, SSIs are the third leading cause of hospital-acquired infections.<sup>[3]</sup> Currently, inpatient surgical procedures involve shorter hospital stays, sicker patients and more complex surgical procedures that contribute to this statistic. However, it is estimated that 75% of surgical procedures are now performed in the outpatient setting, thereby, increasing concerns about SSI detection in the community<sup>[4]</sup>. The most common reasons for a community-nursing visit in the province of Ontario in Canada are post-operative wound infections and cellulitis. Unpublished Canadian prevalence data suggest that in selected community care sites approximately 30–40%

of nursing visits involve wound care. Surgical wound care accounts for as much 50% of these visits<sup>[5]</sup>. Community costs for the care of SSIs have been estimated as being between C\$1 and \$10 billion for direct and indirect medical costs<sup>[6]</sup>. Recognition of the potential for a SSI may be the most important issue when the discharge of a post surgical patient is planned, yet there is often no formal connection or linkage between in-hospital and community surveillance<sup>[7]</sup>. The actual incidence of SSI is debatable; this is due to many factors, one of which is poor surveillance in the community or primary care, and although there is surveillance in the acute care setting the accuracy is questionable.

As with all infections, SSIs are due to three main factors:

- Bacteria being introduced from the patient himself or herself (endogenous contamination)
- The surgical environment relating to the length of the procedure or break in asepsis

**Table 1. Definition of surgical site infections (SSIs). Adapted from Horan et al<sup>[1]</sup> and Leaper and Fry<sup>[2]</sup>.**

Type	Definition	Sign or symptoms
Superficial incisional SSI	<ul style="list-style-type: none"> <li>■ Infection occurs within 30 days after operation</li> <li>■ Involves only the skin or subcutaneous tissue.</li> </ul>	At least one of the following: <ul style="list-style-type: none"> <li>■ Purulent drainage (with or without laboratory confirmation)</li> <li>■ Organisms isolated from the fluid/tissue of the superficial incision</li> <li>■ At least one sign of inflammation or classic signs and symptoms of infection (pain, tenderness, local oedema, warmth)</li> <li>■ Wound deliberately opened by the surgeon</li> <li>■ Surgeon/medical team declare/diagnose as infected.</li> </ul>
Deep incisional SSI	<ul style="list-style-type: none"> <li>■ Infection occurs within 30 days after operation or within 1 year if an implant is present</li> <li>■ Infection involves deep soft tissue (e.g. fascia and/or muscle).</li> </ul>	At least one of the following: <ul style="list-style-type: none"> <li>■ Purulent drainage from the deep incision but not from the organ/space component of the surgical site (with or without laboratory confirmation)</li> <li>■ A spontaneous fascial dehiscence or fascia is deliberately opened by the surgeon</li> <li>■ A deep abscess or other evidence of infection involving the deep incision is identified: by direct examination, during reoperation, histopathology or radiologic examination</li> <li>■ Surgeon/medical team declare/diagnose as deep incisional infection.</li> </ul>
Organ/space SSI	<ul style="list-style-type: none"> <li>■ Infection occurs within 30 days after operation or within 1 year if an implant is present</li> <li>■ Infection involves anatomic structures not opened or manipulated by the operation.</li> </ul>	At least one of the following <ul style="list-style-type: none"> <li>■ Purulent drainage from a drain placed through a stab wound into the organ/space</li> <li>■ Organisms isolated from the organ/space by wound culture</li> <li>■ Abscess or other evidence of infection involving the organ/space is identified: by direct examination, during reoperation, histopathology or radiologic examination</li> <li>■ Surgeon/medical team declare/diagnose as organ/space SSI.</li> </ul>



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(exogenous contamination)

- Diminished immune capacity of the individual due to general factors (disease, malnutrition, medication) and local factors (perfusion, bioburden, damage).

These Top Ten Tips will therefore focus on identifying the risks, patient assessment, and preventative and management strategies. The authors, from the International Wound Infection Institute, acknowledge that there is limited evidence for some of these areas but, because of the morbidity and mortality that a SSI causes, prevention and early detection is imperative.

There are numerous guidelines that summarise evidence and provide recommendations for clinicians regarding SSI (e.g., the National Institute for Health and Care Excellence in the UK, the Surgical Care Improvement Project and National Surgical Quality Improvement Program in the USA, and National Health and Medical Research Council in Australia). Healthcare professionals should be familiar with the relevant information.

**1 Complete a holistic assessment to identify risk factors that may affect surgical wound healing pre-operatively, intra-operatively and postoperatively:** Although not all risk factors have been determined with a level one evidence rating, there is some evidence to suggest that the patient's age, weight, general health and medication usage may increase the risk of SSI. It is therefore important that these factors be assessed before an elective procedure and discussed with the patient so that informed decisions can be made. The pre-operative assessment needs to focus on the patient's general health and coexisting health conditions, glycaemic control, recent weight loss or gain, overweight or obesity category, physical activity levels, present and past smoking history, and previous experiences with anaesthetic.

**2 Manage pre-operative risk factors:** As previously stated, there are both intrinsic and extrinsic factors that increase the risk of an SSI. In particular, there is growing evidence that a patient's age is a risk factor that relates to decreased healing potential and diminished immune factors with aging<sup>[8]</sup>. For an elective procedure it is imperative that the nutritional status of the patient be determined through a simple nutritional risk assessment and/or laboratory analysis, such as serum albumin and total protein. Determination of the presence and level of obesity prior to elective surgery is necessary for several reasons, such as planning for any bariatric and hygiene requirements<sup>[9]</sup>. Some

surgical procedures may require that the patient reduce weight prior to proceeding<sup>[10,11]</sup>.

The presence and severity of all chronic illness, comorbidity, medication use, smoking, and alcohol and drug intake should also be explored in the pre-admission interview. This is the perfect time to educate the patient on lifestyle choices and management strategies. Verbal and written information should be given in the surgeon's office when the type of procedure is determined and reinforced and reviewed at the pre-admission interview.

Specific pre-operative recommendations will depend on the type of surgery, patient risk factors and surgeon preferences. Some guidelines recommend when to cease or commence certain medications, nasal decontamination, skin preparation or bowel preparation. It is always recommended that the patient cease smoking. Smoking impacts in many ways on the body<sup>[12]</sup>: nicotine causes vasoconstriction, carbon monoxide reduces oxygen-carrying capacity, and hydrogen cyanide inhibits the enzyme system necessary for oxidative metabolism and oxygen transport at cellular level, where there is evidence that this increases the risk of surgical site infections.

**3 Manage intra-operative risk factors:** The two primary intra-operative factors involved in the prevention of SSIs are maintenance of patient homeostasis and consistent staff practice of effective operating room (OR) safety techniques. This includes the maintenance of normal patient body temperature and blood glucose<sup>[13]</sup> levels as well as blood oxygen saturation of ≥95% throughout the surgical intervention<sup>[14]</sup>. OR staff must have good hand hygiene practices, wear sterile gowns, prepare the surgical site using an antiseptic skin preparation and use drapes that prevent liquid penetration. There is some debate in the literature as to whether impregnated incise drapes decrease SSIs<sup>[8]</sup>. The OR staff should change surgical gloves if perforation is observed and double glove if the risk of perforation is high<sup>[15]</sup>. It is recommended that the site of incision and that closure devices be positioned to minimise the risk of associated dehiscence and that antimicrobial sutures be used<sup>[16,17]</sup>. Finally, it is recommended that dead space, within or below the skin, be minimised where possible and that wound trauma be minimised by gentle tissue handling and limited use of electrocautery<sup>[16,17]</sup>.

Antibiotic prophylaxis has been shown to decrease SSI (level one evidence) and there are many protocols on the timing, type of procedure and type of antibiotic to be used<sup>[18]</sup>.

#### **4 Manage postoperative risk factors:**

Managing postoperative risk factors involves a continuation of the intra-operative measures, which include:

- Maintenance of body temperature
- Adequate oxygenation
- Clean, intact wound dressing
- Well-controlled pain.

The literature does not provide enough evidence to promote one dressing over another but there is some evidence that negative pressure wound therapy may reduce SSI after trauma and in high-risk groups<sup>[19,20]</sup>. Patients should be informed that a waterproof dressing is to be maintained for 48 hours post surgery and if the dressing requires changing then a surgical aseptic technique is required.

#### **5 Educate patients and families on the signs and symptoms of SSIs:**

It is important that patient and family education on not only the operative procedure but also the possibility of surgical site infection begins prior to surgery<sup>[21]</sup>. This information should be provided in verbal and written form and include how to recognise SSI and who to contact if they suspect infection<sup>[19]</sup>. The information should be in a language that is easy to understand and translated into other languages for those who do not speak English<sup>[21]</sup>. Provision of information on how to care for the patient's wound once he or she is discharged home is required for family members and carers. Patients should be informed if they have been given antibiotics and how to take them most appropriately to maximise effectiveness<sup>[19]</sup>.

Educate patients that a little redness around the wound edge is normal and can be expected for the first few days after surgery. However, redness spreading more than 2 cm out from the incision, increasing pain and swelling or pus coming from the suture line are danger signs that should be reported to their doctor immediately<sup>[21]</sup>.

#### **6 Identify and treat SSIs:**

SSIs have been divided into categories (superficial incisional, deep incisional and organ/space) according to their location, timing of onset, and local signs and symptoms<sup>[3]</sup>. Diagnosis largely depends on the subjective assessment of pain or tenderness, swelling, erythema and purulent discharge from the wound, although no consensus on criteria has been established<sup>[21]</sup>. Indicators normally manifest at least 48 hours after surgery and within 30 days, or up to 1 year following insertion of a prosthesis such as a total hip or knee replacement. Evidence of an SSI can be delayed

in obese patients, and poorly defined and difficult to recognise in immune-compromised patients. Early diagnosis is imperative for effective management. Incision sites should be opened to remove sutures and infected material, and to facilitate drainage. Dressings should be used to encourage secondary healing. Recommendations for the use of antibiotics in SSI have recently been published<sup>[23]</sup>; empirical antimicrobial choice is influenced by location and clinical presentation.

#### **7 Debride necrotic tissue:**

Necrotic tissue can prolong inflammation and may harbour both aerobic and anaerobic bacteria and toxins, therefore removal of necrotic tissue is a key component of wound management. There are several options for debridement and the option(s) chosen will depend on the wound condition, goal of treatment, resources and patient considerations.

- Surgical debridement: conducted in the operating theatre for patients that require anaesthesia, positioning and assistants for cautery, suction, and suture ties
- Conservative sharp: can be conducted in a clinic, at the bedside or in the home environment as long as asepsis is provided using scalpel, scissors or curette
- Mechanical: includes therapeutic irrigation (4–15 psi), ultrasound debridement, debriding pads, and hydrosurgery
- Enzymatic: for small to moderate amounts of necrotic tissue in patients who cannot tolerate sharp debridement and do not have obvious infection
- Chemical: use of antiseptics (i.e., polyhexanide and octenidine), but preferably one that is non-cytotoxic to fibroblasts
- Autolytic: a slow degradation of tissue using the interaction of the host enzymes and wound dressings.
- Larvae: selective debridement with the use of medical-grade fly larvae.

As the wound progresses, shifting from one method of debridement to another may be necessary to obtain better results<sup>[24]</sup>.

#### **8 Choose an appropriate dressing or device to manage exudate and bacterial burden:**

Excessive exudate may be indicative of SSI or predispose to increased bioburden. Select a dressing or device to manage the amount and type of exudate. The exudate management ability of dressings or devices is subject to the absorptive and evaporative materials used, or their ability to drain or suction fluid from the wound. Select the antiseptic solution or impregnated dressing

based on clinical efficacy, duration of action and safety profile. Antiseptic impregnated dressings can be actively bacteriostatic when organisms are killed by release of the antiseptic into the wound or on contact with the antiseptic when absorbed into the dressing<sup>[26]</sup>. Some dressings utilise passive antimicrobial methods when organisms bind to dressings and are physically removed from the wound on dressing change<sup>[27]</sup>.

Choose the dressing on the basis of patient and wound needs, i.e. exudate level, wound depth, need for conformability, antimicrobial efficacy, odour control, ease of removal, safety and patient comfort<sup>[28]</sup>.

If the wound deteriorates or fails to improve after 14 days, it is recommended that an alternative antiseptic/antimicrobial agent is used<sup>[29]</sup>.

## 9 Consider adjunctive therapies:

Consultation and collaboration with the attending physician/surgeon and specialists in wound care related to the use of adjunctive therapy interventions is recommended. In 2008, NICE identified the following adjunctive therapies that may be considered including: topical negative pressure wound therapy (NPWT), growth factors (such as platelet-derived growth factor), antibacterial honey, larva therapy (maggots), anti-scarring agents (such as transforming growth factors), antiseptic-impregnated sutures (such as triclosan coating)<sup>[30]</sup>. Dehisced surgical wounds, usually secondary to SSI may benefit from NPWT. Examples include dehisced sternal split and abdominal incisions<sup>[29]</sup>. In particular the treatment of open abdominal wounds (laparostomy) has improved survival and enabled a higher rate of total abdominal wall closure. The role of hyperbaric oxygen therapy (HBOT) in open surgical wounds may be beneficial. Consideration of HBOT must include costs to clients/families, including travel costs, reimbursement fees for the cost of HBOT treatments<sup>[21]</sup>.

## 10 Implement a surgical site surveillance program that crosses setting boundaries:

The epidemiology of SSIs was first studied in the 1960s and a system for classifying surgical wounds, according to their risk of microbial contamination (clean, clean-contaminated, contaminated and dirty), has been used for reporting postoperative infections since 1980<sup>[31]</sup>. Many countries monitor SSIs; collating infection rates for

individual surgeons, as well as for surgical procedures, has been shown to reduce infection rates<sup>[32,33]</sup>. SSI surveillance programs allow the identification of trends in infection rates and causative agents. They also provide a means to evaluate the effectiveness of preventative and/or control strategies, which can be utilised in the development of guidelines. Guidelines to prevent SSIs using the bundle approach have been devised in many countries. However, compliance has been shown to depend on teamwork, collaboration and effective communication between practitioners and it is often less than optimal. Standardised methodology would allow comparison between different countries. With more and more surgical procedures occurring as outpatients, surveillance programs need to continue into the community and should extend a minimum of 30 days for most procedures and up to one year when implants are involved

## Conclusion

Prevention and management of SSI needs to be of great concern to patients, healthcare professionals and administrators. In these times of rationalization of health care funds, it is important to ensure that patients receive the appropriate screening and care beginning at the pre-operative assessment to postoperative care and monitoring in the community. By using the information presented here, clinicians can begin to develop skills and tools to identify those at high risk for infection and develop plans with the patient to ensure a best-practice approach.

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# Use of a bioplastic material containing hyaluronic acid on a chronic leg ulcer



Authors:  
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Chronic leg ulcers of various aetiologies are commonly seen in a regional dermatology unit in Russia and patients are treated with a range of surgical and therapeutic techniques. An important trend in the modern treatment of patients with complex chronic ulcers is the adjunctive use of a new group of dressings made of bioplastic materials. These dressings can stimulate tissue repair and regeneration. This case report describes the successful use of G-Derm® (G-Group) — a polymer of hydrocolloid hyaluronic acid and peptide complex — in the management of a large, long-standing leg ulcer.

The Burn Centre at Leningrad Regional Hospital is located 10km from St Petersburg, Russia. It provides specialised care for patients with burns of various aetiologies, area and depth (53%), as well as frostbite (17%), chronic leg ulcers, non-healing wounds and pressure ulcers (14%), as well as the consequences of burns, such as scar deformities and contractures (16%). Between 450 and 500 patients are hospitalised annually, with 80% requiring surgery.

Alongside pharmacotherapy and surgical correction, the local stimulation of regenerative processes with new wound dressings based on natural and synthetic polymers, including living skin cells (keratinocytes and fibroblasts), growth factors and cytokines, as well as biotechnological methods for restoring the skin<sup>[1-3]</sup>, has become a key trend in modern treatment of patients with complex chronic ulcers.

A new group of bioplastic materials<sup>[4-6]</sup> is now available for use as a wound covering. One such material is G-Derm — a product of polymerisation of hydrocolloid hyaluronic acid and peptide complex [Figure 1].

### Case report

A 65-year-old woman (Mrs C) was treated at the Leningrad Regional Hospital's burn centre in 2013 for an extensive chronic venous ulcer (170cm<sup>2</sup>) on the right tibia.

On presentation, she complained of pain, muscle cramps and constant heaviness and swelling in her legs and feet, which intensified after work and decreased after sleep. She had varicose veins on both legs.

The patient was obese (BMI = 43). She worked as a train conductor for 40 years so was standing all day and she occasionally carried out heavy lifting. Her diet over the past 30 years was poor. At the age of 35, Mrs C first noticed fatigue in the lower extremities and the emergence of a venous skin pattern in her legs. She did not see a doctor, however. The chronic ulcer of the right shin first appeared just over a decade previously (2003), after a minor injury at home. For 5 years, she self-medicated and during this time, the ulcer area tripled in size.

In 2010, she suffered dermabrasion and dermoplasty was performed on the right shin, however, the patient was non-concordant with the surgeon's recommendations. Mrs C later refused surgical correction of venous blood flow and the ulcer recurred.

The patient was a non-smoker with no known family history of venous disease. She was not diabetic and had no known allergies.

### Wound assessment

The ulcer was on the posterior-medial side of the right shin. On assessment, it had an area of 170 cm<sup>2</sup>, with purulent discharge, medium levels of exudate, some evidence of granulation and some areas of necrosis. The ulcer surface was uneven with jagged recesses and dense, puffy edges. *Staphylococcus aureus* (10<sup>6</sup> microbial cells per 1g of tissue) was present on swabbing [Figure 2].

According to the patient, the ulcer reduced her quality of life due to motor activity limitations and reduced the possibility of self-care. The presence of a fetid smell and exudate caused discomfort in Mrs C's everyday life.

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\*All references translated from Russian



**Figure 1.** Bioplastic material.



**Figure 2.** View of ulcer on admission to hospital.



**Figure 3.** Day one after bioplastics application.

The patient was assigned complex conservative therapy involving antimicrobial cleansing, simple dressings and compression therapy. On the fifth day after the start of treatment, after relieving the local inflammatory reaction and seeing signs of improvement, Mrs C was offered surgical correction of venous blood flow, which she refused.

### Rationale for planned intervention

Due to Mrs C's categorical refusal of surgery, it was decided to use a bioplastic wound covering based on hyaluronic acid on the sixth day of her hospitalisation. In order to use the bioplastic material, the following steps were followed:

- The wound surface was cleaned with gauze and an antiseptic solution. Nonviable tissue and wound detritus was removed.
- The ulcer surface was cleaned with a Volkman spoon. Dense callous ulcer edges were excised with a scalpel.
- From the excision of wound edges, rounded epidermis fragments 1–2 mm in diameter were taken. These were placed in sterile saline solution at 36–37°C.
- The plate of bioplastic material (hyaluronic acid film) was cut to the size and shape of the ulcer to cover the entire wound.
- After application to the wound, the material tightly fixed to the surface. Rounded pieces of skin (1–2 mm in diameter) were removed from the saline and placed in holes on the surface of the material. After filling all of the holes with pieces of tissue, they were covered with a second layer of bioplastic material, which was replaced daily.



**Figure 4.** The wound on day six with evidence of improvement.



**Figure 5.** View of the healed ulcer, 11 months after discharge.

On the second day after the procedure, the patient reported significant pain reduction in the ulcer area. The biomaterial was tightly fixed to the ulcer, had a dark colour, and there were no signs of inflammatory changes in the wound or surrounding tissue [Figure 3].

On the sixth day following the procedure, a partial biodegradation of the bottom plate of material, located on the wound, could be observed. There was marginal epithelialisation of the wound surface (areas of rounded transplanted skin grafts), and a decrease in the ulcer area [Figure 4].

On days 7–14, the wound was covered with two additional layers of bioplastic material with 1–2 mm autografts. Epithelialisation was observed on day 15. The patient was discharged from hospital on day 21.

There was no relapse over the follow-up period and the leg was healed after 11 months [Figure 5]. The patient has an active lifestyle and was encouraged to continue wearing compression stockings, take phlebotropic drugs and undergo physiotherapy.

### Conclusion

The bioplastic method is a simple and effective way to restore skin in chronic ulcers of various aetiologies. The technique has proved to be effective in the surgical treatment of long-standing ulcers in patients who are opposed to traditional therapy. Bioplastics has been shown to reduce the healing time by 13–16 days, and the amount of exudate by 16–23% ( $P \leq 0.01$ )<sup>[7]</sup>. There were no reported side-effects or allergic reactions to the bioplastics at any stage of observation in this case. The method allows clinicians to reduce the duration of treatment and improves patients' quality of life.

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# Patient story: the importance of dressing selection after heart surgery

Author:  
Mark Rippon

In this article, the author describes undergoing open heart surgery for bicuspid aortic valve disease describes how the dressings chosen for his postoperative care affected his recovery. He explains how, despite having more than 25 years experience working in wound care marketing, he was surprised at how much the wrong dressing could influence his physical and psychological wellbeing postoperatively, and suggests ways in which healthcare practitioners could address dressing choices for surgical wounds.

I have been working on the academic and commercial side of wound care for more than 25 years; so naturally have a keen interest in both acute and chronic wounds. When I recently needed surgery to replace an aortic valve due to bicuspid aortic valve disease (BAVD), I came to look at the wound care world from yet another new angle: from a patient's point of view.

However, before describing my experience I should point out that until I had surgery I agreed with the choice of dressing for surgical wounds is largely inconsequential and secondary to the success of the actual surgical intervention (bar that of infection). I also believed that the pain and discomfort associated with dressing removal could be controlled with appropriate analgesia. However, my first-hand experience of surgical wounds led me to change this belief.

### Medical background

My BAVD was diagnosed during a routine hospital check before a knee arthroscopy. During this routine check a heart murmur was detected and bicuspid aortic valve disease (where the aortic valve has only two flaps instead of the usual three) was diagnosed by ultrasound. Over time, calcium deposits on and around the cusps can eventually cause the valve to stiffen and narrow (stenosis), and as the disease progresses the heart has to pump increasingly harder to force the blood through the valve. Also, if the bicuspid valve

does not close completely, blood can leak back into the heart (aortic regurgitation). The main symptom of aortic valve regurgitation is shortness of breath during exertion.

At the time of diagnosis I was asymptomatic so I was monitored until symptoms became evident and surgery needed — about six years.

### Wound focus

Treating my BAVD required open heart surgery to replace the aortic valve. During the procedure my sternum was transected (sternotomy) to provide access to the relevant portion of the heart. Once the valve was replaced, the sternum was wired together and the skin sutured with dissolving sutures.

During the first 12 to 24 hours after surgery, I was not aware of my wound site, other than that of severe chest pain. However, after being moved out of intensive care and onto the wards I became aware that I had at least three vascular access sites — at the neck and wrists, all held in place by adhesive dressings. While the chest wound site itself was not covered, the drain site (at the lower part of the wound) was secured with an adhesive surgical dressing.

### Postoperative rehabilitation

This phase occurred almost immediately I was able to mobilise, in the first 24 hours in ITU rehabilitation consisted of pulmonary exercises and coughing (very painful) and as soon as I was able getting out of bed for

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assisted short walks, until I met the criteria for transfer to the wards.

### Wound dressings

Initially, the wound dressings did not generally get in the way of postoperative rehabilitation because the pain from the surgical procedure itself was an overriding factor.

However, soon I became increasingly aware of the wound dressings because they pulled on my skin, and with increasing skin sensitivity around the wound site, I found that my movements, and therefore my ability to rehabilitate properly, were restricted.

It was also interesting to note that the analgesia I was receiving (oral morphine and paracetamol) did not appear to affect the sensations around my wound sites, nor did it reduce the considerable amount of pain during dressing removal, in particular at the drain site.

The nurses' approach to removing the dressings varied from slowly peeling them back to a quick sharp pull, neither of which seemed effective at reducing the pain. Although the nurses did their very best to make me as comfortable as possible during dressing changes, at the time it occurred to me that choosing a less adhesive dressing from the beginning might have made both my life and the nurses' life easier.

Also, and surprising to me was the psychological impact that the sight of the

surgical incision had on me. Since the incision site was not covered by a dressing, whenever I was in front of a mirror it was in full sight and it was weeks before I could bring myself to look at it. Also, part of the incision site could be seen by visitors, some of whom reacted in a distressed or embarrassed manner. My thoughts then were that even if a dressing provided no overtly clinical benefit other than cosmetically covering the incision site, then this in itself would be advantageous to the patient.

### Overall impressions

Following my experience of wound dressings, my previously held belief, that choice of dressing had little impact on the patient in terms of overall treatment, was overridden.

In my case, despite excellent care from the doctors and nurses, vascular access and drain site dressing removals were very painful. I found that the adhesion of the dressings to the surrounding skin caused discomfort and impeded movement and mobility to a degree.

It is possible that in a frail patient this pain and discomfort could have a greater impact.

Perhaps the impact of postoperative dressing selection on patients' quality of life needs to be investigated further and given the same level of consideration as that given to chronic wounds. **WIN!**

## The role of wound cleansing in the management of wounds



Authors:  
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Wound cleansing should be seen as an integral part of wound bed preparation to optimise the wound environment by removing debris, reducing bacterial load and preventing biofilm activity. Clinicians have a number of options to choose from when selecting an appropriate wound irrigation solution. One factor to consider includes the ability to mount a rapid antimicrobial response to microbial contamination, while avoiding damage to human cells important for wound healing.

**M**icro-organisms produce significant barriers to the healing of chronic wounds<sup>[1]</sup>. They are present in all wounds, although not all wounds become chronic. Microbes grow in both a planktonic phenotype (free-floating mobile single cells) and biofilm phenotype (a fixed polymicrobial community)<sup>[2]</sup>. A self-secreted matrix protects the biofilm from attack by the host immune system and makes the wound harder to treat<sup>[3]</sup>. In fact, many of the characteristics of chronic wounds, such as persistent inflammation, exudate, and host-cell senescence, result directly from biofilm<sup>[4,5,6]</sup>.

Wounds that have become chronic — characterised by delayed or stalled healing — due to suspected biofilm/increased bioburden should be managed with a biofilm-based approach to wound care<sup>[7]</sup>. This means combining wound cleansing/irrigation with debridement and application of topical antimicrobial agents (e.g. wound cleansers and dressings), to facilitate healing by disrupting, removing and preventing the reformation of biofilm<sup>[8]</sup>.

### Importance of wound bed preparation

Wound bed preparation is recognised as having a key role in wound management. The International Advisory Board on Wound Bed Preparation has developed an assessment tool, known by the acronym TIME (T = tissue, non-viable or deficient; I = infection or inflammation; M = moisture imbalance; E = edge of wound, non-advancing or undermined), that sets out the goals of wound-bed preparation: removing non-viable tissue, reducing oedema and exudate, reducing the bacterial burden and correcting any abnormalities to promote wound healing<sup>[9]</sup>. Wound bed preparation offers a

structured and systematic approach to assist clinicians when assessing and managing patients with wounds.

### Where wound cleansing fits

Wound cleansing [Box 1] can help achieve the goals of wound bed preparation by assisting in removing loose material to create the optimal local conditions for wound healing by removing exudate and other debris. Irrigation is the preferred method of wound cleansing, as it can clear the wound of debris and microbes, while avoiding trauma in the wound bed<sup>[10]</sup>.

A practical strategy for wound bed preparation in chronic wounds is to lightly irrigate the wound before inspection and assessment. Debride any soft, degraded areas of the wound bed, slough or necrotic tissue according to local protocols, and then re-irrigate the wound with a cleansing solution before applying an appropriate dressing, also according to local protocols.

There are several broad categories of solutions that can be used: saline and water, highly reactive solutions, and minimally or non-cytotoxic antimicrobial-containing solutions.

### Exploring irrigation solutions

When considering the clinical benefits of wound irrigation and the appropriate agents to use, the clinician should keep in mind that an ideal wound irrigation solution will provide periodic reduction of bacterial contamination and removal of debris without adversely affecting cellular activities crucial to the wound-healing process<sup>[11]</sup>. It is, therefore, important to consider the balance of antimicrobial action and cytotoxicity when choosing a wound irrigation solution [Table 1].

### Saline and tap water

Although tap water and saline are not

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wcytotoxic and do not seem to be harmful to wounds<sup>[12]</sup>, these cleansing choices may not actively promote healing, particularly in chronic wounds with biofilm and/or increased bacterial burden<sup>[13]</sup>, indicating that non-antiseptic cleansing does not remove harmful molecules such as matrix metalloproteases and elevated proinflammatory cytokines. These molecules may be present in chronic wounds and delay healing.

Although these agents have been used as standards of non-cytotoxicity<sup>[14]</sup>, neither has significant antimicrobial properties. This means saline is not appropriate for augmenting wound-bed preparation in the context of biofilm-based wound care<sup>[15]</sup>, or where wounds are clinically diagnosed as locally infected or at risk of infection. Further, it should be pointed out that even 'safe' tap water can become colonised with viable microbes. In particular, *Pseudomonas* is well-documented in the plumbing systems of healthcare facilities<sup>[16,17,18]</sup>. Therefore, a cleansing agent with broad-spectrum activity and rapid kill rates (dwell time of 5 to 10 minutes) should be chosen to aid wound bed preparation.

### Highly reactive solutions

Solutions such as peroxide and povidone iodine (depending on the carrier and the strength of the povidone iodine) and commercially available products (e.g. alcohol-based cleansers, soaps, foams and wipes) can be particularly cytotoxic<sup>[19]</sup>. A 2010 Cochrane review suggested that such solutions may do little to control wound bacteria and may in fact interfere with host healing mechanisms<sup>[12]</sup>. Although they probably do not significantly harm the host, the high level of reactivity is not necessary.

### Antimicrobial solutions

Multiple antiseptic agents are available and have been extensively evaluated for cytotoxicity and their biocidal abilities against a broad spectrum of microorganisms, including bacteria and fungus (yeast)<sup>[15]</sup>. Common cleansing agents such as octenidine

and polyhexamethylene biguanide (PHMB) are minimally toxic to host cells when used in low concentrations<sup>[21]</sup>.

Hypochlorous acid is produced by the body's immune cells in response to invading pathogens<sup>[22]</sup>. It is available as a commercially-prepared wound cleansing solution, which is non-toxic, effective against a broad range of microorganisms and has a rapid kill rate<sup>[23,24]</sup>. Clinical studies of hypochlorous acid demonstrate improved wound-healing outcomes<sup>[24,25]</sup>.

### Rationale for antimicrobial solutions

After a wound has been washed and debrided, exposing microbial cells to the environment, the antimicrobial properties of a cleansing agent can be effective. Because microbes may exist on the wound bed in high numbers, agents stronger than simple saline or tap water may be needed. Antimicrobial solutions can be used as part of the balance in managing wound colonisation, biofilm and/or infection. Non-toxic agents that are effective at low concentrations should be considered when possible.

Antimicrobial solutions have the added benefit of being usable across the spectrum of chronic wounds without resulting in bacterial resistance issues, because they are antiseptic rather than antibiotic. These factors, along with the ability to disrupt and prevent reformation of biofilm/reduce bioburden are ideal properties of an antimicrobial irrigation solution [Figure 1]. As a result, such irrigation solutions may have an important place within the process of chronic wound management.

### Summary

Resolving critical colonisation, biofilm and/or infection in a chronic wound is achieved through appropriate wound bed preparation. The goal of wound cleansing is to remove loose material in the wound bed, reduce bacterial load and to assist in the suppression of biofilm.

Cleansing should be tailored according to the goals determined by holistic assessment of the patient and wound, and best practices for irrigation followed [Box 2]. Generally speaking, wounds should be irrigated at every dressing change until visible debris is removed. Cleansing agents may also be useful in removing encrusted dressings in order to lift them and avoid causing trauma to newly formed granulation tissue in the wound bed.

It is critical that the wound cleansing agent does not impair the wound healing process,

#### Box 1. Definition of wound cleansing

- Remove surface contaminants, loose debris, slough, softened necrosis, microbes and/or remnants of previous dressings from the wound surface and its surrounding skin<sup>[20]</sup>.

**Table 1. Key considerations in some common wound irrigation agents.**

Saline <sup>[10]</sup>	Low toxicity Limited ability to reduce bacterial load Bacterial growth can occur in an open container within 24 hours
Sterile water <sup>[10]</sup>	Limited ability to reduce bacterial load Readily absorbed by tissues; water toxicity may result when excess volumes are used No longer sterile after opening
Tap water <sup>[10,17]</sup>	Recommended where saline and sterile water are not available Limited ability to reduce bacterial load Microbes, in particular <i>P. aeruginosa</i> , can colonise taps and as a result may end up in wounds irrigated in this way
Commercially available products (e.g. foams, soaps, wipes and solutions with surfactants <sup>[10]</sup> )	Remove bacteria with less required force due to surfactant content May be best suited for wounds with adherent cellular debris and biofilm Typically contain preservatives to extend effective shelf life Can be highly cytotoxic to healthy cells and granulating tissue
Povidone iodine <sup>[10]</sup>	Broad-spectrum antimicrobial activity Cytotoxic to healthy cells and granulating tissue in higher-percentage concentrations May irritate periwound skin
Hydrogen peroxide <sup>[10]</sup>	May be cytotoxic to healthy cells and granulating tissue Ineffective in reducing bacterial counts
Polyhexamethylene biguanide (PHMB) 0.1% <sup>[26]</sup>	Also contains betaine, a surfactant, to lift microbes and debris and suspend them in solution to prevent wound recontamination Has an increased ability to penetrate difficult-to-remove coatings, lifting debris, bacteria and biofilm from the wound Broad spectrum of activity against bacteria, viruses and fungi No evidence of resistance
Octenidine <sup>[27]</sup>	Can be used to loosen encrusted dressings in addition to irrigating debris and microbes from the wound bed Contains octenidine dihydrochloride, a preservative, to extend shelf life and a surfactant-like molecule that is effective at infiltrating wounds while being less irritating Shown to prevent and remove the growth of bacterial biofilms
Hypochlorous acid 0.01% <sup>[11,23,28,29,30,32]</sup>	Broad-spectrum antimicrobial activity Non-irritating, non-sensitising, non-toxic Can be used to loosen encrusted dressings in addition to irrigating loose debris and bacteria from the wound bed Has rapid antimicrobial activity at concentrations safe for human cells

but is strong enough to remove the protective matrix secreted by microbes attached to the wound (biofilm) and reduce the bioburden.

Clinicians have a number of options when selecting a wound cleansing agent [Figure 1]. Although saline and water have been found by numerous studies to not be harmful to wounds, this feature is not enough in the context of biofilm-based wound care. Other wound cleansers, such as povidone iodine (in higher concentrations), soaps, peroxide and alcohol may be too harsh (Rabenberg et al, 2002)<sup>[33]</sup>.

The ideal wound irrigation solution should exhibit potent and rapid antimicrobial activity at concentrations that do not damage host cells required for wound healing. Hypochlorous acid,

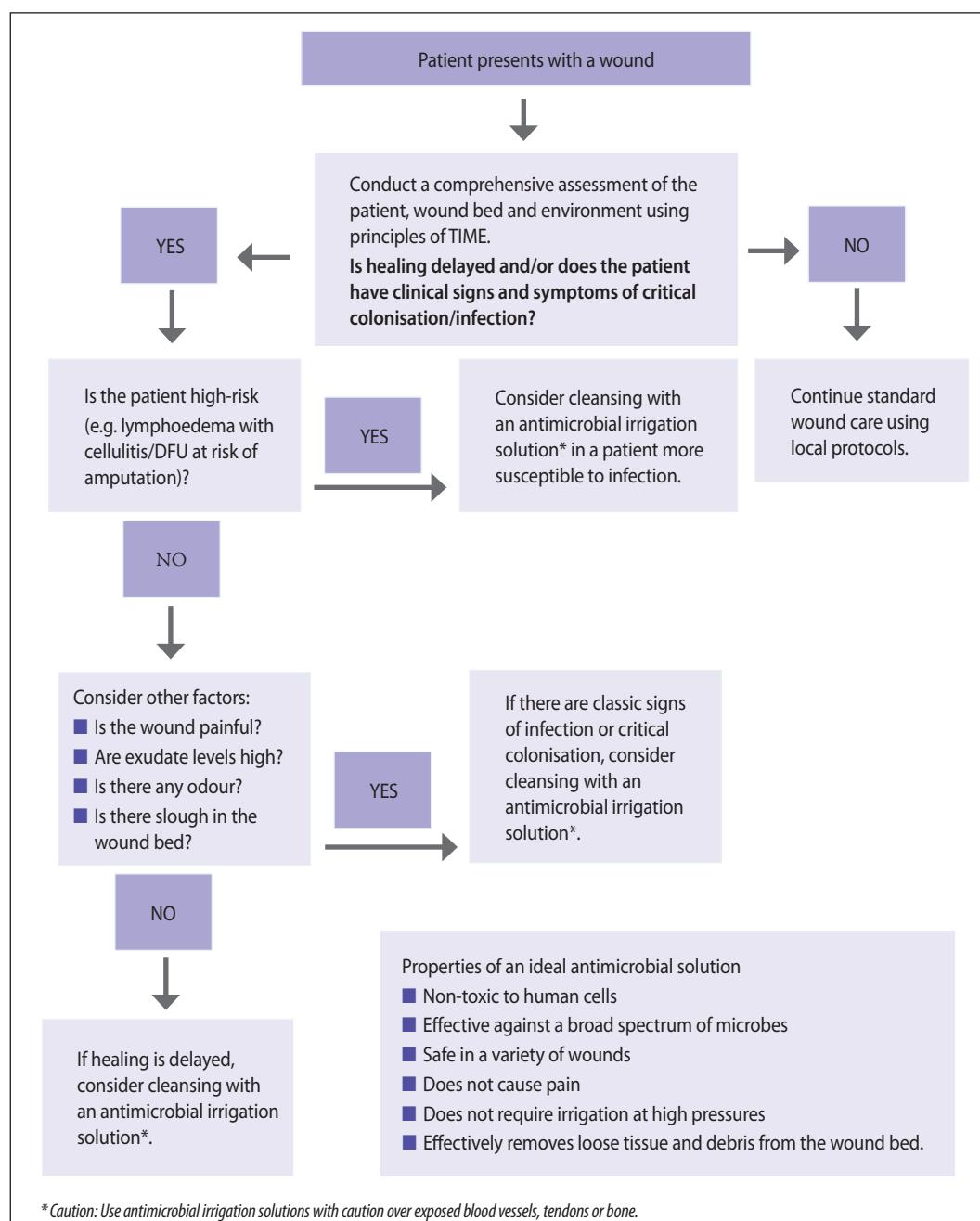
when used in low concentrations, is non-toxic and has a rapid antimicrobial action. The choice of irrigation solution should also reflect the individual requirements of the wound and the patient after thorough holistic assessment<sup>[13]</sup>.

Where holistic assessment leads to the suspicion that bioburden is delaying wound healing, clinicians should consider using a suitable antimicrobial wound irrigation solution to promote healing, reduce bioburden, prevent the proliferation of biofilms and/or remove biofilm before applying an appropriate dressing. As such, cleansing should become an integral part of wound-bed preparation, to help prevent infection and optimise the wound environment for healing.

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**Figure 1. Wound-cleansing decision making pathway.**

## Box 2. Practical tips for wound irrigation.

- Choice of solution: Base choice on assessment of both the patient (including medical condition and allergies) and the wound (e.g. clinically assessed as critically colonised<sup>[10,34]</sup>)
- Method of delivery: Deliver irrigation based on the needs of the patient (e.g. pain levels) and wound (e.g. fragility of wound and periwound skin<sup>[10,34]</sup>).
- Volume of solution: Volumes of 50–100 ml per centimetre of wound length is the general rule of thumb<sup>[35,36]</sup>.
- Prevention of cross-contamination: The clinician should wear personal protective equipment. Do not use solution that has been opened for longer than 24 hours<sup>[10,34]</sup>.
- Comfort of patient: Make sure irrigation solution is at room temperature or slightly warmer. Use analgesia for painful wounds and allow time for it to take effect<sup>[10,34]</sup>.
- Irrigation of wound: Position the patient so the solution runs from the upper end of the wound downward or from clean to dirty (if the upper end is heavily infected and the lower end is clean), into a clean basin or irrigating pouch<sup>[10,34]</sup>.
- Documentation of treatment: Record all aspects of the wound cleansing, including assessment of the wound (e.g. slough, exudate, pain, erythema), date and time of treatment, amount and type of solution used, skin care performed, wound dressing(s) applied and notes on the patient's concordance with treatment<sup>[10,34]</sup>.

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# Expert commentary: wound cleansing

The microbiological profile of chronic wounds is diverse, and Wolcott and Fletcher highlight the developing evidence base regarding the role of planktonic and biofilm phenotypes in the pathogenesis of chronic wound infection<sup>[1,2]</sup>. They go on to highlight the fundamental point that increased proliferation of exogenous microorganisms exacerbates a state believed to inhibit wound healing<sup>[3]</sup>.

It is therefore logical to focus on the importance of reducing the microbial load and preventing the introduction of new microbes during the management of chronic wounds. Historically, aseptic technique has been mandated to achieve these ends; however, the term is rarely adequately defined, nor is the practical application adequately explained. As a result, practice standards vary widely<sup>[4–6]</sup>, ultimately contributing to failures in aseptic technique and, in turn, contributing to the existence of chronic wounds.

Having a standard approach to aseptic technique is increasingly mandated internationally<sup>[7,8]</sup>, as it has been shown to improve healthcare worker knowledge and clinical practice and, in a growing number of cases, play a significant role in reducing healthcare-associated infection<sup>[9]</sup>. One example of a robust, evidence-based clinical practice framework that has improved competency-based teaching and the

practice of aseptic technique is the now globally recognised aseptic non-touch technique initiative<sup>[10]</sup>.

Wolcott and Fletcher attempt to thoroughly address one component of the overall practice of aseptic technique: the importance of delivering effective wound irrigation. In exploring the variety of potential solutions that could be employed in this crucial activity, they touch on the controversy that surrounds sterilised saline solutions and tap water for irrigation. The most recent Cochrane review of randomised and quasi-randomised trials reports no evidence that saline and tap water are detrimental to wound healing<sup>[11]</sup>, but nor does it show that these solutions exhibit the antimicrobial effectiveness needed to help manage chronic wounds. Furthermore, there are possible water source-related problems with using tap water. For example, Gram-negative *Pseudomonas* bacteria is a well-reported issue in tap water<sup>[12]</sup> and, given the potential for biofilm development in healthcare water systems<sup>[13]</sup>, the nature and extent of its presence in chronic wounds should be investigated further. Chronic wounds are not often swabbed, which limits an epidemiological approach to biofilm in chronic wounds. Moreover, in community settings (where the majority of chronic wounds are cared for), water quality is not routinely monitored, underappreciating the role it might play in the development of



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gram-negative-rich biofilms.

Although we cannot know the extent of delayed healing of wounds related to tap water, the potential to impede healing combined with the lack of antimicrobial activity on the parts of both tap water and saline solution mean they cannot be viewed as the most effective options for irrigation of chronic wounds. Clinicians should seek to use a solution that balances antimicrobial activity with minimal cytotoxicity as part of managing wound biofilm. Whatever wound irrigation solution is chosen and used should be in accordance with standardised aseptic technique, to decrease the risk of microorganism proliferation. A holistic approach to chronic wound care, incorporating the practical tips provided by Wolcott and Fletcher is therefore essential to working towards solving the huge problem of chronic wound prevalence. In an area short of gold-standard evidence, Wolcott and Fletcher's appraisal of both the role and application of wound irrigation will be welcomed by practitioners.

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## Meeting report: stepping up to customised wound care



Karl-Christian Münter,  
symposium chair

A one-hour symposium was held by Urgo Medical on Thursday 15th May 2014 at the annual European Wound Management Association (EWMA) Conference in Madrid, entitled 'Stepping up to customised wound care'. The objective of the session was to highlight the benefits of a sequential treatment in chronic wounds. This is an important concept that creates an individualised approach to wound management and dressing choice, recognising the need to tailor treatment to the different phases of healing. Chaired by Dr Karl-Christian Münter, Germany, four eminent speakers focused on the evidence in the form of randomised controlled trials (RCTs) — including double-blind — clinical studies and clinical experience of using both UrgoClean® and UrgoStart® dressings for managing wounds at the inflammation, proliferation (granulation) and maturation (epithelialisation) stages of the healing process.

### What are UrgoClean® and UrgoStart®?

UrgoClean is a dressing made up of hydro-desloughing fibres and soft-adherent TLC (Technology Lipido-Colloid) healing matrix [Box 1], indicated for effective removal of slough.

UrgoStart is a foam dressing with soft-adherent TLC-NOSF healing matrix [Box 1] to accelerate healing of chronic wounds.

### Session one — State of the art in desloughing: Luc Téot, MD, Plastic Surgeon, Wound Healing Unit, Lapeyronie Hospital, Montpellier University, France

Debridement is an integral part of wound management and involves removing all non-viable tissue from a wound, which can act as a nidus of infection and can delay the formation of granulation tissue in the wound bed.

Chronic wounds often contain necrotic or sloughy tissue that can enhance the growth of bacteria, delaying wound healing. The availability of nutrients and oxygen, and the presence of ischaemic tissue combine to ensure this is an ideal environment in which both aerobic and anaerobic bacteria can multiply<sup>[1]</sup>, increasing the risk of infection. Debridement of sloughy/necrotic tissue is vital when reducing the bacterial burden within the wound<sup>[2,3]</sup>.

According to Luc Téot, debridement is essential and a range of debridement techniques are used at present, including autolytic, biosurgical (maggot therapy), hydrosurgical, mechanical, sharp, surgical and ultrasonic. Each of these methods requires varying levels of clinical expertise and have their advantages and drawbacks in terms of patient acceptability and ease of use<sup>[4]</sup>. To achieve successful debridement a combination of techniques may be required.

The first fact emphasised in the symposium was, therefore, that debridement is essential; there are many methods available, including dressings that provide moist wound healing.

### Second session — Results of the European RCT 'Earth study': Sylvie Meaume, MD, Gerontologist-Dermatologist, Head of the Clinical Gerontology Department, Wound Care Unit, Hospital Rothschild APHP, University of Paris, UPMC, France

The second session focused on the role of dressings in wound desloughing. The study by Sylvie Meaume et al (2014)<sup>[5]</sup> on 'Evaluation of two fibrous wound dressings for the management of leg ulcers: Results of a European randomised controlled trial (EARTH RCT)' compared the efficacy of UrgoClean® and a Hydrofiber® dressing (Aquacel®, Convatec) in the treatment of venous or mixed leg ulcers.

This randomised, multicentre clinical trial was conducted in three European countries. Aquacel was selected as the control dressing due to its high level of absorbency and marked gelling capacity, which offer autolytic properties that are conducive to effective local wound debridement. The primary endpoint for this study was the percentage of relative wound area reduction at week 6, while secondary endpoints were relative slough

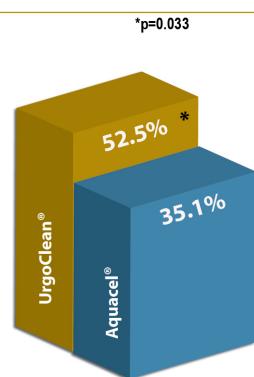


The speakers at the symposium were (clockwise from top left): Luc Téot, Sylvie Meaume, Serge Bohbot and Alexandra Whalley

### **Box 1. Understanding TLC and NOSF technology**

TLC stands for Technology Lipido-Colloid and was developed by Laboratoires Urgo. TLC is a healing matrix that includes a hydrocolloid (carboxymethyl-cellulose) with fatty particles. When in contact with the wound exudate, it forms a gel to create a moist wound environment, allowing exudate to pass through to an absorbent pad or secondary dressing. The TLC healing matrix is atraumatic to newly formed tissue, allows pain-free removal and, has been shown to promote fibroblast proliferation at the cellular level<sup>[8]</sup>.

TLC is compatible with different materials and compounds and is used in a wide range of dressings. It has been combined with NOSF, which is a new compound derived from the chemical oligosaccharide family to inhibit proteases. TLC-NOSF enhances healing in chronic wounds<sup>[7]</sup>.



**Figure 1.** Percentage of debrided wounds, UrgoClean versus Aquacel.

reduction, the percentage of debrided wounds after 6 weeks of treatment, and the acceptability and safety of the tested dressings.

After the 6-week treatment period, the mean percentage of wound reduction was 36.95% in the UrgoClean group and 35.42% in the Aquacel group, results that validated the non-inferiority hypothesis.

In terms of sloughy tissue reduction, UrgoClean showed a 65.3% reduction, higher than the 42.6% seen in the Aquacel group ( $p=0.013$ ), while the percentage of debrided wounds was also higher in the UrgoClean group (52.5%) compared to the Aquacel group (35.1%;  $p=0.033$ ) [Figure 1]. A Global Performance Score (GPS) between 0 and 36 was given for each dressing at the end of the treatment. This GPS was calculated on the basis of nine questions (including efficacy, safety, pain and comfort) using a qualitative scale of five points ('very poor', 'poor', 'fair', 'good', 'very good'). The trial investigators considered the performance of UrgoClean to be superior to that of Aquacel (scores  $30.1\pm3.9$  versus  $27.4\pm5.8$ , respectively;  $p=0.002$ ).

**The second fact highlighted during the symposium was that UrgoClean is a hydro-desloughing dressing that has proven its superiority in the desloughing stage.**

### **Third session — Overview of UrgoStart clinical evidence: Serge Bohbot MD, Medical Director, Laboratoires Urgo, France**

The third speaker at the symposium was Serge Bohbot, who described in detail the physical properties of UrgoStart based on laboratory data to illustrate the mode of action of TLC (Technology Lipido-Colloid) technology and NOSF (Nano-Oligosaccharide-Factor). While the TLC healing matrix has been shown to enhance fibroblast activation and proliferation, NOSF inhibits levels of matrix metalloproteinases (MMPs) in the wound to accelerate healing of chronic wounds. Based on RCT evidence, there is strong support for using UrgoStart to stimulate granulation tissue formation in venous leg ulcers<sup>[6,7]</sup>. The size and duration of the wound was found to have no impact on the performance of UrgoStart.

Serge Bohbot sought to establish the answers to three specific questions:

1. Is there an extrapolation of efficacy from venous leg ulcers to other wounds when using UrgoStart?
2. Can UrgoStart be used as a first-line dressing?

### **3. What is the correlation between UrgoStart and complete wound closure?**

Three cohort surveys were conducted to answer these three questions: Starter, Speed and Opus studies revealed the following:

- The Starter survey involved 1,185 wounds, including venous leg ulcers, pressure ulcers, and diabetic foot ulcers and gave a positive indication that UrgoStart can also be used to promote granulation tissue in diabetic foot ulcers and pressure ulcers with similar efficacy.
- Based on the Speed survey results involving 968 wounds, the suggestion is that UrgoStart should be used as a first-line dressing as results were even better when it was used as such.
- There was an 84% healing rate at 20 weeks in the Opus study, involving 1,405 venous leg ulcers, which shows that UrgoStart can be used right up until healing.

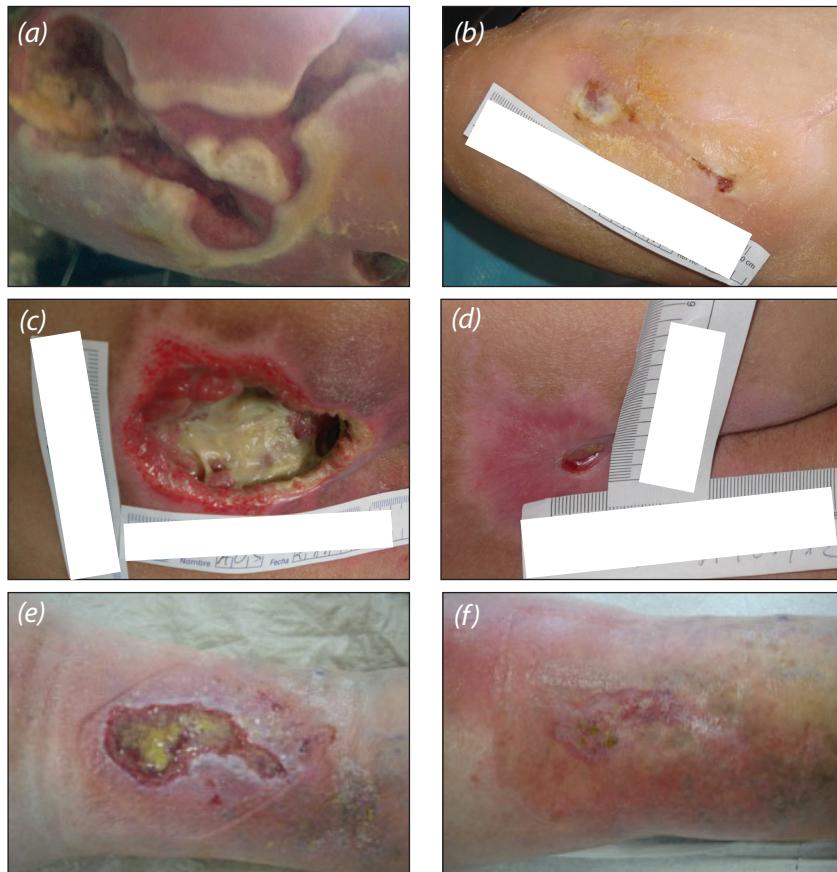
The EXPLORER trial will be the next step; it is a double-blind, multicentre, two-arm European RCT that is ongoing at the time of writing and will involve more than 200 patients with neuro-ischaemic diabetic foot ulcers.

**The third fact highlighted in the symposium was that UrgoStart combines TLC with NOSF technology and has proven efficacy, as demonstrated in a double-blind RCT.**

### **Fourth session — Clinical cases using sequential treatments: Alexandra Whalley, Advanced Podiatrist, UK**

Although the efficacy of UrgoClean and UrgoStart have already been demonstrated through randomised controlled trials (including a double-blind RCT), observational studies and non-comparative clinical studies, case studies, are also important in that they reflect real-life practice in various wound types.

Alexandra Whalley focused on a range of case studies where a sequential treatment using UrgoClean (for desloughing) then UrgoStart (for accelerated wound healing) was initiated. These included patients with diabetic foot ulcers, leg ulcers, pressure ulcers and trauma wounds [Figure 2]. One case described a 63-year-old male patient who presented with type 2 diabetes, hypertension, high cholesterol, obesity, retinopathy, neuropathy and a previous cerebrovascular accident. He had bilateral Charcot feet. The patient was non-concordant with treatment and ignored his wounds. The wound on the left foot remained static.



**Figure 2.** Photographs showing progress (before and after) using sequential treatment with UrgoClean and UrgoStart on a diabetic foot ulcer (a) before (b) after 8 months; a pressure ulcer (c) before (d) after 80 days; and a venous leg ulcer (e) before (f) after 3 weeks.

Treatment with UrgoClean was initiated to prepare the wound bed, reducing exudate levels and removing all slough. It was then decided to use UrgoStart and the wound continued to reduce in size dramatically. There was no adherence of the dressing to the wound or the surrounding skin due to TLC healing matrix and the dressings were easy to remove. The sequential treatment in this case had a positive impact both on the patient's wound healing and his quality of life.

#### The fourth and final fact of the symposium was that sequential treatment with UrgoClean and UrgoStart can optimise the healing process of chronic wounds.

#### Conclusion

Sequential treatment is an important approach in wound management<sup>[9]</sup>. While UrgoClean has been specifically developed for use at the desloughing stage of the healing process, UrgoStart can be introduced at the proliferation stage to stimulate granulation and promote faster healing<sup>[7]</sup>.

Both dressings make use of Urgo's lipido-colloid technology (TLC). A wide range of considerations determine dressing selection, including the removal of slough and the promotion of granulation tissue formulation to stimulate wound healing. Clinicians must look to the literature as a guide when making their decisions in this regard.

The symposium showed that there is a wealth of robust evidence in support of the sequential treatment model and UrgoClean and UrgoStart represent effective wound care options tailored for specific stages of the healing process.

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#### Four key facts from the symposium

1. Debridement is essential; there are many methods available, including dressings that provide moist wound healing.
2. UrgoClean is a hydro-desloughing dressing that has proven its superiority in the desloughing stage.
3. UrgoStart combines TLC with NOSF technology to accelerate healing of chronic wounds and has proven efficacy, including in a double-blind RCT.
4. Sequential treatment with UrgoClean and UrgoStart can optimise the healing process of chronic wounds.



SLOUGHY CHRONIC WOUNDS  
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**UrgoClean FOLLOWED BY UrgoStart**  
**THE WINNING CARE PROTOCOL**

(1) Meaume S., Dissemont J., Addala A. et al. Evaluation of two fibrous wound dressings for the management of leg ulcers: Results of a European randomised controlled trial (EARTH RCT). Journal of Wound Care 2014; 23(3): 105 - 116. (2) Meaume S. et al. A randomized, controlled, double-blind prospective trial with a Lipido-Colloid Technology-Nano-OligoSaccharide Factor wound dressing in the local management of venous leg ulcers. Wound Repair and Regeneration 2012 (july/august); 20 (4): 500-511. Healing speed = 10,83 mm<sup>2</sup>/day versus 5,15 mm<sup>2</sup>/day - p = 0,0056.

## Wounds digest

In this section, a brief synopsis is presented of a range of recently published articles that may be of interest to health professionals working in the wound care setting. The aim of this round-up is to provide an overview, rather than a detailed summary and critique, of the research papers selected. Full references are provided should you wish to look at any of the papers in more detail.

### 1 Detecting biofilms in diabetic foot wounds using different visualisation methods

Readability	✓	✓	✓		
Relevance to daily practice	✓	✓	✓		
Novelty factor	✓	✓			

- Biofilms are found in diabetic wounds and their presence is increasingly being recognised as a potential barrier to healing. They have been shown to be less susceptible to antimicrobial agents than planktonic bacteria.
- In this investigation, the presence of structured microbial assemblages in chronic diabetic foot wounds was demonstrated using several visualisation methods.
- All 26 samples investigated harboured bioburdens in excess of  $5 \log_{10}$  colony-forming units (CFU)/g.
- Results in this pilot study indicated that bacterial micro-colonies and putative biofilm matrix can be visualised in chronic wounds using fluorescence microscopy and environmental scanning electron microscopy (ESEM), as well as the simple Gram stain.

Oates A, Bowling FL, Boulton AJ et al (2014) The visualization of biofilms in chronic diabetic foot wounds using routine diagnostic microscopy methods. *J Diabetes Res* 2014: 153586

### 2 The effect of diabetic foot complications on psychosocial outcomes and health

Readability	✓	✓	✓		
Relevance to daily practice	✓	✓	✓	✓	
Novelty factor	✓	✓	✓		

- The authors compared a selected list of psychological and social characteristics among people with diabetes with and without diabetic foot complications to examine the impact of diabetic foot on daily life and mental health.
- In total, 104 people with and 48 people without diabetic foot completed the World Health Organization Quality of Life Assessment (WHOQOL-BREF), which consists of 24 items grouped into four domains (physical health, psychological health, social relationships and environment).
- Those with diabetic foot had a significantly worse quality of life in the area of health and standard of living as measured by the physical health domain and scored a lower environmental domain than those without diabetic foot, which was negatively correlated with diabetes duration ( $p=0.003$ ).
- People with diabetic foot subjectively felt more depressed compared with people without diabetic foot ( $p<0.05$ ) although depression was objectively recorded in a high percentage in both study groups.

- The authors conclude that people with diabetic foot had a predominantly worse standard of living. In contrast to the authors' expectations, people with diabetic foot appeared to have good stress tolerability and mental health (with the exception of individuals with previous major amputation) and did not reveal severe forms of depression or any associated consequences.

Fejfarová V, Jirkovská A, Dragomirecká E et al (2014) Does the diabetic foot have a significant impact on selected psychological or social characteristics of patients with diabetes mellitus? *J Diabetes Res* 2014: 371938

### 3 Risk factors for recurrent plantar foot ulcers in people with neuropathic diabetes

Readability	✓	✓	✓		
Relevance to daily practice	✓	✓	✓		
Novelty factor	✓	✓	✓		

- The study aim was to identify risk factors for ulcer recurrence and to establish targets for ulcer prevention.
- In total, 171 people with diabetes and neuropathy with a recently healed plantar foot ulcer and custom-made footwear were monitored during an 18-month period or until ulceration.
- Seventy-one people had a recurrent ulcer. The presence of minor lesions was the most significant independent predictor for recurrent ulceration (odds ratio, 9.05 [95% confidence interval, 2.98–27.57]).
- Of the 41 ulcer recurrences that were suggested to be the result of unrecognised repetitive trauma, the strongest independent predictor for recurrent ulceration was still the presence of minor lesions.
- Use of adequate off-loading footwear was a strong predictor against ulcer recurrence from unrecognised repetitive trauma.

Waaijman R, de Haart M, Arts ML et al (2014) Risk factors for plantar foot ulcer recurrence in neuropathic diabetic patients. *Diabetes Care* 37: 1697–705

### 4 Comparing two approaches to pressure ulcer risk assessment in Norway and Ireland

Readability	✓	✓	✓	✓
Relevance to daily practice	✓	✓	✓	✓
Novelty factor	✓	✓	✓	✓

- The study set out to compare nurses' views on two different approaches to risk assessment and preventive care for pressure ulcers. In one setting in Norway clinical judgement alone was used to assess risk and the other in Ireland used clinical judgement along with formal structured risk assessment.
- A descriptive, qualitative design was used to collate the views of nine healthcare workers in Norway and five in Ireland.

- The authors found that identified risk factors, the detection of at-risk patients and the preventive measures used were similar at the two different care settings regardless of their different approaches. However, they found that planning and implementation of preventive measures did not always follow after risk had been assessed.
- The authors, whose research was partly funded by a grant from the Norwegian Nurses Organisation, concluded that a formal risk assessment tool did not make any difference to planning, initiation and evaluation of pressure ulcer prevention. They described a 'missing link' between identifying risk and documented care planning and recommended further investigation into the barriers that prevent appropriate pressure ulcer documentation.

Johansen E, Moore Z, van Etten M, Strapp H (2014) Pressure ulcer risk assessment and prevention: What difference does a risk scale make? A comparison between Norway and Ireland. *J Wound Care* 23(7): 369–78

## 5 Reflectance spectrophotometry and the early detection of non-blanching erythema

Readability	✓	✓	✓	✓
Relevance to daily practice	✓	✓	✓	✓
Novelty factor	✓	✓	✓	✓

- Early detection of non-blanching erythema is important if further skin damage is to be prevented. It is normally detected using a finger press test and there is not a commonly-used objective method of detection. This study tested whether reflectance spectrophotometry could be used to detect non-blanching erythema.
- The sacral area of 78 patients who were having hip fracture surgery was assessed using both a finger-press test and a digital reading using reflectance spectrophotometry. This was carried out upon admission and five days post-surgery.
- The authors found the measurements from the reflectance spectrophotometry could be used to discriminate between blanching and non-blanching erythema with excellent reliability quantified by the intra-class correlation coefficient between repeated measurements. This suggests that reflectance spectrophotometry could be used as a valuable tool to identify early pressure damage.

Sternér E, Fossum B, Berg E et al (2014) Objective evaluation by reflectance spectrophotometry can be of clinical value for the verification of blanching/non-blanching erythema in the sacral area. *Int Wound J* 11(4): 416–23

## 6 Update to the Cochrane review on compression and pressure ulcer recurrence

Readability	✓	✓	✓	✓
Relevance to daily practice	✓	✓	✓	✓
Novelty factor	✓	✓	✓	✓

- This review assessed whether compression does prevent the recurrence of venous ulcers and also looked at the evidence for recommending particular levels of compression such as high, medium or low, types of compression or brands of compression to prevent ulcer recurrence after healing.
- Randomised controlled trials (RCTs) evaluating compression bandages or hosiery for preventing the recurrence of venous ulcers

were used after searching The Cochrane Wounds Group Specialised Register.

- Four RCTs ( $n=979$ ) were eligible for inclusion in this review. One trial involving patients with recently healed venous ulcers ( $n=153$ ) found that compression significantly reduced ulcer recurrence at six months when compared with no compression.
- Two trials compared high-compression hosiery with moderate-compression hosiery. The first study ( $n=300$ ) found no significant reduction in recurrence at five years follow-up with high-compression hosiery compared with moderate compression. The second study ( $n=338$ ) assessed ulcer recurrence at three years follow-up and found that high-compression hosiery reduced recurrence compared with moderate compression.
- A fourth trial ( $n=166$ ) found no statistically significant difference in recurrence between two types of medium compression hosiery (Medi and Scholl).
- Patient intolerance of compression hosiery was high across all the studies.
- There was insufficient evidence to aid selection of different types, brands or lengths of compression hosiery.

Nelson EA, Bell-Syer SE (2014) Compression for preventing recurrence of venous ulcers. *Cochrane Database Syst Rev* 9: CD002303

## 7 Different treatment strategies and the effect on the wound characteristics of malignant wounds

Readability	✓	✓	✓	✓
Relevance to daily practice	✓	✓	✓	✓
Novelty factor	✓	✓	✓	✓

- Symptoms and wound management methods were observed over a period of 42 days in 32 patients (all women, mean age 60 years, range 30–96 years, most with infiltrating ductal carcinoma).
- After cleansing (with either sterile saline or water), a variety of wound treatments were used based on specific wound characteristics.
- Wound size, colour, peri-wound condition, surface wound organisms (species and quantity) signs of infection, wound-related pain, odour, bleeding (spontaneous or induced) and exudate levels were assessed at baseline and on days 21 and 42 of treatment and each symptom was rated as controlled, partly-controlled or not controlled.
- Mean initial wound size remained unchanged over the evaluation period and most (74%) wounds were characterised as being inflamed. No infectious episodes were observed. Exudate and bleeding were generally controlled with haemostatic dressings, calcium alginate dressings, or absorbent pads. Odour was not completely controlled with charcoal dressing and was noted to be significantly greater in patients with  $>105/g$  bacterial counts and/or with one or more anaerobic bacteria ( $p=0.05$ ). At baseline, 13 out of 25 patients (50%) had uncontrolled pain and pain ratings did not change over the course of the study.
- The authors stressed the importance of investigating the care of malignant wounds in order to improve quality of care, which may also improve quality of life.

Fromantin I, Watson S, Baffie A et al (2014) A prospective, descriptive cohort study of malignant wound characteristics and wound care strategies in patients with breast cancer. *Ostomy Wound Manage* 60(6): 38–48

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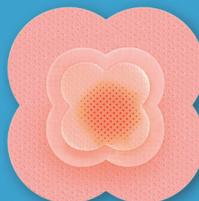
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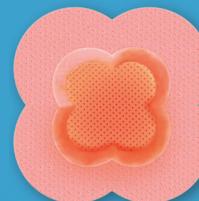
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Reference

1. Stephen-Haynes et al, The clinical performance of a silicone foam in an NHS community trust. Journal of Community Nursing 2013.

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