Introduction

Negative pressure wound therapy (NPWT) offers clinicians an important option for the advanced management of many wound types. Key factors for successful use are the appropriate preparation of the wound bed and the application technique used. In addition, a decision must be made about the type of dressing selected within the NPWT system: currently the choice is between gauze and foam. This document builds on the article ‘NPWT settings and dressing choices made easy’, and focuses on the practical, everyday aspects of how to deliver NPWT safely and effectively to make best use of this technology and maximise patient benefits.

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Full author details can be found on page 6.

When is NPWT indicated?

NPWT is indicated for use in many acute and chronic wounds, and has the potential to benefit a large number of patients from both a symptom management and wound healing perspective. Box 1 opposite summarises the key advantages of the therapy. NPWT can be considered when the wound:

- is not progressing towards healing in the expected time frame, eg edges are slow to contract using standard care
- produces excessive exudate that is difficult to manage
- is in an awkward location or is a difficult size so that achieving an effective seal with traditional dressings is problematic
- requires reduction in size to achieve surgical closure.

NPWT is also indicated for use when the patient requires a dressing/treatment regimen that stays in place securely and does not need frequent changes. A good example of this is in the case of children with wounds, where frequent dressing changes may be traumatic or where dressings may fail to stay in position. In addition, in certain wound types and with skin grafts, NPWT provides a splinting effect (rigid support).

What needs to be considered before applying NPWT?

Before the application of NPWT, it is important that a full assessment of the wound and the patient is undertaken by a knowledgeable and competent practitioner to confirm whether NPWT is appropriate. Points to consider include:

- Will the patient’s symptoms be managed more effectively using NPWT?
- What are the dimensions of the wound and can NPWT be easily applied?
- Are there any contraindications (see page 4)?
- Will the placement of tubing be a problem?
- If the patient is discharged home on NPWT, will he/she be able to manage the NPWT system alone at home?
- Can the wound bed be effectively debrided and prepared prior to application?
- Is the patient willing/able to give consent (see page 4)?

What are the goals of treatment?

There should be a documented treatment plan for individual patients, including short- and long-term goals and outcomes.

Short-term goals may include:

- management of wound exudate
- management of wound odour
- reduction in pain
- removal of sloughy tissue
- prevention of infection.
Long-term goals may include:

- reduction in wound area
- reduction in wound exudate volume
- production of healthy granulation tissue
- wound closure through surgical means or secondary intention healing
- restoration of physical function in the wound site.

When should NPWT not be used?

As with any wound therapy, clinicians must be fully aware of precautions and contraindications (Box 2, page 4). The use of NPWT should be carefully considered and the risks weighed against possible benefits.

What components are there in a NPWT system?

There are a number of systems available. Most comprise a base unit with pump and a gauze or foam wound dressing (filler). If foam is used, a non-adherent wound contact layer can be beneficial to reduce tissue ingrowth and pain on removal. Transparent film is used over the filler to create a seal around the drain, which is imbedded in the gauze or foam filler. Alternatively, a port can be used in place of a drain. The drain or port is then connected to a canister, which is attached to the pump. Larger units are often used in hospitals and smaller portable units are suitable for use in both community and hospital settings.

Gauze or foam?

The NPWT device works through the application of an open cell foam or gauze dressing, which allows equal distribution of negative pressure across the entire wound bed. Recent published research has shown that both types of dressing interface are equally effective at delivering negative pressure, wound contraction and stimulation of blood flow at the wound edge. However, studies have documented in-growth of granulation tissue into the cells of the open cell polyurethane foam. This can cause patients to experience pain at dressing changes and a disturbance of the re-epithelialisation process.

The rapid granulation associated with foam dressings can sometimes be an advantage in wounds that require quick healing, such as in patients with significant vascular problems or those at risk of infection.

It is important not to compress the foam or overpack the wound so that local vasoconstriction in the wound can be prevented and allow fluid to flow freely through the interface. Contact between the foam and the surrounding skin should be avoided to prevent damage to the periwound skin.

A list of benefits and disadvantages of foam and gauze can be found in Box 3.

Continuous or intermittent suction settings?

NPWT units usually have two suction settings: continuous and intermittent. Continuous suction is the most commonly used setting and is the recommended setting at the start of therapy. This is also the best setting for wounds producing high levels of exudate and to help maintain a good seal. The continuous setting means the unit will apply continuous suction to the wound bed, providing stable and consistent negative pressure.

The intermittent suction setting usually provides a cycle of five minutes on and two minutes off and may be used once the amount of exudate drainage has been reduced or stabilised. There are cases where intermittent suction can be used throughout treatment.

Pressure settings

Most units provide a range of negative pressure, between -40mmHg and -200mmHg. Negative pressure...
levels will be dependent on the patient’s tolerance and wound aetiology. For example, the therapy is often delivered at lower pressures for painful wounds or wounds that have compromised perfusion\(^1\). Clinicians may initiate NPWT at -80 to -125mmHg for an adult patient, which may be reduced if the patient is experiencing pain or slight bleeding.

**When should NPWT be discontinued?**

NPWT should be discontinued when the goal of treatment has been achieved. Other reasons to discontinue NPWT include:
- when uniform granulation tissue and little depth to the wound is present
- the patient is not tolerating the NPWT, or withdraws consent to treatment
- when wound volume reduction is less than 15% over a two week period\(^1\)
- the patient complains of extreme pain
- there is excessive bleeding
- an alternative treatment option is more suitable
- there are signs of local or spreading infection.

**Patient-specific factors**

**Informed consent**

The patient should understand the treatment options and why NPWT is being proposed. This includes how the treatment works, the rationale and treatment goals, the possible side effects and how these will be managed, any impact the treatment may have on quality of life, how long the treatment is likely to take and possible outcomes.

**How should NPWT be explained to a patient?**

The basic elements of the NPWT system should be explained and demonstrated. Key benefits of NPWT that can be easily explained include that it:
- manages fluid leaking from the wound by collecting in an enclosed canister
- protects the skin around the wound from exposure to damaging enzymes present in wound fluid
- speeds up the healing process by encouraging blood flow in the wound
- reduces the risk of infection as micro-organisms cannot penetrate the sealed wound environment
- can help to reduce the wound pain experienced
- can reduce the number of dressing changes needed, resulting in less inconvenience to the patient and his/her family
- helps to reduce the level of odour emanating from the wound because of the seal and the exudate management system
- can help to reduce the swelling in and around the wound area, which can help healing and reduce pain.

**Other essential patient information**

- Initially the negative pressure dressing may take longer to apply than other products. However, this therapy will be in place for up to three days
- The device should make a noise only when it is establishing a seal; once this has been achieved the machine will operate more quietly
- Portable devices are available that enable patients to undergo therapy regardless of the setting.

**NPWT at home**

As with any treatment option, the patient may not remain in hospital for the duration of treatment. Before discharge, it is important to assess whether the patient can continue to receive NPWT in the home environment using portable equipment. More and more patients are using NPWT in the home environment and nurses are now very familiar with the therapy.

Home use may raise certain safety issues. In particular, NPWT involves a therapy unit pump which the patient must carry with them (most models come with a carry bag). Where patients have a foot or lower leg wound, this may present a risk of tripping and falling. It is also important to check with patients that their home electricity supply is safe and that there are no problems such as loose wiring.

**Safety checklist**

- Patient mobility – does the patient use a walking aid?
- Is the patient able to carry the device and manage the weight and tubing?
- Is the patient at risk of falling because of the device?
- Is the patient/carer cognitively able to manage the therapy? For example, paediatrics and patients with learning difficulties may have problems
- Does the patient have sensory deficits, such as hearing loss or vision problems. Does the patient have sufficient hearing/vision to manage the system (eg hear alarms/see dial)?
- Is the patient in a psychological and social situation appropriate for NPWT?
- Is the patient’s home electricity supply safe?
- Are there stairs or other obstacles that the patient will need to manoeuvre with the device?
**Box 3 Benefits and disadvantages of foam (open cell) and gauze application**

<table>
<thead>
<tr>
<th>Foam</th>
<th>Gauze</th>
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**Box 2 Patient risk factors**

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<tr>
<th>Contraindications</th>
<th>Precautions</th>
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<tr>
<td>Osteomyelitis: NPWT is contraindicated in the presence of untreated osteomyelitis.</td>
<td>Weakened blood vessels: patients who have weakened blood vessels, friable vessels and infected vessels (direct negative pressure may cause trauma and bleeding).</td>
</tr>
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<td>Malignancy: NPWT is not recommended in malignant wounds because it may stimulate proliferation of malignant cells.</td>
<td>Exposed delicate structures: patients with exposed blood vessels, delicate fascia, exposed tendons or ligaments (direct negative pressure may cause trauma and bleeding).</td>
</tr>
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<td>Non-enteric and unexplored fistulae: there may be communication with underlying vulnerable organs.</td>
<td>Bleeding: wounds that are actively bleeding or where the patient is at a high risk of bleeding or haemorrhage, receiving anticoagulant therapy and/or platelet aggregation inhibitors (negative pressure could encourage bleeding as local perfusion will be increased and therefore blood loss will be greater).</td>
</tr>
<tr>
<td>Exposed vasculature, nerves, anastomotic sites or organs: if directly applied to exposed structures, NPWT can cause damage or rupture vessels due to the force of negative pressure.</td>
<td>Fistulae: wounds with enteric fistulae (these require special precautions to optimise therapy). The clinician needs to refer to or take advice from a specialist in NPWT for these patients.</td>
</tr>
<tr>
<td>Necrotic tissue with eschar present or thick slough in the wound bed: appropriate debridement should be performed before the application of NPWT. This therapy is not designed to debride and quicker results will be obtained if the wound is debrided prior to application of NPWT.</td>
<td>Patients requiring certain treatments: special consideration and caution should be taken where patients require magnetic resonance imaging (MRI), hyperbaric oxygen treatment, defibrillation, etc.</td>
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<td>Additional precautions: these include patients with spinal cord injury, infected wounds, wounds with sharp edges (eg bone fragments) and vascular anastomoses.</td>
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See [http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/PublicHealthNotifications/ucm190658.htm](http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/PublicHealthNotifications/ucm190658.htm) for the FDA list of contraindications and risk factors.
Summary

Negative pressure wound therapy has the potential to benefit a large number of patients in terms of both symptom management and wound healing. The combination of managing exudate, reducing odour and promoting granulation tissue formation are major benefits of the therapy. It is also essential that clinicians use the therapy when it will be most helpful. Best results are found when used on wounds that have been debrided and where rapid granulation is sought. The decision to use foam and gauze interfaces should be based on the individual patient and wound assessment, and on the goals that need to be achieved, whether they be wound healing or symptom management or both. Finally, all clinicians, patients and carers should be fully informed about NPWT as a therapy, how the system works, what the benefits are and, most importantly, what to do when there is a problem.
References


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Further reading


To cite this publication


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