Guide to Negative Pressure Wound Therapy (NPWT)

Negative Pressure Wound Therapy (NPWT), also known as vacuum-assisted wound closure (VAC), is a dressing system that continuously or intermittently applies negative pressure across the surface of wounds that are acute, chronic, complex, or difficult-to-heal (Gestring, 2025). NPWT involves the placement of a well-sealed foam dressing and the application of sub-atmospheric pressure to help reduce inflammatory exudate and promote the formation of granulation tissue (Zavar & Kankanalu, 2023). Many of these devices are small and lightweight, allowing patients full mobility. Due to varying designs, you should be familiar with the manufacturer's instructions for the specific device in use.

Indications

Wounds that benefit most from NPWT (Wound Care Centers, n.d.)

- Diabetic ulcers
- Venous ulcers
- Arterial ulcers
- Pressure injuries
- First and second-degree burns
- Chronic wounds
- Wounds at high risk for infection
- Open abdominal incisions or dehisced surgical wounds
- Following surgical debridement of acute or chronic wounds (i.e., orthopedic, necrotizing infection, post-sternotomy mediastinitis)
- Skin flaps and preparation for skin graft sites in reconstructive surgery
- Skin grafts
- Wounds with copious drainage
- Meshed grafts, to either secure the graft in place or improve epithelialization

Prophylactic negative pressure wound therapy (NPWT) may help reduce surgical site infections (SSI) in certain incision types compared to standard dressings, according to small clinical trials. The proposed benefits include improved wound stabilization and reduced shear forces. However, larger randomized studies with extended follow-up are needed to confirm effectiveness, cost-benefit, and identify which patient populations benefit most.

Advantages of NPWT Compared to Traditional Forms of Wound Therapy (Gestring, 2025)

- Dressing changes are required less frequently (e.g., every two to five days).
- Customizable to almost all types of wounds including circumferential extremity wounds and wounds located close to orthopedic fixation frames.
- Accelerates wound healing and significantly decreases the time to wound closure in diabetic patients, improving quality of life.
- Reduces the need for complex, subsequent reconstructive procedures.

Disadvantages of NPWT (Gestring, 2025)

- The patient is required to carry a portable pump.
- NPWT systems cost significantly more than traditional wound dressings.

General Procedure (Gestring, 2025)

NPWT systems include an open-pore polyurethane ether foam sponge, semi-occlusive adhesive cover, fluid collection system, and suction pump. The following steps outline the general procedure, *however please consult your institution's specific policies regarding NPWT and device manufacturer instructions.*

- Trim the foam sponge to fit the size of the open wound and place it into the wound; the foam should not extend beyond the wound margin.
- Apply the adhesive sheet on top of the foam dressing.
- Cut a hole in the adhesive sheet and apply the suction port with tubing which is connected to the disposable collection cannister.
- Connect the portable pump to the suction tubing and apply settings, typically -50 to -175 mmHg of continuous or intermittent suction; the polyurethane foam evenly distributes subatmospheric pressure throughout the foam creating positive pressure across the surface of the wound.
- If fragile structures are present within the wound, place an additional layer beneath the foam, such as mesh (Vicryl), petrolatum gauze, or a dense (white) foam.

NPWT Mechanism of Action (Normandin et al., 2021)

Macrodeformation

- Reduction of wound surface area by application of subatmospheric pressure to sponge, reducing its size by up to 80%

Drainage of fluids

- Negative pressure application creates suction to remove extracellular fluid reducing edema and increasing proliferative cellular responses required for wound healing
- Removal of exudate and toxic material reducing pressure on surrounding vasculature and improving perfusion to the wound

Stabilization of the wound environment

- Less frequent dressing changes
- Creation of an impermeable wound bed preventing exposure to microorganisms and colonization
- Semi-occlusive cover limits permeability to gases and water vapor reducing heat transfer and promoting a moist, warm wound environment

Microdeformation

- Negative pressure application creates movement of fluid through cellular matrix creating shear and deformation forces on cells promoting cellular proliferation, angiogenesis, and formation of granulation tissue.

Dressing Changes (Gestring, 2025)

Change dressing and tubing every 48 to 120 hours (two to five days), as ordered or based on your institution's policy. More frequent dressing changes may be needed if the wound has heavy drainage or if the wound is infected.

- Pre-medicate patient with analgesia prior to dressing change as ordered.

- Turn off the device.
- Remove the semi-occlusive dressing and carefully remove the foam sponge. If the sponge adheres to the underlying tissue, soak with saline and let it sit for a few minutes prior to removal.
- If patient experiences excessive pain during sponge removal, the sponge may be soaked with topical Xylocaine without epinephrine.

Risks and Complications (Gestring, 2025; Zavar & Kankanalu, 2023)

The table below outlines common risks and complications associated with negative pressure wound therapy (NPWT), along with recommended preventive measures and management strategies.

Risk or Complication	Prevention and Management
Pain	Premedicate prior to dressing changes.
Bleeding	Apply firm pressure to the wound surface if minor bleeding occurs during dressing changes. For severe hemorrhage apply direct pressure and contact provider as surgery may be needed to control bleeding based on the source (e.g., exposed vessel or vascular graft).
Infection	Discontinue NPWT dressing, irrigate and debride the wound, obtain wound cultures, and initiate empiric antibiotics as prescribed.
Enterocutaneous fistula	While NPWT may assist with the closure of postoperative fistulas, they may also cause enteric fistulas to form.
Loss of suction due to inadequate seal	Ensure proper placement of sponge and semi-occlusive adhesive cover.
Hypersensitivity to dressing material	Monitor for pruritis and skin changes such as hives or erythema. Notify provider of concerning signs or symptoms.
Negative pressure erosion, necrosis, or damage to adjacent skin	Ensure proper placement of sponge and semi-occlusive adhesive cover; avoid sponge contact with healthy skin.
Dehydration due to secondary extracellular fluid loss	Monitor fluid losses and replace as clinically indicated and prescribed by the provider.

Factors that increase a patient's risk for adverse events with NPWT

- Anticoagulant or platelet aggregation inhibitor therapy
- Any factors that increase patient risk for bleeding and hemorrhage
- Friable or infected blood vessels
- Vascular anastomosis
- Infected wounds
- Osteomyelitis

- Spinal cord injury
- Enteric fistulas
- Exposed organs, vessels, nerves, tendons, and ligaments

Contraindications (Gestring, 2025; Zavar & Kankanalu, 2023)

- Exposed vital organs, blood vessels, or vascular grafts
- Untreated malignancy due to risk of tumourigenesis and friability of malignant tissue

Relative Contraindications

- Ischemic wounds, necrotic tissue with eschar
- Ongoing infection – Wounds should be adequately debrided of devitalized tissue and infections should be treated prior to NPWT.
- Fragile skin – Shearing force at the wound margin can result in skin avulsion and necrosis.
- Adhesive allergy

What should the NPWT orders include?

- Wound dressing material (foam or gauze) and wound adjunct (protective non-adherent, petroleum or silver dressing)
- Negative pressure setting (-50 to -175 mmHg)
- Therapy setting (continuous, intermittent or variable)
- Frequency of dressing change; varies between 1 and 7 days or as needed (Wound Care Centers, n.d.; Gestring, 2023)

What should you document? (Lippincott Solutions, 2023)

- Date and time of wound therapy
- Wound assessment findings, including signs and symptoms of infection
- Wound measurements
- Pain assessment and patient's tolerance to the procedure
- Interventions and patient's response
- Weight of soiled dressings (if appropriate)
- Type and number of dressings used
- Settings for the NPWT unit
- Teaching provided to the patient and family, their understanding, and need for follow-up

Wound Care Tips (Lippincott Solutions, 2023)

- Use protective barriers, such as non-adherent or petroleum gauze, to protect sutured blood vessels or organs near areas being treated with NPWT.
- Avoid over packing the wound too tightly with foam; this prevents negative pressure from reaching the wound bed, causing exudate to accumulate.

- Avoid placing the tubing over bony prominences, skinfolds, creases, and weight-bearing surfaces to prevent tubing-related pressure ulcers.
- Count and document all pieces of foam or gauze on the outer dressing and in the medical record, to help prevent retention of materials in the wound; whenever possible, apply foam dressing as a single piece.
- Ensure that the patient receives uninterrupted therapy for at least 22 hours daily. If therapy is interrupted for more than 2 hours, remove the old dressing and irrigate the wound. Apply a new sterile dressing and restart the therapy. Alternatively, if ordered, apply a wet-to-moist sterile gauze dressing to the wound.
- With a heavily colonized or infected wound, consider changing the dressing every 12 to 24 hours as directed by the prescribing provider.

Nursing Considerations (Lippincott Solutions, 2023)

- Assess your patient for wound healing issues, such as poor nutrition (low protein and/or albumin levels), diminished oxygenation, decreased circulation, diabetes, smoking, obesity, presence of foreign bodies, infection, and anemia.
- Assess and manage your patient's pain, be sure to premedicate as needed before each dressing change as ordered by the provider.
- Provide patient education on:
    - Alarms and device 'noise'
        - Audible and visual alarms will alert you when the canister is full, dressing has an air leak, battery is low, or tubing becomes blocked or dislodged.
    - Dressing changes
    - Signs of complications
    - If the machine malfunctions, they should remove the dressing and replace it with a wet-to-damp dressing and contact the provider as soon as possible to reapply the wound vac dressing and resume therapy.
- Advise patients to seek medical care if they notice:
    - Significant change in the color of the drainage (cloudy or bright red)
    - Excessive bleeding under the clear dressing, in the tubing or in the canister
    - Increased redness or odor from the wound
    - Increased pain
    - The device has been left off for more than 2 hours
    - Signs of infection, such as fever (above 100.4°F), redness or swelling around the wound, itching/rash, warmth, pus, or foul-smelling drainage
    - Signs of allergic reaction to the drape/dressing including redness, swelling, rash, hives, or severe itching
    - *Difficulty or trouble breathing*
        - *Patient should be advised to seek immediate medical assistance*

Troubleshooting the Device (Lippincott Solutions, 2023)

- Confirm that the unit is on and set to the appropriate negative pressure, that the foam is collapsed, and the NPWT device is maintaining the prescribed therapy.

- Be sure the negative pressure seal has not been broken, and leaks are minimal.
- Ensure there are no kinks in the tubing and that all clamps are open.
- Address and resolve alarm issues.
- Do not leave the device off for more than two hours; if the device is off for more than two hours, apply a moist dressing and notify the prescribing clinician immediately.
- Avoid getting the electrical device wet; educate the patient to disconnect the unit from the tubing and clamp the tubing before bathing.
- Check the drainage chamber to make sure it is filling correctly and does not need changing. Change the evacuation canister once per week or when it's full, according to the manufacturer's instructions and as directed by your facility.

References:

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