Guidelines for safe negative-pressure wound therapy

Rule of thumb: Assess twice, dress once

By Ron Rock MSN, RN, ACNS-BC

Since its introduction almost 20 years ago, negative-pressure wound therapy (NPWT) has become a leading technology in the care and management of acute, chronic, dehisced, traumatic wounds; pressure ulcers; diabetic ulcers; orthopedic trauma; skin flaps; and grafts. NPWT applies controlled suction to a wound using a suction pump that delivers intermittent, continuous, or variable negative pressure evenly through a wound filler (foam or gauze). Drainage tubing adheres to an occlusive transparent dressing; drainage is removed through the tubing into a collection canister. NWPT increases local vascularity and oxygenation of the wound bed and reduces edema by removing wound fluid, exudate, and bacteria.

Every day, countless healthcare providers apply NPWT devices during patient care. More than 25 FDA Class II approved NPWT devices are available commercially. If used safely in conjunction with a comprehensive wound treatment program, NPWT supports wound healing. But improper use may cause harm to patients. (See *Risk factors and contraindications for NPWT.*)

Lawsuits involving NPWT are increasing. The chance of error rises when inexperienced caregivers use NPWT. Simply applying an NPWT dressing without critically thinking your way through the process or understanding contraindications for and potential complications of NPWT may put your patients at risk and increase your exposure to litigation.

Proper patient selection, appropriate dressing material, correct device settings, frequent patient monitoring, and closely managed care help minimize risks. So before you flip the switch to initiate NPWT, read on to learn how you can use NPWT safely.

Understand the equipment and its use

Consult your facility's NPWT protocols, policies, and procedures. If your facility lacks these, consult the device manufacturer's guidelines and review NPWT indications, contraindications, and how to recognize and manage potential complications. Ideally, facilities should establish training programs to evaluate clinicians'

Risk factors and contraindications for NPWT

Since 2007, the Food and Drug Administration (FDA) has received 12 reports of death and 174 reports of injury related directly to negative-pressure wound therapy (NPWT). The deaths occurred in patients' homes and long-term care facilities. The most serious complications were bleeding and infection. Patients taking anticoagulants and those who had vascular grafts or infected wounds were most at risk. In 32 of the injuries, dressings had adhered to tissue and foam was embedded or retained in the wound; most of these patients had to be readmitted for surgical removal of foam, management of dehisced wounds, and antibiotic therapy. Infection from the original wound or retained foam was reported in 27 additional injury cases.

These reports compelled the FDA in 2011 to recommend that clinicians use extreme care when prescribing NPWT. The agency stressed that clinicians should know that NPWT is contraindicated for specific wound types and should thoroughly consider all patient risk factors before prescribing it. Once NPWT has been applied, clinicians must assess and monitor the patient in an appropriate setting. Monitoring frequency depends on the patient's condition, wound status, wound location, and comorbidities. Most importantly, clinicians must be vigilant in checking for potentially life-threatening complications and be prepared to respond appropriately.

The Pennsylvania Patient Safety Authority reported 419 adverse events linked to NPWT between January 2008 and December 2009. Assessment and monitoring deficiencies accounted for nearly half; delayed or incorrect dressing application accounted for another 21%.

Contraindications

Contraindications for NPWT include:

- inadequately debrided wounds
- necrotic tissue with eschar
- untreated osteomyelitis
- cancer in the wound
- untreated coagulopathy
- nonenteric and unexplored fistulas
- exposed vital organs.

Patient risk factors

Factors that increase the risk of harm from NPWT include:

- increased risk for bleeding and hemorrhage
- anticoagulant or platelet aggregation inhibitor therapy
- friable or infected blood vessels
- spinal cord injury
- enteric fistulas.

View: FDA information on NPWT adverse events

skills. Enhanced training should include comprehension of training materials, troubleshooting, and correct operation of the device, as shown by return demonstration of the specific NPWT device used in the facility.

Assess the patient thoroughly

The prescribing provider is responsible for ensuring patients are assessed thoroughly to confirm they're appropriate NPWT candidates. Aspects to consider include comorbidities, contraindicated wound types, high-risk conditions, bleeding disorders, nutritional status, medications that prolong bleeding, and relevant laboratory values. The pain management plan also should be evaluated and addressed.

Assess the order

Before NPWT begins, make sure you have a proper written order. The order should specify:

- wound filling material (foam or gauze dressing and any wound adjunct, such as a protective nonadherent, petrolatum, or silver dressing)
- negative pressure setting (from -20 to -200 mm Hg)
- therapy setting (continuous, intermittent, or variable)
- frequency of dressing changes.

Follow all parts of the order as prescribed. Otherwise, you may be held responsible if a complication arises—for example, if you apply a nonadherent

Assessing with DIM

To assess your patient's wound, use the acronym *DIM*—**D**ebridement, **I**nfection and **I**nflammation control, and **M**oisture balance.

Debridement. This procedure reestablishes a viable wound base with a functional extracellular matrix. Necrotic or devitalized tissue harbors bacteria and cells, which impede wound healing. It also prevents NPWT from being distributed equally across the wound bed, which reduces NPWT efficacy and prevents effective exudate removal. In wound beds with more than 20% nonviable tissue consider debridement (surgical, mechanical, enzymatic, chemical, or autolytic) before initial NPWT application. The debridement method will vary depending on the patient's condition.

Infection and inflammation control. Infection and inflammation delay wound healing. Antimicrobial (silver) dressings are effective in localized infections and inflamed wounds due to their anti-inflammatory effects. Wound debridement also reduces bacterial burden, including biofilm. NPWT then can remove surface wound fluid–containing contaminants.

Moisture balance. Moisture balance allows cells within the wound to function effectively. If the wound is too moist, wound edges may become macerated, turning white. On the other hand, too little moisture may inhibit cellular growth and promote eschar formation. NPWT helps preserve a moist environment and reduces edema, contributing to improved tissue perfusion. Incremental increases or decreases in negative pressure may be needed to ensure a moist wound environment.

dressing when none is ordered and this dressing becomes retained, requiring surgery for removal; or if you set a default pressure when none is ordered and the patient suffers severe bleeding or fistula formation as a result.

Assess the wound

If you know what your patient's wound needs, you can take proactive measures. What is the wound "telling" you? With adept assessment, you can become a "wound whisperer"—a clinician who understands wound-healing dynamics and can interpret what the wound is "saying." This allows you to see the wound as a whole rather than just maintaining it as a "hole."

- If the wound tells you it's too wet, take steps to absorb fluid or consider increasing negative pressure, as ordered.
- If it's telling you it's dry, consider decreasing negative pressure, as ordered. If the wound bed remains dry, you might want to take a NPWT "time out". Apply a moisture dressing for several days and assess the patient's hydration status before restarting NPWT.
- If the wound says it's moist, maintain the negative pressure.
- If it tells you it's infected, treat the infection.
- If it tells you it's dirty, debride it.
- If it says it's malnourished, feed it.

The DIM approach

To establish a baseline evaluation, develop a systematic approach for assessing the wound before NPWT. This will help optimize wound-bed preparation, enhance NPWT efficacy, and prevent delayed wound healing. (See *Assessing with DIM.*)

Take a time-out

Before you apply the NPWT dressing, be a **STAR—S**top, **T**hink, **A**ct, and **R**eview your action. This time-out allows you to critically think your way through the application process and consider potential consequences of your actions.

Ongoing patient assessment and monitoring

Follow these guidelines to help ensure safe and effective NPWT:

- Follow the device manufacturer's instructions and your facility's NPWT protocol, policy, and procedures.
- Identify and eliminate factors that can impede wound healing (poor nutritional status, limited oxygen supply, poor circulation, diabetes, smoking, obesity, foreign bodies, infection, and low blood counts).
- Evaluate the patient's nutritional status to ensure protein stores are adequate for healing.
- Assess and manage the patient's pain accordingly.
- Protect the periwound from direct contact with foam or gauze.
- Prevent stretching or pulling of the transparent drape to secure the seal and avoid shear trauma to surrounding tissue.

Don't overpack the wound too tightly with foam. Compressing the foam prevents negative pressure from reaching the wound bed.

- Prevent stripping of fragile skin by minimizing shear forces from repetitive or forceful removal of transparent drapes.
- Use protective barriers, such as multiple layers of nonadherent or petrolatum gauze, to protect sutured blood vessels or organs near areas being treated with NPWT.
- Don't overpack the wound too tightly with foam. Compressing the foam prevents negative pressure from reaching the wound bed, causing exudate to accumulate.
- Position drainage tubing to avoid bony prominences, skinfolds, creases, and weight-bearing surfaces. Otherwise, a drainage tubing related pressure wound may develop.
- Bridge posterior wounds to the lateral or anterior surface to minimize drainage tubing related pressure wounds to the surrounding tissue.
- Count and document all pieces of foam, gauze, or adjunctive materials on the outer dressing and in the medical record, to help prevent retention of materials in the wound.
- Ensure the foam is collapsed and the NPWT device is maintaining the prescribed therapy and pressure at the time of initial patient assessment and when rounding.
- Address and resolve alarm issues. If you can't resolve these issues and the device needs to be turned off, don't let it stay off more than 2 hours. While the device is off, apply a moist-to-dry dressing.
- With a heavily colonized or infected wound, consider changing the dressing every 12 to 24 hours.
- Monitor the patient frequently for signs and symptoms of complications.

Evaluate patient comprehension of teaching

A proactive approach to education can ease the patient's anxiety about NPWT. Unfamiliar sounds and alarms may heighten anxiety and cause unwarranted concerns, so inform patients in advance that the device may make noise and cause some discomfort. An educated and empowered patient can participate actively in treatment. Improved communication may enhance outcomes and help identify errors in technique before they cause complications.

Be prepared to answer patients' questions, which may include:

- Am I using the device correctly?
- How long will I have to use it?

- What serious complications could occur?
- What should I do if a complication occurs? Whom should I contact?
- How do I recognize bleeding?
- How do I recognize a serious infection?
- How do I tell if the wound's condition is worsening?
- Do I need to stop taking aspirin or other medicines that affect my bleeding system or platelet function? What are the possible risks of stopping or avoiding these medicines?
- Can you give me written patient instructions or tell me where I can find them?

View: Patient Education

Be a STAR

To avoid patient harm and potential litigation, be a STAR and a wound whisperer. If you're in doubt about potential complications of NPWT or how to assess and monitor patients, stop the therapy and seek expert guidance. "Listen" to the wound and assess your patient. This may take a little time, but remember—monitoring NPWT, the wound, and the patient is an ongoing process. You can't rush it. Sometimes, to go fast, you need to go slowly.

Access more information about **NPWT**.

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