

Examining a Combination Approach to Manage Pain in Negative Pressure Wound Therapy: A Literature Review and Implementation Model

Samantha Kuplicki, BSN, RN, CWS, CWCN, CFCN, MSN-CNS Student
The University of Oklahoma Health Sciences Center College of Nursing, Tulsa, Oklahoma

Background and Significance

Negative Pressure Wound Therapy (NPWT) is an advanced wound healing modality that utilizes subatmospheric (negative) pressure paired with the application of a specialized dressing system. Various systems are in use today and are generally composed of the main unit which provides negative pressure, a collection canister for exudate, connection tubing to carry exudate to the collection canister, occlusive tape to form an airtight seal over the wound bed, and a foam or gauze dressing medium to apply to the wound bed.



ILLUSTRATION OF NEGATIVE PRESSURE AND GRANULATION TISSUE FORMATION WITH FOAM NPWT

NPWT is very advantageous in that it promotes tissue growth and proliferation via tissue strain, encourages wound contraction, provides exudate management, and reduces bioburden¹⁶. The adherence of the typical NPWT foam dressing to the wound bed can be a source of significant pain during dressing changes¹⁷, which must be addressed to facilitate an environment of holistic patient care. Despite the evidence available that pain slows healing and recovery, many studies demonstrate that the healthcare system has not improved with regards to providing adequate pain control^{18,19}.

Purpose and Objectives

- To review the available methods of decreasing pain with NPWT dressing changes
- To review a combination of evidence-based interventions for NPWT pain management that can be applied in a variety of settings
- To understand the role of the Clinical Nurse Specialist in the implementation of improved NPWT pain management using the IOWA model

Literature Review

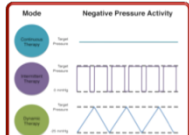
Francyk et al. (2009) concluded through a double blind RCT that administration of 0.2% topical lidocaine into the NPWT foam dressing 30 minutes prior to dressing changes decreased procedural pain. In a similar trial, Christensen et al. (2013) performed a double blind crossover-RCT in which patients who were premedicated for NPWT dressing changes by instilling topical lidocaine into the NPWT foam had significantly lower pain ratings as well as lower narcotic analgesic requirements.



FOAM DRESSING APPEARANCE AFTER REMOVAL OF WOUND CONTACT LAYER UNDER NPWT FLOW DEMONSTRATES HOW THE CONTACT LAYER REDUCES ADHERENCE. WHITE SPOTS ON THE MARGINATION WOUND BED HAVE TAPE ON WOUND SURFACE AS WELL AS LOWER NARCOTIC ANALGESIC REQUIREMENTS

Several studies and analyses reviewed also detailed recommendations for modulating the treatment variables of NPWT to achieve specific outcomes. The following were found to decrease pain during therapy:

- Applying a wound contact layer between wound bed and NPWT foam reduces adherence of the foam to the wound bed via decreasing the surface area contacted by NPWT foam^{20,21}
- Utilizing a denser foam dressing such as PVA foam allows less tissue ingrowth via decrease in granulation approximately 20% from baseline of traditional polyethylene foam due to smaller pore size²²
- Changing NPWT settings to continuous from intermittent or dynamic therapy to decrease granulation and ingrowth of tissue by up to 30% (intermittent) and 40% (dynamic) from baseline of continuous therapy^{16,19}
- Titrating the treatment pressure downward after the first 24 hours in increments of 25mmHg can achieve better pain control during therapy¹⁸
- Substituting a gauze-based NPWT system to decrease pain during therapy and dressing changes by decreasing tissue ingrowth up to 60% from baseline of traditional polyurethane foam^{8,9,19}



NPWT MODE AS RELATED TO NEGATIVE PRESSURE ACTIVITY



V.A.C.® SURFACE DRESSING (POLYURETHANE [PVA] FOAM) TYPICALLY USED TO INITIATE NPWT



V.A.C.® WOUNDGRAFT DRESSING (POLYURETHANE, COLLOID [PVA] FOAM)



AQUAFIX TISSUE REINFORCEMENT DRESSING WOUND CONTACT LAYER

Interventions

The appraised evidence suggests that when formulating an individualized pain management plan for NPWT, the provider should consider the following interventions:

- Instill lidocaine topically into NPWT foam dressing of no more than 3mg/kg after inactivating therapy, 15-30 minutes before scheduled dressing change (to decrease pain associated with foam dressing removal)^{2,4,7,10}. Use clinical judgment with large wounds, or wounds with vasculature, organs, or other structures exposed to minimize potential for systemic absorption⁷.
- Apply a wound contact layer between the wound bed and NPWT foam (to reduce pain on removal and with reapplication)
- Utilize an alternative foam dressing such as PVA foam to decrease ingrowth of tissue and pain on removal
- Titrate pressure settings downward in increments of 25mmHg after initial 24 hours of therapy (to decrease ingrowth of tissue and decrease pain on removal)
- Change NPWT settings to continuous from intermittent or dynamic therapy (to decrease pain during therapy)
- Consider substituting a gauze-based NPWT system if the above interventions fail to appropriately manage pain (to decrease ingrowth of tissue and pain on removal of dressing)

Implementation

Initiating Change

A change in practice will include utilization of a combination of interventions with the potential to provide synergistic pain relief. The Clinical Nurse Specialist, an APRN expertly prepared to guide an organization and nursing staff through change and implementation of best practice, will work closely with the organization to institute these changes. CNS concepts integral to implementation include:

- Designing, implementing, and evaluating innovative individual and/or population-based programs of care to achieve desired quality, cost effective and nurse-sensitive outcomes.
- Serving as leader/consultant/mentor/change agent in advancing the practice of nursing among other nurses and across organizations to achieve outcomes.
- Advancing nursing practice through innovative evidence-based interventions, best-practice guidelines, and modification of professional standards and organizational policies that direct the care of nursing personnel and other providers of healthcare to improve outcomes²³.



UTILIZING THE IOWA MODEL, THE CLINICAL NURSE SPECIALIST IS ABLE TO DESIGN INNOVATIVE INTERVENTIONS AND GUIDE IMPLEMENTATION OF RESEARCH IN CLINICAL PRACTICE

Process Change: Electronic Order Entry and Nursing Assessments

The EHR will prompt the ordering provider to select a topical lidocaine order with NPWT dressing changes. The parameters of the order will require data input for dose (in ml), route (through tube or directly into sponge), dwell time (length of time lidocaine contacts wound before sponge removal), and frequency (ideally, prior to each dressing change which is an average of 3 times weekly). A pain assessment should be performed before, during, and 30 minutes after the NPWT dressing changes using a visual analogue scale. Then the other interventions can be instituted if the individualized pain goals for NPWT were not met with application of the topical anesthetic alone, beginning with application of a wound contact layer. The clinician's judgment and knowledge of NPWT mechanisms should be used when combining interventions.

Disseminating Knowledge to Nursing Staff

The knowledge base required for bedside nurses will be addressed by providing in-services, given by the CNS specializing in wound care. The in-services will include demonstration of application of NPWT and the proposed interventions by the CNS, then hands-on return demonstration by the nursing staff. Nursing staff will be given a short likert-style survey prior to the in-service, and then again afterwards. Each nurse will use an anonymous but consistent identifier on the pre and post surveys in order to elucidate candid feedback. After the initial in-services, the CNS will round weekly to address questions and concerns, reinforce teaching, or provide bedside troubleshooting with nursing staff.

NPWT Pain Management Plan	Not in Evidence	Not in Evidence	Not in Evidence	Not in Evidence	Not in Evidence
1. Ability to communicate nursing orders for pain relief utilizing NPWT					
2. Ability to communicate with patient					
3. Knowledge of the use of NPWT in wound beds					
4. Knowledge of interventions to decrease pain with NPWT dressing changes					
5. Ability to implement practice to decrease pain with NPWT dressing changes					
6. Ability to implement practice to decrease pain with NPWT dressing changes					
7. The patient pain management system including NPWT will benefit the patient					
8. The patient pain management system including NPWT will benefit the patient					
9. The patient pain management system including NPWT will benefit the patient					

LIKERT-STYLE SELF-ASSESSMENT SURVEY FOR NURSING STAFF

Outcomes

Patient

Outcome measures for patients prescribed NPWT will include pain ratings and use of opioid analgesics for pain with dressing changes. Expected outcomes would include lower overall pain ratings and less narcotic analgesic use. Long term measures which were not discussed in the research but may also be explored are length of stay and patient satisfaction.

Nursing

The outcomes for nursing staff will include a return demonstration competency of application of NPWT and confirmation of understanding of the function of each intervention to decrease pain with dressing changes. The goal is for nursing to report positive self-assessment of their competency with NPWT and understanding of the use of the different interventions listed in the guideline to control pain during NPWT therapy. Nurses will at least rate their knowledge and abilities as "confident" on the 5-point-Likert style scale survey given afterwards.

Facility

In approximately 6 months, the organization will query pain rating data for patients prescribed NPWT. Administration of topical lidocaine and order entry data will be reviewed to evaluate compliance with the implementation of the pain management plan and give feedback to the practice providers and nursing staff regarding the patient outcomes. This step is instrumental in establishing the EBP concept within the organization and the direct care setting. Feedback about the effects of the change and reevaluation of the process if the expected outcomes were not achieved is vital. This process can also facilitate other quality improvement activities within the organization.

Conclusion

The population of individuals with chronic illnesses is expanding due to increased life expectancy of the aging population, and with it, the number of individuals with complex wounds. By implementing an individualized pain management plan for patients receiving NPWT, we can improve the patient experience and continue to reap the benefits of NPWT on wound healing. This plan also has the potential to reduce stress for the patient, nursing staff, and facility, creating a holistic care environment. By prompting providers to consider topical analgesia when ordering NPWT and educating nurses on the importance of pain assessment as well as knowledge in application of selected interventions to decrease pain with dressing changes, we support patient-centered care. We must strive to provide the most evidence based, efficient care possible, and innovate to develop interventions for the sequelae of that care. This requires diligent attention to creating individualized plans of care in order to mitigate the pain that accompanies wound healing modalities such as NPWT, a very efficient tool that has become a staple in the management of complex acute and chronic wounds.

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The UNIVERSITY OF OKLAHOMA
Health Sciences Center
College of Nursing

FOR ADDITIONAL INFORMATION, PLEASE CONTACT: SAMANTHA.KUPLICKI@OUHSU.EDU

*NOT AN ACILITY COMPANY, SAN ANTONIO, TEXAS
†PAINFREE WOUND MANAGEMENT, AN ACILITY COMPANY, GAITHERSBURG, MD