Developed by the British Columbia Provincial Nursing Skin & Wound Committee in collaboration with NSWOCs/WCs from:	
Title	**Negative Pressure Wound Therapy: Guideline**
Endorsement **British Columbia & Yukon**	Endorsement done: FHA, NHA & VCH/PHC; check your Health Authority (HA)'s document for any limits & conditions placed upon this practice by your HA. Reference document for FNHA & Island Health. Endorsement pending for IHA, PHSA & Yukon; until endorsement has been granted by your HA, please follow your HA's current document.
Document Indications for Use	This document is to be used to guide the assessment, decision making, and treatment of wounds, closed incisions and skin grafts using either multi-use (reusable) or single-use (disposable) Negative Pressure Wound Therapy (NPWT) devices as well as NPWT Instill-Dwell Therapy. Clients undergoing NPWT require an interprofessional approach to provide comprehensive, evidence-based assessment and treatment. This guideline does not provide detailed direction for the ordering or dressing application of: • NPWT for the management of fistulas. The use of NPWT for enterocutaneous or enteroatmospheric fistula closure requires a surgeon/physician order and the management of the therapy is done as a collaboration between surgeon/physician and NSWOCs. See NSWOCC Nursing Best Practice Recommendations: Enterocutaneous Fistula and Enteroatmospheric Fistula for further guidance. • NPWT for open abdomen. Please see Heath Authority (HA)/agency policy.

Practice Level
British Columbia & Yukon
	British Columbia
	• Most Responsible Providers (MRPs) and those Nurses Specializing in Wound, Ostomy, and Continence (NSWOCs) or Wound Clinicians (WCs) who are supported by their HA policy to provide clinical direction on NPWT:
	  ○ Do a detailed assessment of the need for NPWT.
	  ○ Provide client-specific detailed orders/directives for the management of NPWT.
	  ○ Communicate the NPWT goals to the health care team.
	• To carry out NPWT, Registered Nurses (RNs), Registered Psychiatric Nurses (RPNs), and Licenced Practical Nurses (LPNs), in accordance with the British Columbia College of Nurses and Midwifes' scope of practice for their specific designation and as per their HA/agency policy must:
	  ○ Have a policy supporting their designation in providing NPWT.
	  ○ Have HA/agency approved NPWT decision support tools, (e.g. guideline and procedures).
	  ○ Successfully complete additional education for monitoring & managing a NPWT system.
	  ○ If required to do NPWT dressing applications, have successfully complete additional education.
	  ○ Have client-specific NPWT orders.
	  ○ In addition, LPNs follow an established NPWT wound treatment plan.
	Yukon
	• NSWOCs, Registered Nurses, Registered Psychiatric Nurses and Licensed Practical Nurses refer to organizational policy and practice in accordance with regulatory bodied.

Background	• NPWT is an advanced therapy that delivers continuous, intermittent, or dynamic negative (sub-atmospheric) pressure equally across the wound area, incision line, or skin graft site.

- NPWT systems use specific non-bio-absorbable foam dressing(s) and interface layers as wound filler(s) for open wounds or as dressings over incisions or skin grafts Transparent film drape or cover dressing is applied over the wound fillers to create an airtight seal. Tubing connects the dressing to a vacuum source which creates a negative pressure within the dressing. Some NPWT systems may provide an instill-dwell cleansing feature using sterile normal saline or antiseptic solution.
- NWPT foams cannot be seen with radiology imaging (non-radiopaque). A packing count of all wound fillers (foams and interfaces) must be done with each dressing application and removal.
- Use of NPWT is determined following an overall client assessment taking into account goals for wound management and indications, contraindications, and precaution.
- The NPWT mechanism of action, in the proper circumstances, can accelerate the natural wound healing processes leading to shorter "days-to-heal' by:
  - Enhancing wound contraction (macrostrain)
  - Enhancing granulation tissue formation (microstrain)
  - Promoting angiogenesis, increasing tissue perfusion bringing nutrients/oxygen to the wound.
  - Reducing localized wound edema.
  - Removing wound exudate.
  - Decreasing harmful levels of pro-inflammatory agents, such as matrix metallo-proteinases
    (MMPs) found in chronic wounds
- **Specific Uses for NPWT:**
  - Open Wound NPWT: Supports secondary closure of wounds or dehisced incision lines which are healing through granulation. The NPWT wound dressing can be applied in the operating room (OR), hospital unit, home, long-term care unit, or clinic setting and can be left in place for 48 to 72 hours, depending on the situation.
    - NPWT Instill-Dwell (Veraflo): used only for Open Wounds; facilitates the removal of necrotic tissue/slough with the instillation of topical solutions. The VACUlta4 device is the only 3M/KCI device that provides NPWTi-d (Instill-Dwell) function. NPWTi-d is not recommended for home use.
  - Closed Incisional NPWT: Supports primary closure of fully approximated sutured, steri-stripped, or stapled incision lines with the purpose of splinting the area as the incision heals. The incisional NPWT dressing may be applied in the OR and left in place for 2 to 7 days. The dressing may also be applied on hospital unit or home. NPWT is commonly used for local and rotation flaps along the incision line(s) only.
  - Skin Graft NPWT: Supports healing of split-thickness grafts by stabilizing the skin graft which aids in the 'take' of the graft. The skin graft NPWT dressing is applied in the OR and may be left in place for 4 to 5 days.

  Note: NPWT may also be used for the management of open abdomen and fistula; but these are not detailed within this document.
- Open Wound NPWT is most effective when the:
  - Wound is well perfused.
  - Wound has a healthy wound bed with no greater than 20% necrotic tissue present.
  - Client's overall clinical condition(s) is optimized.
- NPWT can be used in acute, community, and long-term care settings depending upon the:
  - HA/agency policy.
  - Knowledge, skill and availability of trained health care staff.

	○ Availability of NWPT supplies. ○ Availability of funding to cover the cost of rental & supplies. • NPWT devices are multi-use or single-use and may be owned or rented by the agency or unit. **General Safety Considerations for all types of NPWT Medical Devices** (also noted pg. 9) • Defibrillation: when defibrillation is required in the area of the NPWT dressing, remove the dressing or place the paddles in an alternate position; ensure that the NPWT device is at least 2 meters away from the paddles. • Electrodes or Conductive Gel: do not place EKG or other electrodes/conductive gels in contact with the NPWT dressing/device. • Magnetic Resonance Imaging (MRI) environment: ○ NPWT devices themselves **cannot** go into the MRI environment. If a canister is present, disconnect it from the device and ensure all tubing clamps are open to allow any exudate to flow into the canister. For PICO 7/PICO 14, disconnect the dressing tubing from the device, protect the end with sterile gauze. ○ If the NPWT dressing (interface and/or foam) does not contain silver, then the dressing may remain in place. If the MRI is to be done in the area of the wound, consult Radiology Department regarding the need to remove the dressing. ○ If the NPWT dressing is comprised of a silver-based interface or Granufoam Silver foam or is a Prevena dressing, consult with the MRI Radiology Department; depending upon the MRI magnetic field environment, the silver-based dressing may need to be removed. • Diagnostic Imaging: Silver-based interfaces, Granufoam Silver foam or Prevena dressings may impair visualization with certain imaging modalities; consult with the Radiology Department regarding the need to remove the dressing. • Hyperbaric Oxygen Chamber environment: the NPWT dressing should be removed and a different type of dressing used for the duration of the HBO treatment period • Cell phones or similar products could affect the NPWT device; move the NPWT device away 2 meters (6.5 feet) away from the device if interference is suspected. • Do not connect NPWT dressings to wall suction. **Special PICO7 & PICO14 Pump Placement Safety Considerations** • **For patients, family, caregivers and the public:** the PICO7 PICO14 pump contains a magnet that can cause other medical devices in close proximity to fail, leading to serious harm including death. The PICO7 pump must be **positioned at least 4" (10cm) away from other medical devices** that could be affected by magnetic interference. These include but are not limited to: Implantable Cardioverter defibrillator (ICD), Pacemakers, Insulin pumps, Shunt Valves, Neuro- stimulators, or Cochlear Implants. • The PICO7 & PICO14 systems can be used in aircraft, train and boat transportation. During transport there is a potential for radio frequency interference that could affect PICO 7/ PICO14 performance. If the PICO 7/PICO14 pump malfunctions, replace batteries. If this does not correct the problem; replace the device.
Bookmarks	• Assessment (indication, precautions, and contra-indications for NPWT use) • Determination of the need/appropriateness for NPWT • Client Care Management while Receiving NPWT ○ Managing Pain Associated with NPWT ○ Lidocaine: Physician/NP Prescribing ○ Medical Device Safety Considerations • Physician/NP/NSWOC/Wound Clinician Interventions ○ Precautions to be Addressed Before Initiating NPWT ○ Special Considerations: NPWT Instill-Dwell (Veraflo)

Key Special Considerations identified	○ Special Considerations: Use of an Interface Layer ○ Special Considerations: Closed Incision Splinting, Skin Graft Bolstering, Open Wound Fillers ○ Bridging & Y-Connecting Two or More Wounds ○ Special Considerations: Therapy Settings ○ Special Considerations: Dressing Change Frequency ○ Special Considerations: Pediatrics ○ Special Considerations: Unable to Maintain NPWT 22/24hrs or System/Device Failure ○ Ordering NPWT • Nurse Interventions ○ Dressing Management ○ Conducting a NPWT Q2H Safety/Monitoring Check ○ Canister Change ○ Alternate Dressing ○ Client Showering ○ Manage Adverse Events • Decision to Continue or Discontinue NPWT • Client/Family Education & Resources • Transition/Discharge Planning • Trouble Shooting Supplies Pack for the Home • Client Clinical Outcomes: Intended and Unintended • Quality Assurance Indicators • Documentation • Definitions • Bibliography/Reference • Document Creation Date/Revision • Appendix A: Summary Table - Form & Function of NPWT Devices • Appendix B: Determining Therapy Mode Settings & Dressing Change Frequencies • Appendix C: Recommended Pre-Fill Canister Volumes & Pressure Settings-Pediatrics • Appendix D: Cleaning an Owned NPWT Device
Related Documents	**Associated Documents** Wound Management: Guideline Wound Cleansing: Procedure Wound Packing: Procedure **Monitor & Manage Documentation** NPWT Safety/Monitor Check Flow Sheet **NPWT Device Specific Procedures** NPWT Dressing Application - VACUlta4/ActiVAC NPWT Dressing Application - VACUlta4 Veraflo NPWT Dressing Application - SNAP NPWT Dressing Application - Prevena Peel & Place NPWT Dressing Application - Prevena Customizable NPWT Dressing Application – Prevena Open Wound NPWT Dressing Application - PICO 7 / PICO 14 **Addition Education Requirements & Competencies** • NPWT Level One: Monitor & Manage: ○ Learning Plan ○ Learning Module • NPWT Level Two: NPWT Dressing Application: ○ Learning Plan ○ Competencies

	○ Learning Module – Dressing Application: Open Wound Principles ○ Learning Module – Closed Incision/Skin Graft Management **Education Videos** • Monitor & Manage ○ Safety/Monitoring Check ○ Trouble-shooting an Air Leak ○ NPWT is Discontinued or Completed: Closed Incision/Skin Graft Dressing Removal ○ NPWT is Discontinued or Completed: Open Wound Dressing Removal ○ Irreparable Dressing Leak System/Device Failure Alternate Dressing: Take-Down ○ Irreparable Dressing Leak System/Device Failure Alternate Dressing: Cut & Cover • Dressing Application – Open Wound ○ Dressing Application for VACUlta & ActiVAC NPWT Devices ○ Bridging Two or More Wounds ○ Offloading the Trac-Pad ○ Y-Connecting Two Wounds ○ Setting Up a VACUlta Device ○ Setting Up an ActivVAC Device **Client Health Education Resources (CHERs)** NPWT ActiVAC NPWT ActiVAC - Yukon NPWT SNAP NPWT Prevena 125 Self Care Closed Incision NPWT Prevena Plus 125 Open Wound Closed Incision NPWT PICO7 Self Care NPWT PICO7 / PICO 14 NPWT PICO7 / PICO14 Yukon

Assessment & Determination of Need/Appropriateness of NPWT – MRP or HA-Supported NSWOC/WC

Assessment

1. Assess Client Concerns
    a. The healability of the wound, incision, or skin graft, (e.g., risk for incisional dehiscence).
    b. Client and/or family's level of understanding regarding the overall wound treatment goal of care and the role of NPWT in achieving that goal.
    c. Client's ability to engage and participate in the NPWT care plan.
    d. Client and/or family's ability to manage NPWT in the home. Problems such as hearing loss, limited dexterity, or impaired cognition can impact the ability to manage NPWT at home.
    e. Client's ability to mobilize, transfer, and manage activities of daily living (ADLs) with NPWT and without compromising personal safety, (e.g., falls related to NPWT tubing).
    f. Impact of the NPWT dressing and device on client's body image and quality of life.
    g. Social and financial concerns that could affect NPWT and support systems to address concerns.
    h. Emotional, cognitive, behavioural, mental health concerns that could affect the effectiveness of NPWT and support systems to address these concerns.
    i. Client and/or family's culture, traditions and spiritual beliefs which could impact NPWT use.

2. Assess Client Wound Pain
    a. Assess client's level of pain or discomfort, plus current pain interventions and their effectiveness.
    b. For clients with spinal cord injury, assess level of spasticity and risk for autonomic dysreflexia.

3. Assess for Indications for the Use of NPWT
    Note: this guideline does not speak to the indications/precautions/contraindications of NPWT for the management of open abdomen or fistula management.

a. NPWT can be used for the following situations given that the client's health condition supports healing as evidenced by good blood flow, oxygen perfusion and nutritional status:
   - Diabetic foot ulcers.
   - Pressure injuries.
   - Venous insufficiency ulcers.
   - Arterial insufficiency ulcers.
   - Traumatic wounds.
   - Surgical incisions healing by primary intention, including local or rotational flap incisions.
   - Surgical incisions healing by secondary intention, such as dehisced surgical wounds.
   - Surgical incisions healing by delayed primary intention.
   - Synthetic/bio-mesh in abdominal wounds without exposed viscera.
   - Split- and full-thickness skin grafts.
   - Dermal substitutes.
   - Partial-thickness burns.

b. The situation requires NPWT functionality to:
   - Support moist wound healing.
   - Increase local blood perfusion.
   - Reduce local edema, wound exudate and debris.
   - Assist in wound contraction.
   - Promote granulation tissue and enhances epithelial cell migration.
   - Facilitate the removal of thick wound exudate and aid in the removal of necrotic tissue and slough through the use of NPWTi-d.
   - Prepare the wound bed for potential surgical closure.
   - Provide surgical site splinting, (e.g., chest, abdominal wall).
   - Provide skin graft stability.
   - Remove drainage from the incision site.
   - Minimize dehiscence and seroma formation.
   - Collect and quantify exudate amount for fluid balance management.

4. Assess for Precautions of Using NPWT

The following conditions and issues need to be assessed for/investigated prior to initiating NPWT:

a. Known bleeding conditions and disorders, or risk of bleeding complications including:
   - Weakened or friable blood vessels in or around the wound, as a result of, but not limited to sutured blood vessel (native anastomoses or grafts), infection as it may erode the blood vessel wall, trauma, or radiation.
   - Inadequate wound hemostasis.
   - Anticoagulation therapy or treatment with platelet aggregation inhibitors.
   - History of bleeding disorders.
   - Inadequate tissue coverage over vascular structures.

b. Inadequately debrided wound; necrotic tissue (eschar/slough) covering **greater than 20% of the wound.**

c. Wound infection and / or osteomyelitis:
   - Assess for clinical signs and symptoms of wound infection. If 2 or more signs and symptoms of infection are present, or, if 1 or more sign(s) and symptom(s) are present in a client has diabetes mellitus, arterial insufficiency, or is immune compromised consider a potential wound infection. Take a C&S as required.
   - Assess for bone or bone fragments in the wound bed. If bone is 'probed', consider the possibility of osteomyelitis and the need for radiological studies for further assessment.
   - If currently being treated with antibiotics for a wound infection, assess effectiveness.

d. Rolled wound edges (epibole).

e. Large or deep wounds that could contain hidden blood vessels, (e.g., wounds in the groin area).

f. Lower limb wounds affected by vascular insufficiency.

g. Groin or peri-anal wounds at greater risk for serious bacterial contamination due to their location.
h. Presence of the following in the wound:
    - Exposed or superficial blood vessels.
    - Vascular anastomosis.
    - Exposed bowel due to surgical wound dehiscence or unsuccessful ‘take’ of a mesh graft
    - Exposed organs.
    - Sharp edges of bone protrusions.
    - Exposed bone, tendon, ligaments or nerves.
i. Presence of another wound, in close proximity to the wound being considered for NPWT, which has exposed blood vessels, nerves, organs, or anastomotic sites, or has infected or potentially infected blood vessels.
j. Assess the level of spinal cord injury, as NPWT can affect the stimulation of the sympathetic nerves and can lead to autonomic dysreflexia.
k. A history of radiation in the wound area.
l. Assess for the presence of implanted medical device, (e.g. Implantable Cardioverter defibrillator (ICD), Pacemaker, Insulin Pump, Shunt Valve, Neurostimulator, Cochlear Implant), as the use of the PICO7 device within 10cm of these devices may interfere with functioning of these types of medical devices.

5. Assess for Contraindications of Using NPWT
    a. Malignancy in the wound as NPWT may lead to cellular proliferation.
    b. Untreated osteomyelitis, untreated wound infection, or a sepsis source in the wound vicinity, until treated.
    c. Presence of untreated coagulopathy, (e.g., wounds with active bleeding or difficult hemostasis, until stabilized).
    d. Unexplored sinuses/tunnels greater than 15 cm if the endpoint has not been determined
    e. Inflammatory ulcers, (e.g., pyoderma, vasculitis).
    f. Areas with necrotic tissue and eschar, until debridement is initiated.
    g. Presence of non-sutured hemostatic agents, (e.g., Gelfoam spray wound sealant).
    h. Allergy or sensitivity to NPWT dressing products.
    i. Inability to obtain/maintain an airtight seal due to the location of the wound, incision, or skin graft.
    j. Insufficient peri-skin around the wound to maintain a NPWT seal.
    k. Non-enteric and unexplored fistulas are not discussed in this document.

6. Assess the Site

    <u>Open Wound</u>

    Complete a full wound assessment. The findings help to determine the need for debridement, NPWTi-d therapy, wound filler(s), interface dressings, and peri skin protection. It also helps to determine canister size. This assessment includes:
    a. Wound etiology.
    b. Date of onset or open wound day.
    c. Date(s) and location(s) of most recent surgical procedure(s) and intervention(s), (e.g., creation of stoma(s), associated drains, or debridement performed in the site area).
    d. Location of the wound.
    e. Length, width, and depth of wound cavity.
    f. Measurement and location of undermining, sinuses/tunnels. If unable to determine an endpoint beyond 15 cm, ask the Physician/NP to consider a Sinogram to determine if NPWT is appropriate.
    g. Wound bed characteristics, including:
        - Presence and description of slough or necrotic tissue, eschar (dry stable or soft boggy), and granulation or non-granulation tissue in the wound bed.
        - Exposed underlying structures such as adipose, bone, muscle, tendon, or blood vessels.

- The presence of a foreign body such as exposed hardware, prosthesis, mesh grafts, or suture material.
- The presence of fistula(s). If noted, ask the Physician/NP to consider a fistulogram to explore the type and extent of the fistula.
- The proximity to anastomosis sites, (e.g., blood vessels or bowel).

h. Presence of a closed wound edge (epibole).
i. The number of non-NPWT dressing changes completed within the previous 24 hours to help predict the amount of exudate and determine the canister size.
j. Peri-skin and surrounding skin condition, (e.g., maceration, excoriation, induration, or erythema).

Closed Incision

Complete a full incisional assessment. The findings help to determine the length of the incisional dressing, status of the incision line, and expected exudate amount. This information helps the nurse to choose the appropriate NPWT canister size and peri-incisional skin protectant, if needed, and decide on a multi-use device versus a single-use device. This assessment includes:

a. Post-op day.
b. Date(s) and location of the most recent surgical procedure(s) and intervention(s), (e.g., creation of stoma, associated drains or debridement performed in the wound area).
c. Location and length of the incision.
d. Capillary refill.
e. Type of flap incision, i.e., local or rotational flap.
f. Status of the incision, i.e., fully epithelialized, approximated, tenuous, or gaping.
g. Closure materials and methods, (e.g., sutures, staples, retention sutures, steri-strips, surgi-glue).
h. Exudate amount, if any.
i. Peri-incisional and surrounding skin conditions.

Skin Graft

Complete an assessment of the graft. The findings help to determine the status of the graft site, the size and type of NPWT dressing required, the appropriate canister size based on the exudate amount and type, and an appropriate peri-graft skin protectant, if needed. This assessment includes:

a. Post-op day.
b. Skin graft location.
c. Type of graft material used, (e.g., skin, skin substitute or biologic).
d. Length and width of the graft.
e. Graft status; the percentage (%) of ‘take’.
f. Closure materials and method insitu, i.e., sutures, staples.
g. Exudate amount, if any.
h. Peri-graft and surrounding skin condition.

7. Assess the client’s coagulation status and clotting factors, in consultation with Pharmacist, to determine the bleeding risk, (e.g., PT, INR).

8. Check the availability of nursing resources to carry out dressing changes and ongoing monitoring.

9. Address the prevention and management of adverse NPWT-related events.

Determination the Need/Appropriateness of NPWT

1. The client’s wound, incision, or skin graft meets the indications for use (page 4).

2. The client’s current clinical condition will support NPWT.

3. In collaboration with the interprofessional team, the client/family, and the community or long-term care teams, if involved, determine the appropriateness of NPWT based on the following criteria:
   a. Any precautions arising from the client situation have been investigated and addressed (page 5).

b. There are no contraindications arising from the client situation (page 5).
c. Client and/or family centered concerns are addressed.
d. The client and/or family is willing and able to engage in and support the NPWT care plan.
e. Tissue perfusion at the site is adequate to support healing.
f. Eschar, slough/necrotic tissue covers no more than 20% in the wound bed, unless NPWTi-d is being done.
g. The ability to obtain and maintain an airtight seal around the site.
h. The client is able to adhere to NPWT at least 22 out of 24 hours / day.
i. The ability to offload or redistribute pressure over the site, if required.
j. Acute and long-term nursing staff are available to change dressings, monitor NPWT every 2 hours and address any issues.
k. Nursing staff have the competencies to carry out NPWT dressing changes.
l. In the community setting:
    - Nursing resources are available to change dressings.
    - Client is able to perform activities of daily living (ADLs) safely with NPWT device in place.
    - Client and/or family is willing and able to monitor NPWT every 2 hours, except when sleeping, and is able to hear the alarms, especially during sleeping hours.
    - Client or family is willing/able to manage doing the alternate dressing; either cut & cover or take down the dressing, or in the event of an irreparable leak or device failure.
    - There is a reliable power source to charge the NPWT device, as needed.

4. Determine the specific use for NPWT:
    a. Open Wound
    b. Closed Incision
    c. Skin Graft

5. Determine the client-specific goal(s) of NPWT:
    a. Wound healing; evidenced by 30% reduction in wound size in 3 weeks with improved quality of the granulating tissue.
    b. Preparation for delayed primary closure; evidenced by a reduction of wound volume.
    c. Closed incision management; evidenced by a maintained well-appropriated incision line.
    d. Skin graft management; evidenced by a ‘complete take’ of the graft.
    e. Wound cleansing (NPWTi-d); evidenced by a reduction of devitalized tissue in the wound bed.
    f. High volume exudate management.
    g. Fistula closure and abdominal open compartment management (not discussed in this document).

Interventions by the Interprofessional Team

The overall NPWT care plan is developed by the Physician/NP/NSWOC/Wound Clinician, nurse, Physiotherapist (PT), Occupational therapist (OT), Registered Dietitian (RD), and the client and/or family. The plan includes client concerns, treatment of risk factors, goal(s) of care, treatment plan, expected outcomes, client & family education and transition or discharge plans.

The Physician/NP/NSWOC/Wound Clinician is responsible for the overall management of NPWT, and for providing the nursing staff with written orders for all aspects of the therapy and dressing requirements.

The nurse is responsible for applying and reapplying the dressing as per orders and conducting safety and monitor checks. In addition, the nurse is responsible for notifying the Physician/NP/NSWOC/Wound Clinician of the progress of the wound, the continued need for NPWT and any need to change the orders, (e.g., if the wound requires an interface layer).

Client Care Management While Receiving NPWT

1. Address Client Concerns related to NPWT

a. Consult with an Occupational Therapist or Physiotherapist to address any ADL or mobility adaptations necessary to ensure client safety while receiving NPWT.
b. Consult with Dietitian for identified nutritional concerns.
c. Consult with Social Worker or the First Nation / Aboriginal Liaison to address social and emotional concerns as they relate to NPWT.
d. Maintain and support treatment of medical, physical, mental health throughout NPWT treatment.

2. Address client's risk factors that impact open wound, closed incision or skin graft healing. Risk factors are determined based on the client assessment.
3. Manage Pain Associated with NPWT

Treat NPWT procedural pain:

a. Monitor for the onset of new or increasing pain, and if noted, communicate to Physician/NP.
b. Organize care to coincide with analgesic administration allowing sufficient time for the analgesic to be effective.
c. Administer analgesic medication(s) prescribed by the Physician/NP regularly and in the appropriate dose to control pain. Consult with a Physician/NP if wound pain is not well controlled. Consider procedural sedation for the pediatric client.
d. For <u>open wounds</u> where foam (white, black, silver or blue) is used: treat the dressing change procedural pain related to the disruption of granulation tissue, by using one of more of the following interventions.

Nurse:

- Turn the NPWT device "off" approximately 30 minutes prior to the dressing change to allow exudate to pool. This helps to lift the dressing from the wound bed.
- Encourage the client to request 'time-out' during NPWT dressing removal
- Do a 20-30 minute pre-soak with sterile NS prior to the dressing change with an amount of NS suffice to allow the foam to release from the wound bed. See specific NPWT device procedure for method.
- If needed, do a 20-30minute pre-soak with the Physician/NP prescribed amount of Lidocaine 1% (without epinephrine) together with, or followed by, the same amount of sterile normal saline 0.9%. See specific NPWT device procedure for method.
- Add an interface dressing, if needed, and communicate this change to the Physician/NP/ NSWOC/Wound Clinician
- Administer Sufentanil as ordered.

MRP or HA-Supported NSWOC/WC

- Order the use of an interface layer, (e.g., meshed non-adherent dressing).
- Order white foam as the primary contact layer as it is denser, non-adherent and prevents the in-growth of granulation tissue into the foam.

MRP:

- When using foam wound fillers, pre-soak with a prescribed amount of Lidocaine 1% (without epinephrine) together with, or followed by, the same amount of sterile normal saline 0.9% instilled into the dressing 20-30 minutes prior to the dressing change. A Physician/NP order for Lidocaine 1% (without epinephrine) is needed unless there is Health Authority approval for a NSWOC or Wound Clinician to order this.
- The prescribed Lidocaine dose is based on the subcutaneous dosage of 4.5 mg/kg to a maximum of 300mg or 30ml of solution.
- If needed, prescribe narcotic Sufentanil as an <u>immediate</u> pre-procedural analgesic and consider the need to repeat during the procedure.

Manage wound pain due to the effect of the NPWT

a. Monitor for the onset of new or increasing pain, and if noted, communicate to Physician/NP.
b. Reassess the ongoing effectiveness (client comfort/quality of life) of analgesic medication(s).
c. In consultation with the Physician/NP/NSWOC/Wound Clinician consider the following interventions:

- If client has a history of NPWT pain, start with a lower Pressure Setting and then slowly increase the setting up to the Pressure Setting as ordered.
- If client develops pain related to NPWT, decease the Pressure Setting by 25mm/Hg, if this does not relieve the pain then re-consult with the-Physician/NP/NSWOC/Wound Clinician.
- Use a continuous versus intermittent therapy setting as continuous therapy reduces the pull of 'off/on' suction on the wound bed.

4. Safety Considerations for NPWT

For all NPWT Systems:

a. Cardiac Arrest Defibrillation Procedure:
   - Do not apply the defibrillator paddles over the NPWT transparent drape or disposable dressing if defibrillation is required in the area of the dressing placement.
   - Ensure that the NPWT device is at least 2 meters away from the paddles.
   - Failure to remove the transparent film drape prior to resuscitation may inhibit the transmission of electrical energy and hinder resuscitation efforts.

b. Magnetic Resonance Imaging (MRI) environment:
   - NPWT devices themselves **cannot** go into the MRI environment. If a canister is present, disconnect it from the device and ensure that all tubing clamps are open to allow any exudate to flow into the canister.
   - If the NPWT dressing (interface and/or foam) does not contain silver, then the dressing may remain in place. If the MRI is to be done in the area of the wound, consult Radiology Department regarding the need to remove the dressing.
   - If the NPWT dressing is comprised of a silver-based interface or Granufoam Silver foam or is a Prevena dressing, consult with the MRI Radiology Department; depending upon the MRI magnetic field environment, the silver-based dressing may need to be removed.

c. Diagnostic Imaging: Silver-based interfaces, Granufoam Silver foam or Prevena dressings may impair visualization with certain imaging modalities; consult with the Radiology Department regarding the need to remove the dressing.

d. Hyperbaric Oxygen Chamber environment: the NPWT dressing should be removed and a different type of dressing used for the duration of the HBO treatment period

e. Cell phones or similar units can affect the functioning of the NPWT device. Keep the NPWT device 2 meters (6.5 ft.) away from cell phones or other mobile units if interference is suspected.

f. Do not connect the NPWT dressing tubing to wall suction.

For PICO7 & PICO14 Systems:

a. **For patients, family, caregivers and the public:** the PICO7 PICO14 pump contains a magnet that can cause other medical devices in close proximity to fail, leading to serious harm including death. The PICO7 pump must be **positioned at least 4" (10cm) away from other medical devices** that could be affected by magnetic interference. These include but are not limited to: Implantable Cardioverter defibrillator (ICD), Pacemakers, Insulin pumps, Shunt Valves, Neurostimulators, or Cochlear Implants.

b. The PICO7 & PICO14 systems can be used in aircraft, train and boat transportation. During transport there is a potential for radio frequency interference that could affect PICO 7/PICO14 performance. If the PICO 7/PICO14 pump malfunctions, replace batteries. If this does not correct the problem; replace the device.

Wound Management with NPWT

Precautions to be Addressed/Special Conditions to be Considered Prior to Ordering NPWT

1. Precautions to be Addressed

The following conditions and issues need to be treated and/or stabilized prior to initiating NPWT:

a. For vascular insufficiency, determine if there is potential for healing based on assessment and vascular study results.
b. Treat, stabilize and monitor any known bleeding conditions or disorders, or risk of bleeding complications:
    - Closely monitor clients for bleeding and ensure the care setting has an appropriate number of skilled staff to do this.
    - Stabilize and monitor anticoagulation or platelet inhibitor therapy.
    - Protect weakened or friable blood vessels in or around the open wound area due to sutured blood vessels (native anastomoses or grafts), surgical trauma, or radiation.
    - Treat infection, as it may erode blood vessel walls.
    - Consider biological graft material if there is inadequate tissue coverage over vascular structures.
    - Address inadequate wound hemostasis by reviewing client conditions that impede hemostasis, (e.g., antiplatelet therapy).
c. For wounds with greater than 20% eschar, necrotic tissue, or slough, debride using one of the following before starting NPWT:
    - NPWT instill-dwell.
    - Conservative sharp wound debridement.
    - Surgical debridement.
    - Wound cleansers/debriders such as Hypochlorous Acid (Vashe), Sodium Hypochlorite (Anasept), dry Hypertonic Saline (Mesalt).
        - Autolytic or enzymatic debridement will debride but are a slower method.
d. Evaluate the risk for higher levels of bacterial contamination and the risk of infection due to wound location, (e.g., groin or peri-anal wounds), and intervene accordingly.
e. Treat infected wounds and/or osteomyelitis and monitor to ensure that the signs and symptoms of infection are resolving:
    - If signs and symptoms of local infection are present, consider the use of:
        - An antimicrobial silver interface layer under the NPWT foam.
        - NPWT silver foam.
        - An antimicrobial (PHMB) woven gauze or packing ribbon.
    - Do not use a bridge or a Y-connector to connect an infected wound to a non-infected wound.
    - NPWT dressing may need to be changed more frequently than 48-72 hours until the infection resolves.
f. Exposed bowel needs to be protected, if possible, surgically by pulling the greater omentum down over the visible bowel, or by covering with mesh. If the surgical option not possible, then **multiple** layers of interface (non-adherent contact layers) are required to mitigate, as much as possible, the development of a fistula:
    - Ensure the involvement of the Surgeon and a NSWOC/Wound Clinician to determine the feasibility/safety of using NPWT over exposed bowel.
    - Consider starting with a low Pressure Setting (e.g., 75 mm/hg and a Therapy Setting of Continuous).
    - Ensure that all layers of the interface are securely positioned so as not to move during the therapy.
    - Initial dressing(s) may need to be done by NSWOC/Wound Clinician until the wound situation is stabilized.
g. Identify the potential for any hidden blood vessels in large or deep wounds, (e.g., blood vessels in wounds in the groin area).
h. Assess the effect or potential effect of NPWT on any wound in close proximity to the wound receiving NPWT, especially if the wound in close proximity is infected or has exposed blood vessels, nerves, organs or anastomotic sites.
i. Determine with diagnostic imaging, the endpoint of undermining/sinus/tunnels which have a depth greater than 15cm and document findings.

j. Manage rolled wound edges (epibole) using surgical sharp wound debridement or silver nitrate.
k. For clients with a spinal cord injury, considering lowering the pressure therapy setting, and use continuous therapy versus intermittent or dynamic pressure control to reduce the potential for autonomic dysreflexia.

2. Special Considerations: NPWT Instill-Dwell (NPWTi-d) Therapy, (e.g., Veraflo)
   a. May be used for adults and children.
   b. Do not use NPWTi-d therapy in wounds which have not been thoroughly explored due to the potential for inadvertent instillation of the wound solution into adjacent body cavities.
   c. Do not use NPWTi-d therapy:
      - Over non-intact fascia or unstable structures, such as unstable chest wall.
      - On clients at increased risk of bleeding.
      - For clients with fragile wound hemostasis due to the potential for disruption of clots or dilution of clotting factors.
      - On highly exudating wounds.
      - On wounds which have a high percentage of eschar.
      - On intact flaps or skin grafts.
      - On wounds with acute enteric fistulae.
      - On wounds open to the thoracic or abdominal cavity due to the potential risk to alter core body temperature and the potential for fluid retention within the cavity.
      - Over bioengineered tissues (cellular or acellular) due to the disruption of clots.
      - Over hemostatic agents.
   d. Instillation solutions:
      - Solution must be in a commercially prepared bottle for spiking.
      - Based upon 3M/KCI in-house testing the following solutions may be used
        - Normal Saline.
        - Lactated Ringers.
        - Lidocaine; note: Physician/NP order is needed.
        - Betaine solution. (e.g., Prontosan).
        - Hypochlorite-based solutions, (e.g., Anasept).
        - Hypochlorous-based solutions, (e.g., Vashe.)
      - Do not use Octenisept, hydrogen peroxide or solutions that are alcohol-based or contain alcohol.
   e. Instill-Dwell therapy requires a pause of the NPWT to allow for the 'instill-dwell/soak' cycle, therefore instill-dwell therapy is not recommended for wounds which requiring Therapy Setting of continuous (e.g., a wound in a challenging location which require continuous suction to maintain the seal).

3. Special Consideration: NPWT Used in Conjunction with Other Wound Therapy Modalities
   a. Antimicrobial dressings, such as, Acticoat Flex or Hydrofera Blue, and Biochemical Modifiers; such as, Endoform, Promogran or Oasis may be used for, with a order
   b. NPWT dressing must be removed while the client receives the hyperbaric oxygen therapy.
   c. NPWT must be removed while the client receives High Voltage Pulsed Current (HVPC) Therapy (E-stim).

4. Special Consideration: NPWT Devices
   a. The devices have default settings. See Appendix A: Summary Table - Form & Function of NPWT Devices for information on these default settings.
   b. Multi-Use NPWT devices (VACUlta4, ActiVAC):
      - May be owned by an agency or rented daily.
      - Are usually used for longer-term therapy.
   c. Single-Use NPWT devices (SNAP, Prevena125 Prevena Plus 125, PICO7/PICO14):
      - Are available through purchasing or supply chain management.

- Are supplied with a predetermined dressing in varying sizes.
- Used for short-term therapy, (e.g., 7-days).
- The entire NPWT device is disposed of once therapy is completed.

5. Special Consideration: When to Use an Interface Layer With NPWT

For the Wound

a. An interface layer is a meshed non-adherent dressing used to protect the wound bed and may be either non-antimicrobial, i.e., silicone Mepitel, or a petrolatum impregnated layer Adaptic, or antimicrobial, i.e., silver Acticoat Flex 3; note: Acticoat Flex 7 should not be used as the NPWT dressing change frequency should be at least 3 times/week.
b. Meshed interface layer can be applied in single or multiple layers of the same dressing and should be used in the following situations:
   - Exposed, friable or superficial blood vessels in or around the wound area.
   - Vascular anastomosis.
   - Exposed vital organs present in the wound - multiple layers recommended.
   - Sharp edges of bone protrusions within the wound bed. Bone fragments should be removed prior to the application of an interface dressing.
   - Exposed bone, tendon, ligaments, and nerves.
   - Fasciotomies.
c. NPWT white foam may be used as a non-adherent interface layer for painful wounds.
d. **Do not staple or suture the interface into place.**

For the Closed Incision or Skin Graft:

a. An interface layer may be needed to protect the staples, suture line or skin graft area, unless the interface is incorporated into the foam dressing as it is with Prevena and PICO7/PICO14.

6. Special Consideration: Closed Incision Splinting, Skin Graft Bolstering and Open Wound Fillers

Do not staple or suture NPWT wound fillers or cover drapes/dressings into place.

a. Closed Incision splinting:
   - The incision line must be well approximated.
   - An interface layer is needed and can be a either a separate dressing or incorporated into the NPWT dressing itself, (i.e., Prevena Peel and Place, and PICO7/PICO14).
   - The dressing must be slightly longer than the incision line and must be at least 5cms in width to ensure that the area is well-splinted.
b. Skin Graft bolstering:
   - An interface layer is needed and can be either a separate dressing or incorporated into the NPWT dressing itself
   - Dressing should be slightly bigger that the graft site to ensure that area is well-bolstered.
c. Open Wound filler(s): Note foam dressing are not detected by X-ray
   - Black foam (low density foam):
     - Black foam has a low density and is hydrophobic (repels moisture) and is used to provide equal distribution of negative pressure across the wound bed, enhancing the formation of tissue granulation and wound contraction. Due to its repelling nature, black foam acts as a conduit for the removal of wound edema and exudate.
     - When using only black foam, the pressure setting should not be higher than 125 mmHg.
     - Granulation coverage of adipose tissue can be difficult to achieve; for best results, use black foam in direct contact (no interface layer) with the adipose tissue.
     - Tendons, ligaments, blood vessels, organs, and nerves must be completely covered with an interface prior to putting black foam into the wound.
     - Do not use within deep undermining, sinuses/tunnels as it has a low tensile strength.
   - White foam (high density foam):
     - Foam has a high density and is hydrophilic (retains moisture).

- Has a higher tensile strength than black or silver foam, therefore it is a better choice for packing deep undermining, sinuses/tunnels.
- White foam has a lower microstrain on the wound bed and is therefore less likely to adhere to the wound. This feature makes it useful as an interface layer for painful wounds or if black foam adheres to the wound bed.

- Combining black foam and white foam:
  - When used in combination, white foam protects the wound bed and black foam acts as a conduit for the removal of wound exudate and edema.
  - When used together, a pressure of 125 mmHg or higher is required.
  - White foam is always used in combination with black foam with the TRAC pad 'sitting' on the black foam as the white foam is not a good conduit for exudate removal.
- Antimicrobial (Silver) foam:
  - To be used only when there are S&S of infection.
  - Is a low density, hydrophobic foam similar to black foam; may be used with white foam.
  - Not to be used for Closed Incisions.
  - The expected outcome of using silver foam is that S&S of infection will be resolved within 2 weeks.
- PHMB woven gauze and ribbon:
  - Is impregnated with 2% polyhexamethylene biguanide antiseptic and comes in a sterile roll or as packing ribbons.
  - May be used in areas with undermining or explored sinuses/tunnels.
  - It can be used in combination with a foam dressing (light blue, black, silver), or a disposable NPWT dressing, (e.g., PICO7 or PICO14).
- Light Blue foam:
  - Only use with the SNAP device
- Instill-dwell (i-d) foam dressing (black, grey):
  - High density foam specially designed to hold instill solution.
  - Comes as a special i-d foam; spiral, rope, solid foam or fenestrated foam
  - Should not be replaced with other types of NPWT foam but white foam may be used in conjunction with for filling/packing of deep undermining/sinuses/tunnels

7. Special Consideration: Use of a Bridge or Y-Connector
   a. Bridging should be considered if the placement of the TRAC pad directly over a wound site could potentially cause a pressure injury or prevent the client from safely mobilizing. A bridge of low-density form is used to connect the wound to the Trac-pad which is positioned away from the area of concern.
   b. Bridging may also be done to connect two or more wounds to one NPWT device. It is appropriate for two or more wounds that are 25 cm or less apart. If on a limb, wounds are on the same limb.
      - Do not connect wounds requiring different pressure settings.
      - Do not connect wounds with different etiologies (e.g., diabetic foot and surgical incision).
      - Do not connect an infected wound to a non-infected wound.
      - May be done with NPWTi-d therapy but there is a risk that the skin under the bridge may become macerated.
   c. Y-connecting may be done to managing two wounds with one NPWT device. It is appropriate for wounds that are greater than 25 cm (10 inches) apart. If on a limb, wounds are on the same limb.
      - The male end of the Y-connector is to be connected to the wound of most concern as this end provided a higher level of negative pressure on the wound
      - Do not connect wounds requiring different pressure settings.
      - Do not connect wounds with different etiologies, (e.g., diabetic foot and surgical incision).
      - Do not connect an infected wound with a non-infected wound.
      - Do not use more than one Y-connector.
      - Do not use with NPWTi-d therapy.

8. Special Consideration: Therapy Settings
    a. The Therapy Setting (Pressure and Mode) should be determined based upon the type of wound, (e.g., skin graft or pressure injury), which type of foam wound filler being used (low-density black or high-density white foam) and the wound situation, (e.g., maintaining a difficult seal, high exudate, wound pain associate with NPWT). See Appendix B: Determining Therapy Settings & Dressing Change Frequencies for details.

9. Special Consideration: Dressing Change Frequency (see Appendix B: Determining Therapy Settings & Dressing Change Frequencies)
    a. An Open Wound NPWT dressing should be changed every 48 to 72 hours, (e.g., Monday-Wednesday-Friday) to allow for the assessment of wound contraction and to minimize the adherence of the foam fillers (black, white, silver or blue) to the granulation tissue.
    b. A Closed Incision NPWT dressing applied in an Operating Room (OR) sterile setting may be left in place for up to 7 days at the surgeon's discretion to a maximum of 14 days.
        - If a new NPWT dressing is required, (e.g., there is an irreparable air-leak in the OR-applied dressing) and the suture line is well-approximated with no signs of infection, the new dressing may be left in place for up to 7 days as per Surgeon/NP.

        If the initial Closed Incision NPWT dressing is applied outside of the OR due to the need for the incision to be bolstered, the dressing should be applied within the 7-day post-op period and changed every 48-72 hours to allow for assessment of the approximation of the suture line and signs of a wound infection as per Surgeon/NP.
    c. A Skin Graft NPWT dressing is usually left in place for up to 7 days at the surgeon's discretion.
    d. For an infected wound, as per the MRP, the NPWT dressing may be changed more frequently until infection is resolved.

10. Special Consideration: NPWT Canisters for Multi-Use Devices
    a. Consider the client's weight, clinical condition(s), wound type when determining the size of canister, (e.g., 500mL or 1000mL)
    b. **Do not** use 1000 mL canister for clients at high risk for bleeding or at risk for volume loss.
    c. 1000mL canisters are only recommended for use in an acute care setting.

11. Special Consideration: The Pediatric Population
    a. If the child experiences procedural pain that is not well managed with oral/IV medication, consider using procedural sedation.
    b. Consider the child's weight, clinical condition(s), wound type when determining the size of canister, (e.g., 500mL or 1000mL):
        - Consider pre-filling a 500 mL canister with fluid to reduce the potential of fluid loss during NPWT. (see Appendix C: Recommended Pre-Fill Canister Volumes & Pressure Settings - Pediatric Clients).
        - **Do not** use a 1000 mL canister for children under 12 years **or** for children 13 years and older at risk for bleeding or fluid loss.
        - As with adults, the 1000mL canisters are only recommended for use in an acute care setting.

12. As per the vendor, PICO7 and PICO14 have not been studied in the pediatric population. Use clinical judgement when prescribing PICO7/PICO14 for an infant or child.
13. Special Consideration: When NPWT Cannot Be Maintained for 22hr/24hrs
    NPWT fillers are not designed to hold exudate but act as a medium through which the negative pressure suction pulls exudate out of the wound. When suction is not applied, as in the case of, an irreparable leak, a device failure or therapy not being maintained due to client situation:
    - Exudate can pool between the wound bed and the bottom of the dressing; this pooling may lead to damage of healthy granulating tissue.

- The NPWT transparent film drape is an occlusive dressing therefore any pooling of exudate provides an environment for bacterial growth/infection.
- The pooling of exudate can occur between the transparent film drape and the periwound skin causing the edges of the dressing to lift and the dressing to leak.
- The pooling of exudate between the transparent film drape and the periwound skin may cause periwound skin maceration and lead to breakdown of the periwound skin making it more difficult to get a good seal for the next NPWT dressing.

The Physician/NP/NSWOC/Wound Clinician must provide an order for an alternate dressing plan:

- Take down the NPWT dressing and apply a non-NPWT dressing.
- Cut the Trac-pad tubing and cover the cut tubing end with an absorbent dressing.

The determination of which alternate dressing plan is to be ordered depends upon the nursing staff having the knowledge/skill to take down the NPWT dressing.

NPWT Order

The client-specific order by the MRP or HA-supported NSWOC/WC should include the following:

- Wound Location.
- Wound Type, (e.g., Open Wound).
- Type of NPWT device to be used.
- Therapy Settings:
  - Pressure Setting, (e.g., -125mmHg).
  - Therapy Mode, (e.g., continuous, intermittent, dynamic pressure).
- Frequency of dressing change.
- Alternate dressing if NPWT dressing/device fails.

The order may also include:

- Interface, if there is a specific requirement.
- Wound filler if there is a specific requirement, (e.g., high density foam (white))

In cases where the order does not indicate an interface or wound filler, the nurse who does the initial application determines what is needed and communicates this to the MRP or HA-supported NSWOC/WC.

Documentation should also include the NPWT treatment goal, (e.g., wound healing or exudate management).

1. Details for a NPWT order
   - See Precautions to be Addressed and Special Considerations above to assist with determining the details of the order.
   - Use Appendix A: Summary Table – Form & Function of NPWT Devices to determine the most appropriate NPWT device,
   - Communicate the plan to the interprofessional team
   - Ensure the order includes the following, as appropriate:
     a. The NPWT Type: Open Wound, Closed Incision or Skin Graft
     b. The wound etiology, type of incision or type of skin graft
     c. The location of the wound, incision or skin graft
     d. The NPWT goal:
        - Wound healing
        - Prep for delayed primary closure
        - Wound cleansing
        - Closed incision management
        - Graft management
        - High volume exudate management

e. Any precautions, (e.g., on platelet inhibitors or anticoagulants, the presence of an exposed organ).
f. If using a **NPWT multi-use device**:
   - The NPWT device to be used: VACUlta4 or ActiVAC
   - Type of interface
   - Type of wound filler(s); foam, gauze or ribbon packing
   - Need for bridging or Y-connector
   - Therapy Settings (see Appendix B: Determining Therapy Settings & Dressing Change Frequencies to determine the most appropriate settings for the type of wound and/or wound situation.
     - Pressure Setting: -25 to -200 mmHg (millimeter of mercury) in -25 mmHg increments. For pediatrics, see Appendix C: Recommended Pre-Fill Canister Volumes & Pressure Settings Pediatrics
     - Therapy Mode:
       - Continuous: should be used for neonates/infants/children
       - Intermittent: ActiVAC setting only
       - Dynamic Pressure Control (DPC): 25mm/Hg to 200mm/Hg, set the low-high range
       - DPC Cycle Rise Time & Cycle Fall Time: timing of the change between the low and high DPC value; default is 3 minutes.
   - If using **NPWTi-d Therapy,** order the instill solution, (e.g., sterile Normal Saline). For the dwell/soak time and instill-dwell cycle:
     - Use the system's Smart-Instill defaults of dwell/soak time (10mins) and instill-dwell cycle every 2 hours.

     or
     - Determine client-specific dwell/soak time between 3-30 minutes and instill-dwell cycle of 3-12 hours.
g. If using a **NPWT single-use device**:
   - The specific device: Prevena 125, Prevena Plus 125, SNAP, PICO7 or PICO14
   - Type of wound filler(s).
   - Type of interface.
   - Pressure Setting.
   - Therapy Setting.
h. For an **Open Wound** dressing change:
   - Frequency of dressing changes is 48 to 72 hours.
   - NPWT dressing change location, (e.g., operating room, the unit, the clinic or home).
   - Procedural pain management - The Physician/NP may order Lidocaine 1% (without epinephrine) to be instilled together with or followed by the same volume of sterile normal saline 0.9% prior to the dressing change. Prescribed Lidocaine is based on the subcutaneous dosage of 4.5 mg/kg to a maximum of 300mg or 30ml of solution.
i. For **Closed incisions** or **Skin Grafts** dressing change:
   - For incisions and skin grafts with NPWT applied in the OR (sterile environment); the date for dressing change and/or date of NPWT discontinuation.
   - For incisions and skin grafts with NPWT applied outside of the OR; dressing should be changed M-W-F to monitor for infection.
j. Provide an alternate dressing plan for how the NPWT dressing is to be managed if the therapy cannot be maintained for 22 out of the 24 hours due to an irreparable leak, device failure or client concern/situation as per agency policy.
k. Interprofessional team consults required to support goal of care (e.g., NSWOC), if not prescriber.
l. Lab tests for consideration: PT, INR, hemoglobin, hematocrit, albumin, blood glucose.
m. For clients with lower leg or foot NPWT, assess colour, warmth, movement, and sensation. (CWMS). For clients who are post-fasciotomy and post-bypass, assess pulses using a Doppler, as well as CWMS.

The Nurse

1. Must successfully complete additional NPWT education for the monitoring and managing of the therapy and the application/removal of the dressing.

2. For the initial VACUlta or ActiVAC dressing, obtain the NPWT multi-use device through the site-specific process for owned devices or the 3M/KCI rental on-line ordering system. Single-use devices are available through the HA's supply chain ordering system.

3. Prior to dressing application/reapplication, review the client's chart for:
   - The initial post-op NPWT dressing removal, review the Operating Room Report for the count of wound packing pieces, the use of retention sutures, (e.g., Abra sutures, hardware insitu, etc.).
   - The current NPWT order.
   - Client's current coagulation status if needed to determine if there is risk for bleeding with the dressing removal.
   - History of dressing change procedural pain and plan pain management as needed.
   - Any issues with previous dressing changes.

4. Promote trauma-informed care to support the client's psychological safety and ensure client's culture, traditions and spiritual beliefs are acknowledged within the provision of care.

5. For clients with a medical device implant, ensure placement of the PICO7/PICO14 device is at least 10 cm (4 inches) away from the implant Safety Considerations NPWT Medical Devices.

6. Dressing Management
   a. Wound:
      i. Apply, change or discontinue the dressing as per order, refer to the specific device procedure:
         NPWT Dressing Application - VACUlta4/ActiVAC
         NPWT Dressing Application - SNAP
         NPWT Dressing Application – Prevena Open Wound
         NPWT Dressing Application - Prevena Peel & Place
         NPWT Dressing Application - Prevena Customizable
         NPWT Dressing Application - PICO7/PICO14
      ii. Count and document:
         - Note: Interface dressings, gauze and foam wound fillers are not radiopaque.
         - The number of wound filler(s), including all the interface layer(s) removed from the wound. Ensure the number of removed packing pieces equals the number of packing pieces inserted into the wound at the previous dressing change.
         - All packing pieces, including the interface layer(s), inserted during the dressing change. The number of packing pieces inserted must be documented on the outside of the dressing; use the documentation sticker provided in the kit or use a pen/marker to write on the dressing or document the count on a piece of tape and apply to the dressing. The following coding system may be used if helpful:
            - I for Interface
            - G for Gauze
            - W for White Foam
            - LB for Light Blue
            - B for Black Foam
            - Gr for Grey
            - S for Silver
            - V for Veraflo foam (black, grey)
      iii. Complete a full wound assessment with each dressing change. There should be a notable improvement in the wound with each dressing change, as evidenced by:

- Decreasing size of the wound: length, width, and depth. A 30% reduction in 3 weeks with improved granulating tissue is the goal of treatment.
- Decreasing depth of undermining, sinuses/tunnels.
- Increasing granulation tissue.
- No signs or symptoms of untreated wound infection.

iv. Cleanse and irrigate the wound bed and peri-skin.
v. Protect the peri-skin and surrounding skin from contact with NPWT wound filler(s) and polyurethane or silicone-acrylic transparent film drape/cover dressing, (e.g., barrier film wipes or hydrocolloids). If hair present, trim hair to ensure an airtight NPWT seal is achieved.
Note: a NPWT silicone-acrylic transparent film drape, (e.g., Dermatac) is available for clients with sensitivities to the polyurethane film drape or if the location of the wound, (e.g., coccyx), poses a concern for getting a seal as drape can be repositioned as needed; do not use barrier film wipes or hydrocolloids due to the silicone.
vi. Use an appropriate interface to protect the wound bed or exposed structures.
vii. Fill and pack undermining, sinuses/tunnels to eliminate dead space. Ensure that the wound fillers are in contact with each other for equal distribution of negative pressure across the wound bed. Leave a tail of gauze or white foam visible in the wound bed.
viii. Fill and pack the wound cavity. For VACUlta4 and ActiVAC dressings, ensure black foam is approximately 2.5 cm to 3 cm above the peri-wound skin edge. Filling to this height ensures the Trac-pad is resting at the level of the skin when vacuum is applied and that the wound edges are supported.
ix. Do not stretch the transparent film drape or NPWT cover dressing during application.
x. Ensure body orifices, stomas, and drains are not occluded by the transparent drape or dressing.
xi. When NPWT is applied to a limb, do not wrap long lengths of drape strips circumferentially around a limb as this can cause a tourniquet affect; cut the strips into short lengths. Check the Colour, Warmth, Movement, and Sensation (CWMS) for the area distal to the NPWT dressing once the NPWT has been initiated as a baseline assessment and then as per HA/agency's standard of care.
xii. Ensure the NPWT dressing has an airtight seal. With an airtight seal the dressing should be collapsed and firm to the touch.
xiii. Notify the Physician/NP/NSWOC/Wound Clinician of any change to the care plan or need to modify the NPWT order, (e.g., the addition of an interface layer).
xiv. When the NPWT therapy is complete or discontinued, check the order for an alternate dressing.

b. Incision:
   i. Apply, change, or discontinue the dressing as per the order. When the NPWT therapy is complete or discontinued, check the order for an alternate dressing.
   ii. Assess the incision for approximation and healing at each dressing change
   iii. Cleanse the incision and peri-incisional skin.
   iv. Protect the peri-incisional skin area from moisture and pressure.
   v. Use an appropriate interface to cover sutures and staples; depended on which NPWT dressing being applied as some dressings, such as Prevena, have an interface layer.
   vi. Ensure the NPWT dressing has an airtight seal.
   vii. Ensure body orifices, stomas, and drains are not occluded by the transparent drape.
   viii. Perform a Colour, Warmth, Movement and Sensation (CWMS) check on the area distal to the NPWT dressing if the dressing is on a limb.
c. Skin Graft:
   i. Apply change or discontinue the dressing as per the order. When the NPWT therapy is complete or discontinued, check the order for an alternate dressing.
   ii. Assess the skin graft for healing (the graft 'take') with dressing removal.
   iii. Protect the peri-graft skin from moisture and pressure.

iv. Perform a Colour, Warmth, Movement and Sensation (CWMS) check on the area distal to the NPWT dressing if the dressing is on a limb.

7. Management of NPWTi-d Therapy, (e.g, Veraflo)
    a. See the Related Documents section of Procedure: NPWT Dressing Application – Veraflo for how to manage Veraflo.

8. Assess & Prevent Wound Infection (Wound Infection Guideline; Wound Infection Guideline Summary)
    a. For NPWT dressing changes, no-touch technique may be used for the cleansing of the wound; sterile technique is required for the preparation and placement of the interface and wound fillers with the wound.
    b. If there is a thick purulent exudate in the tubing or canister and/or a foul odour noted from the dressing or canister, notify the Physician/NP/NSWOC/Wound Clinician.
    c. Monitor for signs and symptoms of localized and systemic infection. If signs and symptoms of infection develop, consider a C&S, and consult with the Physician/NP/NSWOC/Wound Clinician.
    d. Do not use a bridge or Y-connector to connect an untreated infected wound with an uninfected wound.
    e. Ensure all wound filler(s), interface layer(s), and packing pieces are removed as retained pieces can promote infection.

9. Monitor for NPWT-associated wound pain and consult with Physician/NP as needed.

10. Prevent/minimize Medical Device-Related Pressure Injuries (MDRPI):
    a. Use bridging techniques to offload the NPWT TRAC Pad and tubing away from weight-bearing surfaces and creases, such as groins.
    b. Refer to a Podiatrist, Orthotist, Pedorthist or OT/PT, where available, for off-loading footwear or appliances for clients with plantar surface ulcers. This may require a Physician/NP referral.
    c. Refer to the Occupational Therapist or Physiotherapist to support pressure injury prevention through pressure redistribution and offloading interventions.

11. Refer to the Registered Dietitian for identified nutritional needs, (e.g., fluid loss due to exudate amount).

12. Listen for and address any NPWT alarm issues:
    a. Alarm issues, such as air leaks, changes in pressure, low battery or full canisters are addressed by the acute or long-term care nurse in their settings. In the community, the client, family member, or caregiver must be able to address any alarms issues if they occur.

13. Conduct a NPWT Safety/Monitoring Check:
- The safety/monitoring check is done every 2 hours to ensure the NPWT system is functioning correctly. The check is the same for all NPWT devices and for all types of NPWT dressings. Documentation of the check is done on the NPWT Safety Monitoring Check Flow Sheet as per HA/agency policy.
- At the beginning of each shift, check the orders for the current NPWT Therapy Settings; Pressure Setting & Therapy Mode.
- The safety/monitoring check has two components:

  Safety
    a. Check the entire NPWT system, from the dressing to the medical device, to ensure proper functioning. Ensure the:
        - Dressing has an airtight seal, i.e., the dressing must be collapsed and firm to touch.
        - Tubing connection(s) is secure, tubing clamps are open, and the tubing is not bent or kinked.
        - Canister is engaged and assess the need to change the canister.
        - NPWT Pressure Setting and Therapy Mode are consistent with NPWT orders.
        - Battery is charged or plugged into a power source.

b. If Veraflo Therapy is running, check that the system is connected correctly and that the Instill-Dwell settings match the current orders.

Monitor

a. Monitor the dressing for pooling of fluid.
b. Monitor the type of drainage in the tubing and canister. Unexpected bleeding, bile, fecal material and purulent drainage must be reported immediately to the Physician/NP.
c. Monitor that the client is not lying on the tubing as this could cause a pressure injury.
d. Monitor the amount of drainage in the canister over time. If NPWTi-d therapy is running, ensure that the volume of instilled drawn-off solution has been subtracted from the overall canister amount. Any volume outside of what is expected must be immediately reported to the Physician/NP.

14. Canister Change (where appropriate for the NPWT device)
    a. Change the canister when ¾ full or at least every 7 days as indicated by the date.

15. Alternate Dressing

When the NPWT suction has been OFF for 2 hours or greater, (e.g., irreparable leak, device failure, client situation) there is the potential for the exudate to build up under the NPWT dressing.

- Advise the Physician/NP/NSWOC/Wound Clinician of the situation.
- As ordered:
  - Cut the Trac-pad tubing; cover the cut tubing and NPWT dressing with a dressing until the NPWT dressing can be changed (cut & cover).
  - Remove the NPWT dressing and apply the alternate dressing (take-down).
- When there is the potential that the NPWT will be OFF for 2 hours or greater the NPWT dressing must be removed and the alternate dressing applied, (e.g., travel time for a MRI, travelling time when transferring the client for one site to another).

16. Client Showering

Clients with may shower (no tub-baths) with the VACUlta4 VACUlta/Veraflo or ActiVAC dressing in place, but the shower must be done prior to a dressing change.

NPWT Dressing Application - VACUlta4/ActiVAC
NPWT Dressing Application - VACUlta4 Veraflo

Clients may may shower (no tub-baths) with a PICO 7, PICO 7/ PICO 14, SNAP or a Prevena dressing in place. Refer to the specific device procedure for how to prepare the client and the device for a shower:

NPWT Dressing Application - SNAP
NPWT Dressing Application – Prevena Open Wound
NPWT Dressing Application - Prevena Peel & Place
NPWT Dressing Application - Prevena Customizable
NPWT Dressing Application - PICO7/PICO14

17. Manage Adverse Events

The following situations require immediate action:

- Frank or active bleeding at the dressing site, in the tubing or in the canister. This does not include expected post-op bleeding.
- Bile at the dressing site, in the tubing or in the canister.
- Fecal content at the dressing site, in the tubing or in canister.
- For clients with a spinal cord injury, an autonomic dysreflexia (AD) event.

If any of the above occur, the following actions are required:

Acute Care – the nurse must:

- Immediately turn off the device, leave the dressing in place and notify Physician/NP of the urgent situation.

- In the event of active bleeding, apply pressure to the dressing area until Physician/NP arrives.

Community Care – the client and/or family must:

- Immediately turn off the device, leave the dressing in place, and call 911 for immediate transportation to Emergency.
- In the event of active bleed, apply pressure to the dressing area until Ambulance arrives.

Long Term Care – the nurse must:

- Immediately turn off the device, leave the dressing in place, and call 911 for immediate transportation to Emergency.
- In the event of active bleed, apply pressure to the dressing area until Ambulance arrives.

Decision to Continue or Discontinue the NPWT Intervention

The decision to continue or discontinue the NPWT intervention is made by the Physician/NP/NSWOC/Wound Clinician in consultation with the interprofessional team and if appropriate, the client and/or family.

Note: Should a client situation arise that requires a short break from NPWT (e.g., special weekend event), the therapy is considered discontinued. For rental devices, the vendor is be notified of the discontinuation and a new rental order is to be placed for the date the therapy is to re-start.

1. Continue NPWT if:
    a. Wound healing is evidenced by a reduction in wound size of 10% per week or 30% over 3 weeks, based on the wound assessment (length, width, and depth), and the improved quality of the granulation tissue.
    b. The incision, including a flap incision, continues to be approximated but is at risk of dehiscence and requires on-going splinting.
    c. The graft continues to require bolstering as per the surgeon's order.
    d. High volume exudate management continues to be required.
    e. The therapy can be consistently maintained for at least 22 of every 24 hours.
    f. The client and/or family continue to be engaged in care.

2. Discontinue NPWT:
    a. When the goal of care has been **successfully met**:
        - Wound closure is achieved or improvement in wound healing is achieved (decreased wound volume, granulating tissue noted) and the wound can be transitioned to another treatment modality.
        - Incisional closure is achieved; discontinue as per the surgeon's order.
        - The skin graft 'take' is achieved; discontinue as per the surgeon's order.
        - Preparation for surgical closure is achieved based on an improved quality of granulation tissue or the specific surgeon's goals of therapy.
        - High volume exudate is sufficiently reduced to allow transition to another treatment.
    b. When the following **adverse situation(s)** occur:
        - The wound size (volume) is not reduced by 10% per week or 30% over 3 weeks.
        - The wound deteriorates, develops a spreading wound infection, has increased necrotic tissue over 20% or a clinically treated wound infection worsens.
        - The client's wound and/or procedural pain not effectively managed.
        - Client's condition has changed such that NPWT is no longer appropriate
        - NPWT is consistently disrupted for more than 2 hours in 24 hours each day; unable to maintain suction 22/24hrs
        - The client experiences a skin allergy or sensitivity to NPWT products.
        - It is not possible to maintain a 24-hour airtight seal around the site, despite trouble-shooting.
    c. When transitioning a client to another care setting and the receiving unit does not have the resources to support NPWT at the time of transition or for ongoing NPWT.

d. Once the NPWT has been discontinued, the following is to be done regarding the device itself:
   - Rented multi-use devices:
     - As per HA process, notify the vendor to stop the rental charge and pick up the device.
     - **Care must be taken to avoid misplacing or losing the rental device, as vendor charges will apply.**
   - Owned multi-use devices:
     - Return to the site's Biomedical Department, if available, for storage and maintenance.
     - If a Biomedical Department is not available, conduct care and maintenance as per device recommendations, see Appendix D: Cleaning Owned Multi-Use NPWT Devices
   - Purchased single-use devices:
     - Devices and batteries are to be recycled, where possible.

Transition/Discharge Planning

When transferring a client with NPWT insitu from acute care to community or long-term care, begin the planning for transition/discharge when the NPWT is started in order to provide uninterrupted NPWT, support a safe and timely discharge and promote optimal client independence.

1. The transition or discharge plan of a client with NPWT is to be done **at least 48 hours** prior to the transition date. This allows the receiving unit or site time to prepare for the provision of safe NPWT and, where possible, to avoid interrupting the therapy.
   a. Determine if the receiving unit or site is able to accept the client based on the following:
      - Available educated nursing staff. Nurses who will be monitoring/managing of the NPWT and those will be doing the dressing changes must have completed the NPWT additional education.
      - Staff resources sufficient to monitor NPWT every two (2) hours.
      - Access to the NPWT device, dressing and canister and the ability to order what is needed.
        - Many multi-use NPWT devices are owned by each specific site or Health Authority. Procedures for requesting and returning the owned NPWT device are unique to each site or Health Authority.
        - Multi-use NPWT devices may be rented by a specific site or Health Authority. Procedures for renting are available online through the approved Vendor website. The procedure for transferring rented NPWT devices is site or Health Authority specific.
        - Disposable NPWT devices are purchased through the Supply Chain ordering system.

      For LTC sites: not all LTC sites are able to support NPWT due to the limited number of nurses available on shift and who have the knowledge/skill needed to complete safety/monitor checks and to do the dressing changes. **Transition to LTC will require a longer planning time** to allow the site to identify and implement processes, (e.g., education sessions for staff for at least the monitoring/ management of the NPWT, determine who will be responsible for the dressing changes, availability of knowledgeable staff on each shift, etc.,) in order to provide safe NPWT for the resident. In addition, some LTC sites may not be able to finance the costs of the rental device/purchased dressings or may need financial assistance to do so. In the case where the LTC site cannot ensure safe NPWT for the resident, then alternative plans must be considered.

   b. If the receiving site is unable to accept the client transfer with NPWT in place, consider the following options in consultation with the Physician/NP/NSWOC/Wound Clinician:
      - Education session(s) if the staff are not familiar with the specific NPWT.
      - Discontinue NPWT and transfer the client with the understanding that the receiving unit or site will restart NPWT as soon as possible.
      - Discontinue NPWT and change the care plan to a different dressing to facilitate the transfer.
      - Postpone the client transfer until the receiving unit or site is able to accept the transfer thereby not interrupting the NPWT treatment.

      Note: if the travel time to the receiving site or to home could take longer than 2 hours, then send the client with an alternate dressing in place.

2. When transitioning the client from one acute care unit to another acute unit or site, the following must be done to support the transition:
    a. The transitioning acute care unit:
        - Provides a current care plan and transfer document(s) that outlines the NPWT treatment goals, dressing and canister products, therapy settings, pressure settings, and the frequency of dressing changes.
        - Replaces the site-owned NPWT device with a rented device as site-owned NPWT devices must stay within the site.
        - Ensures the rental confirmation information is provided to the receiving unit or site.
    b. The receiving acute care unit transfers the billing for a rental device to their unit as per agency procedure.

3. When transitioning the client from acute care to community care**,** the following must be done to support the transition:
    a. The transitioning acute care site:
        - Ensures the client and/or family is willing to carry out 2-hourly NPWT safety and monitor checks. Monitoring during the sleeping hours is not required, as long as the client and/or family can hear the alarms, unless the NPWT device does not have an alarm.
        - Ensures the home has potable tap water, a phone, a reliable power source for the NPWT device, and a home environment that can adapt and support the client receiving NPWT.
        - Provides a current care plan and transfer document(s) that outline the NPWT treatment, products, therapy settings, pressure settings, and dressing change frequency.
        - Replaces a site-owned NPWT device with a rented or community-owned device as acute site-owned NPWT devices must stay within the site.
        - Ensures the rental device confirmation information is provided to the receiving unit/site.
        - Provides education to the patient/family regarding monitoring/managing their NPWT, see Client/Family Education and Resources section.
        - Puts together NPWT Trouble-Shooting Supplies bag with the following:
            - An extra canister for the NPWT device being used if there is the potential that it would be needed.
            - Sterile transparent film dressing to patch air leaks
            - Sterile scissors
            - Alcohol swabs
            - Sterile dressings, (e.g., abdominal pads, cover dressing). The dressing size will depend upon which Alternate Dressing Plan the client is to do (cut & cover or take-down). There should be enough dressings to allow for a change(s) when saturated.
            - Tape, if needed
        - Determines the Alternate Dressing Plan that the client would use in the situation of an irreparable leak or system failure.
    b. The receiving community care site:
        - Reinforces client education regarding monitoring and trouble-shooting.
        - Ensures NPWT Trouble-Shooting supplies are available.
        - Ensures the billing for a rental device is transferred to their unit or site as per agency procedure.

4. When transitioning the client from acute care to long-term care the following must be done to support the transition:
    a. The transitioning acute care unit:
        - Provides a current care plan and transfer document(s) that outline the NPWT treatment goals, dressing and canister products, therapy settings, pressure settings, and dressing change frequency.

- Replaces a site-owned NPWT device with a rented device as site-owned NPWT devices must stay within the site.
- Ensures that the rental confirmation information is provided to the receiving unit or site.

b. The receiving long-term care unit:
- Ensures the billing for a rental device is transferred to their unit as per agency procedure.

5. When the client's care is being transitioned from community care or long-term care to acute care the following must be done to support the transition:
   a. The transitioning community or long-term site:
      - Provides a current care plan and transfer document(s) that outlines the NPWT treatment goals, dressing and canister products, therapy settings, pressure settings, and dressing change frequency.
      - Site owned NPWT devices must stay within the site, therefore prior to the client's transition, replace the owned device with a rented device, or a device owned by the receiving agency.
      - Ensure that the receiving unit or site has the rental confirmation information.
   b. The receiving acute care unit:
      - Ensures the billing for a rental device is transferred to their unit as per agency procedure.

Client/Family Education and Resources

1. Select the specific NPWT device Client Health Education Resource (CHER):
   - NPWT ActiVac
   - NPWT ActiVAC - Yukon
   - NPWT SNAP
   - NPWT Prevena125 Self Care Closed Incision
   - NPWT Prevena Plus 125 Open Wound Closed Incision
   - PICO7 Self Care
   - NPWT PICO7 / PICO14
   - NPWT PICO7 / PICO14 - Yukon

2. Review with the client/family the information found in the Client Health Education Resource (CHER) to cover the following general points:
   a. The rationale for NPWT and the underlying mechanisms of therapy.
   b. The importance of complying with NPWT treatment for a minimum of 22 out of 24 hours. The non-therapy hours (2 hours) are for client showering (VACUlta or ActiVAC dressing), toileting activities, and dressing changes.
   c. The frequency of dressing changes carried out by the nurse.

3. For the patient going home with NPWT, review with the client/family the information found in the Client Health Education Resource (CHER) to cover the following specific points:
   a. When and how to conduct Safety/Monitor Checks. In the home setting, checks should be done every 2 hours but do not need to be done during the sleeping hours as long as the alarms can be heard.

      Safety Check
      - Check that the NPWT pressure and therapy settings have not changed.
      - Check the entire NPWT system from the dressing to the power source to ensure it is functioning correctly:
        - Ensure the dressing has an airtight sea. The dressing should be collapsed, firm to touch, and devoid of hissing sounds when the seal is airtight.
        - Ensure the tubing clamps are open and that the tubing is not bent or kinked.
        - Ensure the tubing connectors are secure.
        - Ensure the canister is engaged (if applicable)
        - Ensure the device battery is charged or plugged into a power source.

- Check the device alarm volumes and ensure they are audible.
- Determine the need to change the canister if applicable.

Monitor Check

- Monitor the dressing fluid pooling.
- Monitor the tubing and canister for the type of exudate, the expected amount of exudate, and for other substances such as blood, bile or feces present in the canister.
- Monitor the canister for increasing amounts of exudate over time.
- Monitor the tubing location after each repositioning to ensure the tubing is not causing a pressure injury.

b. How to use the specific NPWT device, including:
   - Turning the device on/off.
   - Changing the canister, if appropriate.
   - Managing the alerts and alarms for the specific device.
   - Use of the carrying case (if available).
   - The battery (rechargeable or not) and power source; should have additional batteries available as back-up

c. How to fix an air-leak.

d. Which Alternate Dressing Plan to use in the case of an irreparable air-leak or a device failure. To determine which plan, consider what the client/caregiver could safely do and how soon could the nurse change the NPWT dressing, (e.g., next morning). For most client situations, the cut & cover dressing plan would be the most appropriate. The take-down dressing plan may be appropriate for situations where there would be a delay in changing the NPWT dressing, (e.g., great travel distance).

e. How to recognize and respond appropriately to complications including:
   - Frank blood in the dressing, tubing, or canister
   - Bile in the dressing, tubing, or canister.
   - Feces in the dressing, tubing, or canister.
   - New or increased pain.
   - An increase in the drainage.
   - Signs and symptoms of an infection or worsening infection.

4. Have the client and/or family demonstrate to the nurse how to do the safely/monitoring check and document their understanding of the teaching points.

5. If the device is either a Health Authority owned or a rented device, stress that the device must be returned to the Community Health Unit or the Hospital Clinic providing the community care, (e.g., do not leave in Surgeon's office).

Client Clinical Outcomes

1. Intended:
   a. The identified NPWT goal of care is met:
      - The wound shows evidence of healing, (e.g., 30% reduction in 3 weeks with improved quality of the granulation tissue).
      - Surgical closure preparation is achieved.
      - Closed Incision approximation is maintained/incision heals.
      - Skin graft 'takes'.
      - High levels of exudate are not present or are treated, if present.
   b. No complications occur, or if they occur, they are successfully treated.
   c. There is no site infection, or if infection is present, it is successfully treated.
   d. There is no procedural and/or wound pain, or if present, it is successfully treated.
   e. The client is able to participant in the NPWT care plan.

2. Unintended
    a. The identified NPWT goal of care is not met:
        - The wound does not heal, (e.g., less than 30% reduction in 3 weeks with no improvement in the quality of the granulating tissue).
        - Surgical closure preparation is delayed.
        - Closed Incision dehisces.
        - Skin graft does not 'take'.
        - High level of exudate is not managed.
        - Peri-wound skin complications.
    b. Complications occur, including fistula development, the presence of unexpected blood, bile or feces in the tubing and canister, or clotting issues in the wound.
    c. Procedural and/or wound pain occurs and is not successfully treated.
    d. The site becomes infected, or the existing site infection worsens.
    e. The client is not able to participate in the NPWT care plan.

Quality Assurance Indicators

The following quality assurance indicators may be used by the Health Authority, agency or facility to ensure the quality of NPWT interventions put in place:

1. An assessment for the appropriate use of NPWT is completed.
2. The goal(s) of the NPWT intervention is clearly identified.
3. The goal(s) of the NPWT intervention is successfully achieved.
4. The following NPWT adverse events are reported as per health authority and agency guidelines in BC Patient Safety Learning System (PSLS):
    - Pooling under the dressing and or in the tubing and/or canister of:
        - Blood
        - Bile
        - Feces
    - Medical-device related Pressure Injury
    - Packing count discrepancy, i.e., the number of interface layers and/or wound filler(s) put into the wound do not match the number taken out.

Documentation

1. With each NPWT dressing change, document in the client's chart as per BCCNM / HA / agency documentation standards and include the following:
    a. The full wound assessment
    b. The numbers (#)/type of interface and wound filler packing pieces removed and replaced.
    c. The client's response to the dressing change.
2. Document NPWT clinical outcomes and care plan revisions as they occur.
3. For Acute Care & Long-Term Care, document safety/monitoring checks on the NPWT Safety/ Monitoring Check Flow Sheet. or e-documentation tool as per HA/agency policy.
4. For Acute Care & Long-Term Care, document canister fluid volume; use the Fluid Balance (In/Out) flow sheets as per unit policy. When Veraflo Therapy is running, subtract the amount of instilled drawn-off solution for the overall canister volume. Any concerns regarding fluid balance should be chart in Progress Notes.
5. Document education provided and supplies given to client/family upon transition to the community setting.

6. When the multi-use NPWT device is initially set up, document if it is owned or rented. If rented, include the "Order Number" (received online), and the device Serial Number as these are needed for tracking purposes.

7. If a NPWT dressing is applied/changed in the OR, the following are documented in the OR record:
    - NPWT type: Open Wound, Open Wound NPWTi-d, Closed Incision. Skin Graft.
    - Number of pieces placed in/removed from the wound cavity by the surgeon/OR nurse.
    - Type(s) of pieces (black foam, white foam, interfaces) placed in/removed from the wound cavity by the surgeon/OR nurse.

8. Report NPWT adverse events in the Patient Safely Learning System or report the safety event according to Health Authority or agency guidelines.

Definitions

BCCNM: British Columbia College of Nurses & Midwifes

Client: generic term used to describe a person accessing care regardless of care setting; patient in the hospital, client in community; resident in long-term care.

Client/Family - Family is two or more individuals who come together for mutual aid. Families are self-defined, and family is 'who the client says their family is'. This is individualized.

Debridement - The removal of non-viable tissue. This supports the development of granulation tissue, which is necessary for healing to occur. Debridement methods include autolytic, enzymatic, mechanical, biologic, conservative sharp and surgical.

Epibole – Refers to a raised, rolled closed wound edge. May be dried, callused, or hyperkeratotic and feels hard and indurated. The rolled edge stops cell migration across the wound effectively stopping wound healing. There are many causes including hypoxia, infection, desiccation, dressing trauma, overpacking the wound, or an unhealthy wound bed.

Eschar, dry stable - Firm, dry necrotic tissue with an absence of drainage, edema, erythema, fluctuance or separation from the wound edge; is black or brown in color and is attached to the wound edges and wound base.

Eschar, soft boggy - Soft necrotic tissue; may be black, brown, grey, or tan in color; may be firmly or loosely attached to the wound edges and wound base; fluctuance and drainage may be present.

Interface layer - An interface layer is a meshed non-adherent dressing, or white foam that is placed in the wound bed before the black or silver foam wound filler(s) and dressings are applied. An interface layer prevents these foams from adhering to the wound bed, supports pain reduction, and aids in easier removal of the wound filler(s). Non-adherent dressings may be antimicrobial.

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NPWT Types

Open Wound: NPWT which supports the closure of wounds including surgery wound dehiscence which are healing through secondary intention (granulation).

Closed Incision: Incisional NPWT which supports primary closure of fully approximated sutured, steri-stripped, or stapled incision lines with the purpose of splinting the area as the incision heals

Skin Graft NPWT which supports healing of split-thickness grafts by stabilizing the skin graft to aid in the 'take' of the graft.

NPWT Techniques

Bridging technique - This procedure is used to connect two or more wounds to one NPWT device. It is appropriate for wounds that are 25 cm or less (10 inches) apart. Do not connect wounds requiring different pressure settings. Do not connect an infected wound with a non-infected wound, (e.g., diabetic foot and surgical incision).

Offloading Bridge - Designed to prevent medical-device related pressure injuries from the TRAC pad and/or tubing. Protective layers of hydrocolloid or transparent drape are placed on intact skin, then black foam with transparent drape. The TRAC pad is positioned in this location.

Y-Connector - No more than 2 wounds connected. This procedure is used for managing two wounds with one NPWT device. It is appropriate for two wounds that are greater than 25 cm (10 inches) apart. Do not connect wounds requiring different pressure settings. Do not connect an infected wound with a non-infected wound, (e.g., diabetic foot and surgical incision).

NPWTi-d (instill-dwell therapy). This NPWT VACUlta4 VeraFlo function is used only for Open Wounds; facilitates the removal of necrotic tissue/slough with the instillation of topical solutions.

Most Responsible Provider (MRP) Surgeon, Physician, Nurse Practitioner (NP)

Osteomyelitis - Infection of the bone or bone marrow.

Peri-skin: This is a generic term used to include peri-wound, peri-incisional, peri-stomal and peri-graft skin that is from the wound edge to the beginning of the surrounding skin.

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Document Creation/Review

This guideline is based on the best evidence-based information available at the time it was published and avoids opinion-based statements, where possible. It was developed by the Provincial Nursing Skin & Wound Committee and has undergone provincial partner review.

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Appendix A	Summary Table – Form & Function of NPWT Devices*					
	Multi-Use Devices		Single-Use Devices			
	VACUlta4 3M	ActiVAC 3M	Prevena125 3M	Prevena Plus 125 3M	SNAP 3M	PICO7/PICO14 S&N
Care setting	Acute Care Only	All care settings	All care settings	All care settings	All care settings	All care settings
Type of Use	Multi-use	Multi-use	Single-use	Single-use	Single-use	Single-use: 7 or 14 days
Indications for Use	Open Wounds Open Abdomen Incision & Graft	Open Wound Graft	Incision ≤ 35cm Peel & Place dressing	Open Wound Incision 35cm - 90cm w Customizable dressing	Open Wound or Graft up to 13x13 cm	Incision up to 40 cm Graft up to 25x25cm Open Wound up to 25x25cm w 2.0cm depth
Instill - Dwell	For Open Wound only					
Exudate Amount	Nil to copious	Nil to large	Nil to minimal	Nil to small	Nil to minimal	Nil to minimal
Canister Volume	500mL or 1000 mL	300 mL	45 mL (can also be connected to VAC Ulta4 or ActiVAC prn)	150 mL (can also be connected to VACUlta4 or ActiVAC prn)	60 mL	No canister
Wound Fillers:						
Black foam	Y	Y		Y		Y
White foam	Y	Y		Y		Y
Instill-Dwell foam	Y					
PHMB woven gauze	Y	Y		Y for open wound		Y
Silver foam	Y	Y		Y		
Purple foam			Y	Y for closed incision		
Light Blue foam					Y	
Other wound fillers				Y for open wound		Y
Interface Layer	**Y**	Y			Y	Y
Therapy Setting: Pressure Setting	Range: -25 to -200 mmHg in increments of 25 mmHg	Range: -25 to -200 mmHg In increments of 25	Pre-set at -125 mmHg	Pre-set at -125 mmHg	Pre-set at -125 mmHg	Pre-set at -80 mmHg
Therapy Setting: Therapy Mode	Continuous or Dynamic Pressure Control	Continuous or Intermittent	Pre-set at Continuous	Pre-set at Continuous	Pre-set at Continuous	Pre-set at Continuous
Therapy Mode Default Settings	-125 mmHg & Continuous	-125 mmHg & Continuous				
Instill-Dwell (I-D) Default Setting	Instill Cycle: 2hrs Dwell/Soak:10mins					
Power Source	Battery life 6 hours charge with AC	Battery life 8 hours charge with AC	Battery life 7 days	Battery life up to 14 days	Mechanically powered	Battery life PICO 7 - 7 days. PICO14 – 14 days

*Table does not address Abthera.
**For closed incision dressings applied in the Operating Room(OR) as per surgeon; if applied outside of the OR, then change should be every 48-72 hours,

Appendix B: Determining Therapy Settings & Dressing Change Frequencies

Considerations:

1. Table 1 shows considerations for therapy settings (pressure & mode) and dressing change frequencies by type of wound
2. Table 2 shows considerations for therapy mode settings for specific wound situations

Appendix B: Table 1

Type of Wound	Pressure Setting Granufoam Foam	Pressure Setting White Foam	Initial Therapy Mode	Subsequent Therapy Mode	Dressing Change Frequency*
Acute Wound **Traumatic Wound** **Burn - Partial Thickness**	-125 mmHg	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for first 48hrs	Intermittent or DPC 5mins on/ 2mins off	48-72hrs
Dehisced Surgical Wound	-125mmHg	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for duration of therapy	-----	48-72hrs
Skin Graft (Meshed)	-75mmHg to -125 mmHg: • -75mmHg can be used in areas that will not be subjected to shear forces if the patient has persistent pain with higher pressures. • -125mmHg can be used in highly contoured areas where shear forces are present. The higher pressure may help to hold the graft more firmly in place.	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for duration of therapy	----	Remove dressing on Day 4 or 5 of therapy
Surgical Flaps	-125mmHg to -150 mmHg Higher pressures may be considered with large, bulky flaps to help bolster the flap.	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for duration of therapy	----------	Remove dressing on Day 4 or 5 of therapy
Pressure Injury	-125mmHg	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for first 48hrs	Intermittent or DPC 5mins on/ 2mins off	48-72hrs

Type of Wound	Pressure Setting Granufoam Foam	Pressure Setting White Foam	Initial Therapy Mode	Subsequent Therapy Mode	Dressing Change Frequency*
Diabetic Foot Ulcer	-50mmHg to -125mmHg • The higher pressures within the stated target pressure range are preferred. • In cases of intolerance, using lower pressure is an option, but ensure that active exudate removal occurs.	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for first 48hrs	Intermittent or DPC 5mins on/ 2mins off	48-72hrs
Venous Ulcer	-125mmHg to -175mmHg	-150mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for duration of therapy	----------	48-72hrs
Slow-to-Heal Wound	-50mmHg to -125mmHg • The higher pressures within the stated target pressure range are preferred. • In cases of intolerance, using lower pressure is an option but ensure that active exudate removal occurs.	-125mmHg to -175mmHg Titrate up for large amounts of exudate	Continuous for first 48hrs	Intermittent or DPC 5mins on/ 2mins off	48-72hrs
Enteric Fistula	HCP Team's clinical judgement				

***** If wound is infected, may need an increased dressing change frequency until infection is resolved.

Appendix B: Table 2

Wound Situation	Therapy Mode	
	Continuous	**Intermittent/DPC**
Difficult dressing application	√	
Highly exudating	√	
Painful	√	
Undermining/sinus track	√	
Unstable structures	√	
Stalled (slow to heal)	√	√
Minimally exduating	√	√
Large wound	√	√
Small wounds	√	√

Appendix C: Recommended Pre-Fill Canister Volumes & Pressure Settings - Pediatric Clients

Recommended Pre-Fill Canister Volumes & Pressure Settings for Pediatric Clients				
Pediatric Group	**Age Range**	**300cc NPWT canister Pre-fill to:**	**500cc canister Pre-fill to:**	**Recommended Pressure Settings**
Neonate	Birth - 1 mos.	275 cc	475 cc	50 – 75 mmHg
Infant	1 mos. – 2 yrs.	250 cc	450 cc	50 – 75 mmHg
Child	3 yrs. – 12 yrs.	200 cc	400 cc	75 – 125 mmHg
Source: Gabriel, A., et al. (2009). Outcomes of vacuum-assisted closure of wounds in the paediatric population: Case series of 58 patients. *Journal of Plastic, Reconstructive & Aesthetic Surgery, 62,* 1428 – 1436. Retrieved from https://www-sciencedirect-com.ezproxy.cbu.ca/science/article/pii/S1748681508007705?via%3Dihub				

Appendix D: Cleaning an Owned Multi-Use NPWT Device

1. **NPWT Device**
   a. Unplug the device from the power source.
   b. Wipe device and the power cord (if supplied) with the Infection Control approved disinfectant wipes.
   c. Allow to dry.
   d. Replace ActiVAC NPWT ‘exhaust filter’ between each client use (the filter is only on the ActiVAC).
      - Forceps and screwdriver will facilitate change of the filter.
      - New filters can be ordered using the KCI Order Code 340037.S

2. **Hard Surface Transport Case (if using)**
   a. Remove the NPWT device from the transport case and set it aside.
   b. Wipe all the hard surfaces of transport case with Infection Control approved disinfectant wipes.
   c. Allow to dry.

3. **Fabric Carrying Case - ActiVAC**
   a. The fabric carrying is a single use item; **do not wash or reuse.**
   b. Discard fabric carrying case in garbage or recycle if possible.
   c. Order new fabric cases using KCI Order Code 340061.S