Negative Pressure Wound Therapy Workshop:

Integrating Innovation, Evidence, and Practical Strategies across the Care Continuum

Supported by an educational grant from Solventum, Medical Surgical Business

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Faculty Disclosures

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Learning Objectives

- Review the latest advancements and indication updates in negative pressure wound therapy (NPWT), including clinical applications of disposable NPWT, NPWT with instillation, closed-incision NPWT, and peel-and-place dressing technology
- Describe function and clinical advantages of advanced multi-lumen pressure-sensing technology in NPWT systems, with focus on improving efficiency through real-time troubleshooting, blockage detection, maintenance of target pressure, and consistent therapy delivery
- Analyze case-based scenarios demonstrating use of the NPWT toolkit, including therapy selection, treatment progression, and step-down approaches that support wound and incision closure
- Examine best practices for transitioning patients across care settings while maintaining continuity, adherence, and optimal outcomes with NPWT
- Explore wound management and surgical site complication prevention strategies for advocating for appropriate NPWT technologies through clinical evidence while reviewing key reimbursement considerations that impact access and utilization in clinical practice

NPWT = negative pressure wound therapy.

The Historic Perspective of NPWT

Dot Weir, RN, CWON, CWS
Holland Hospital Wound and Hyperbaric Medicine
Holland, Michigan

“If we look at how far we have come, the future looks even more exciting!”

—Sundar Pichai


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Function

“The Beginning”

- Wall suction used initially as clinicians searched for a way to treat complex wounds with significant drainage
- Safety concerns
- Lack of consistency
- Lack of portability



The Original NPWT





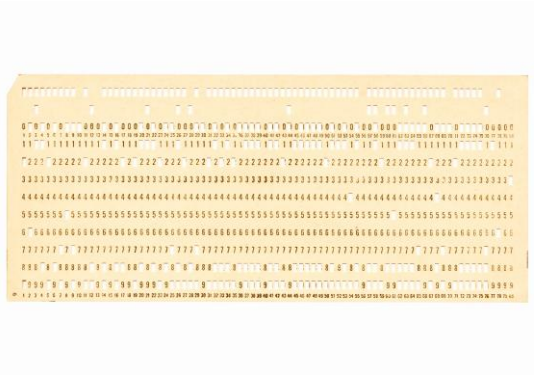






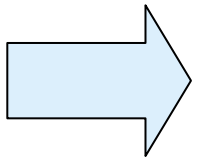


Technological Advances over Time...

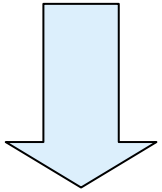




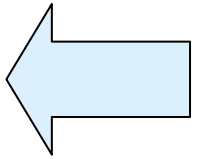
















“The Desktop”

- “Traditional” NPWT
  - Larger machine
  - Continues to advance in terms of irrigation and cleansing
- Widest array of features
- Minimal portability
- Used in inpatient settings









Before
Day 0



After
Day 8

Case courtesy of Mary Anne Obst, RN, BSN, CWON, CCRN.

“The Laptop”

- Portable NPWT System
  - Improved patient mobility using these devices
  - Fewer features
  - Smaller canisters







Diabetic Foot Wound

- 62yo Male
- Type 1 diabetes
- Ulcer on foot reportedly for 6wks
- Dangerously close to structures of foot
- Works as a security guard – not working is not an option





Portable NPWT Initiated on Day 1





NPWT Initiated on Day 1

Day 28



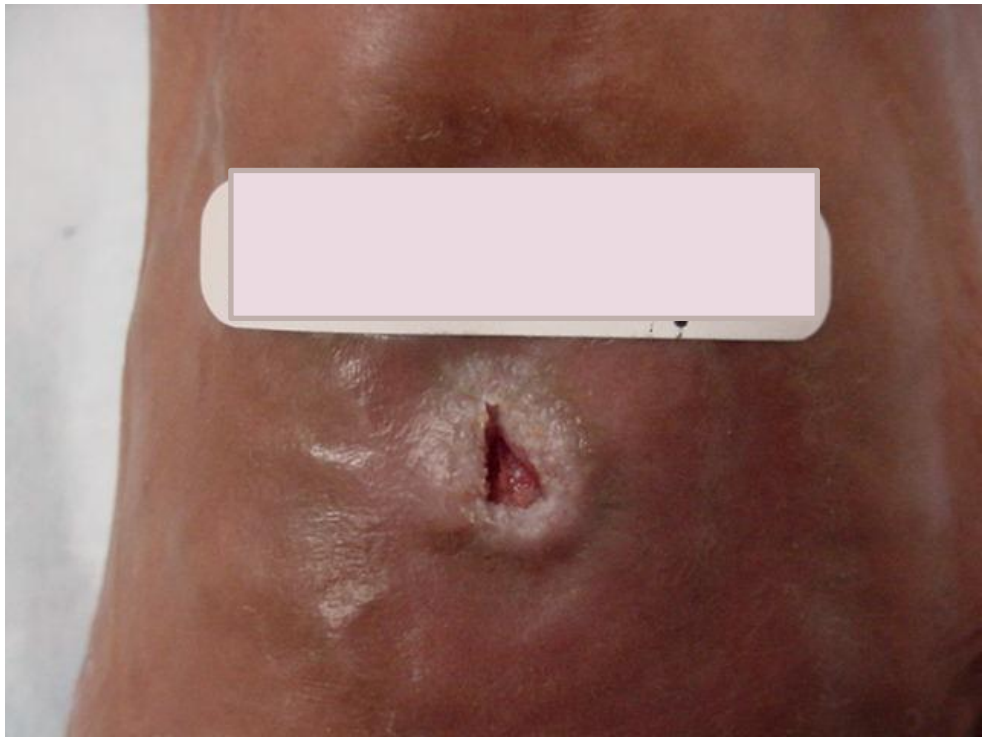
3 days later, began treatment with ORC collagen with silver

Day 31



ORC = oxidized regenerated cellulose.

Finished the Job





- Portable NPWT system for 5wks
- Collagen/ORC with silver for 10 days











“Laptop” Upgrade

- Improved NPWT System
  - Improved features
  - “Buttonology” became a thing
    - Seal check
    - Hours of use
    - Continued portability







2.5wks

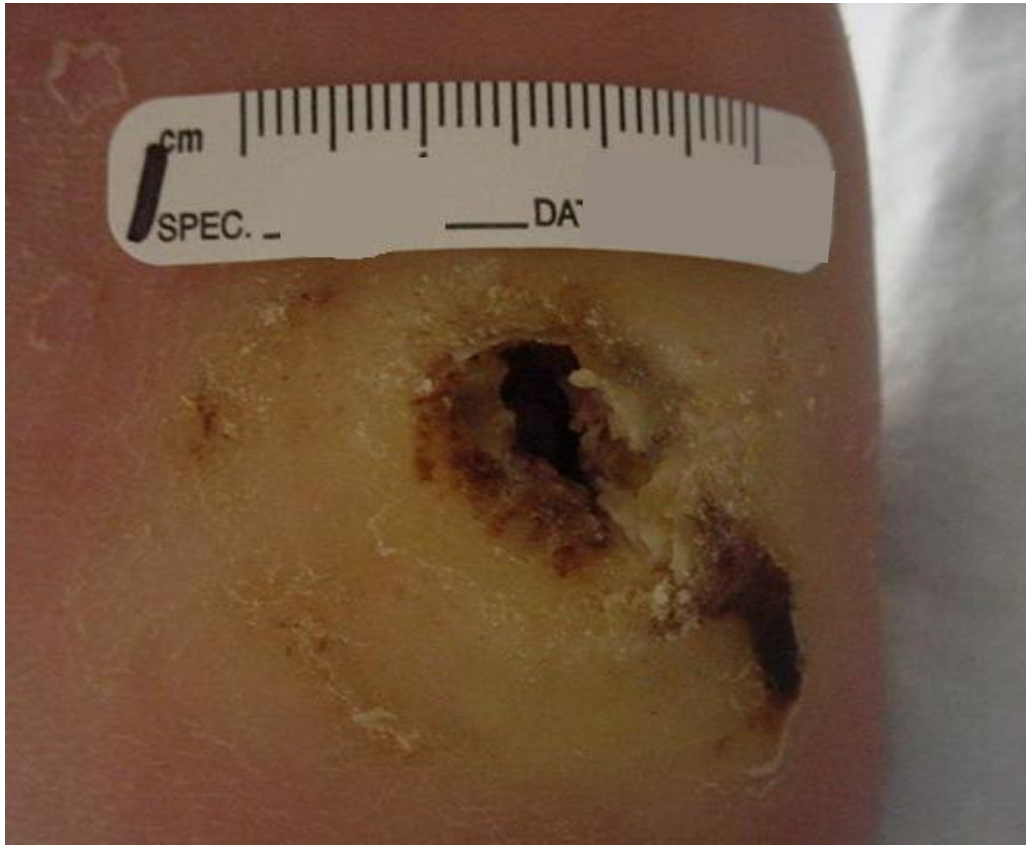
Meeting All Support Needs









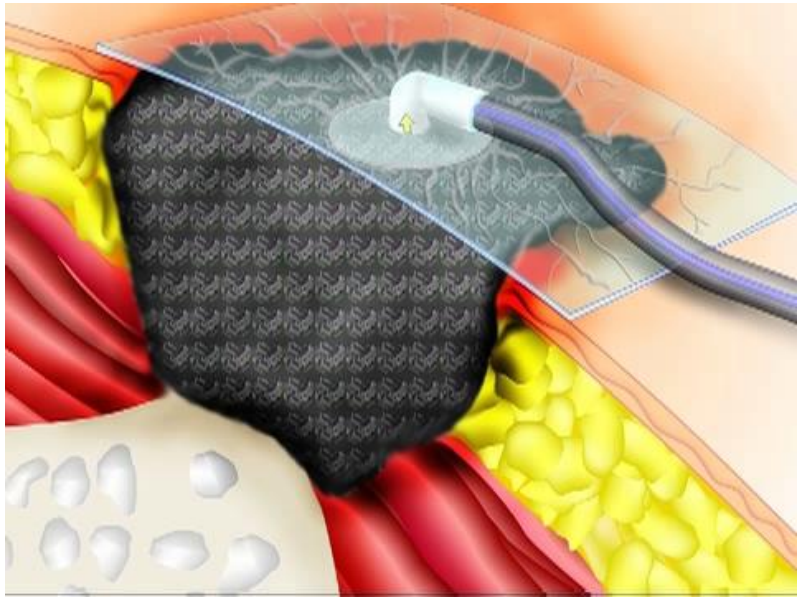


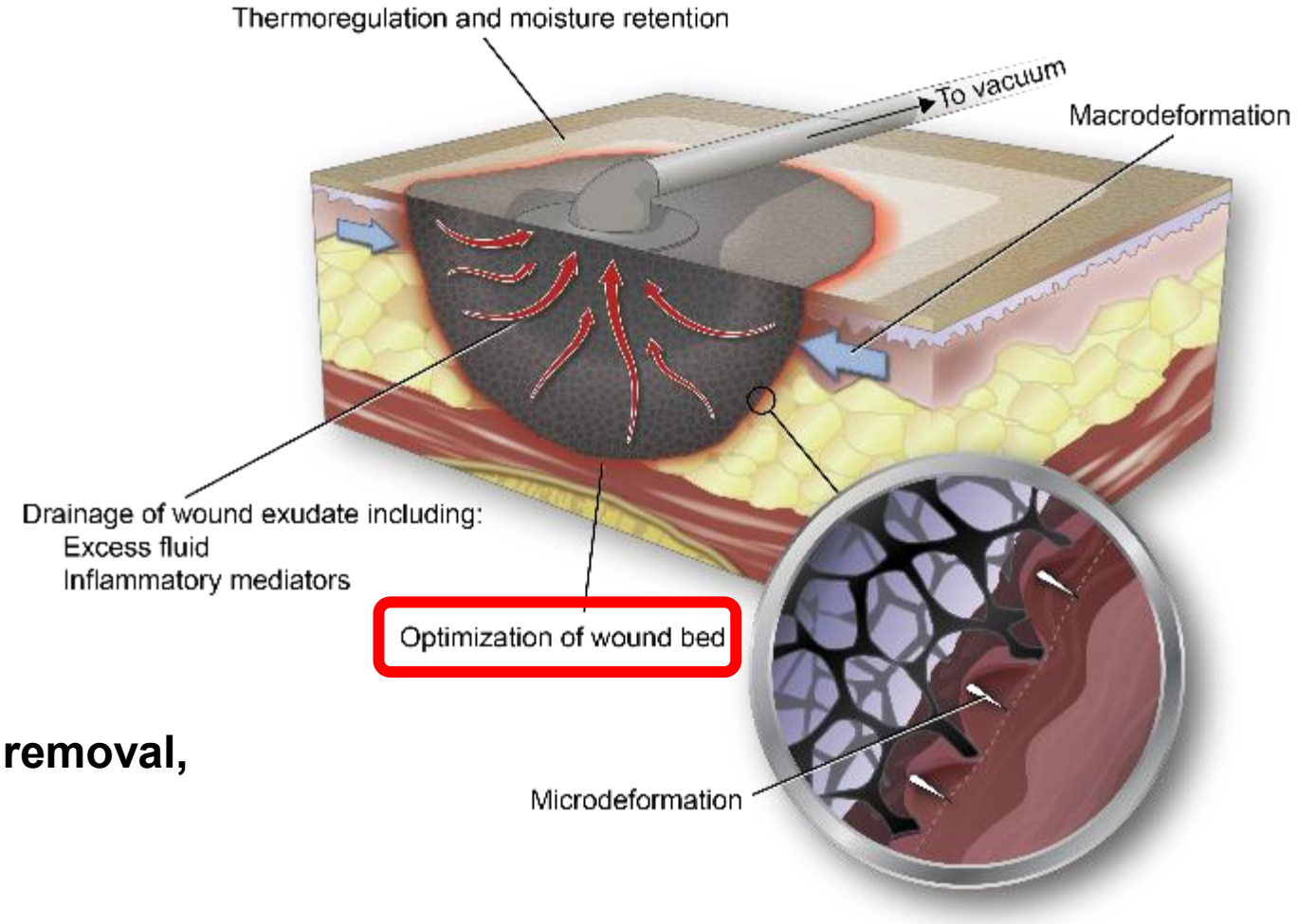
6yrs



3mos

NPWT Mechanism of Action





Macrodeformation, microdeformation, fluid removal, and alteration of the wound environment

Panayi AC, Leavitt T, Orgill DP. *World J Dermatol*. 2017;6(1):1-16.

Macrodeformation (Macrostrain)

- Wound contraction: Effects on bulk tissue
  - Dependent upon laxity or compliance of the tissue
  - Visible alteration of form or shape
  - When negative pressure contracts the foam, it draws the wound edges together and removes fluid





Borgquist O, et al. *Ann Plast Surg*. 2010;64(6)789-793.

Removal of Wound Exudate/Waste

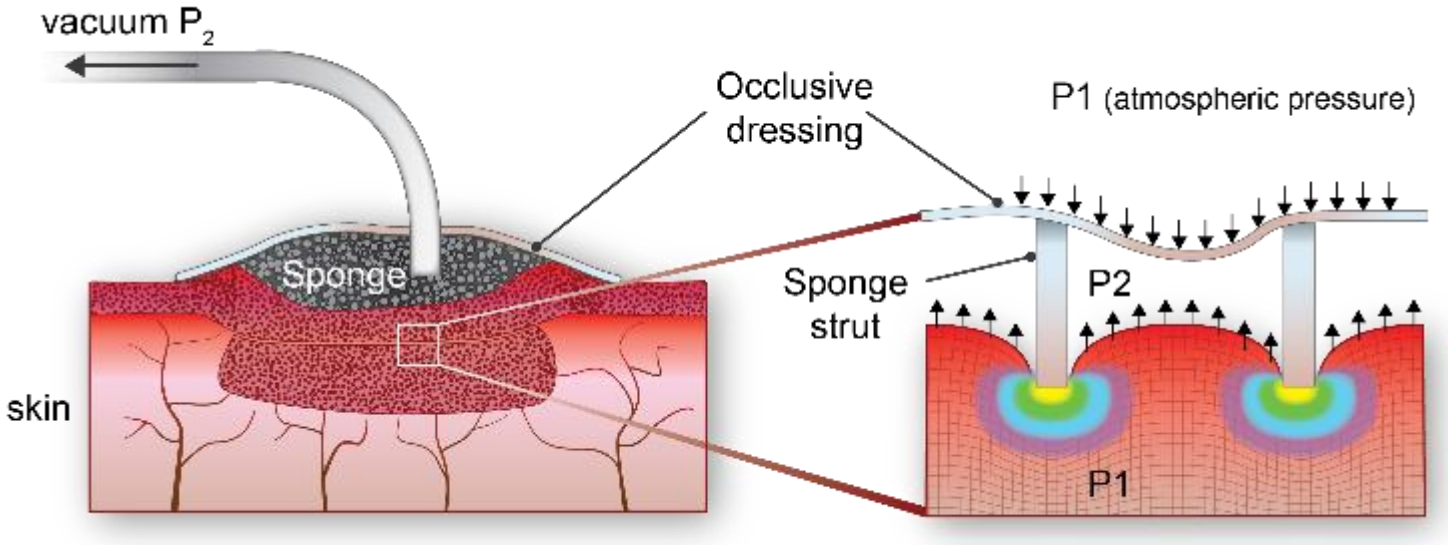
- Reduction in surface and surrounding tissue exudates
  - Reduced edema
- Benefit is in the suction, not just drainage removal
- Canister output may assist with evaluation of therapy

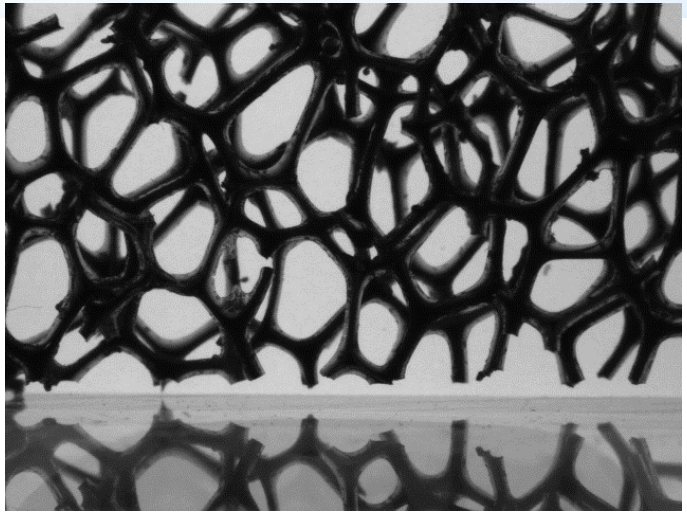


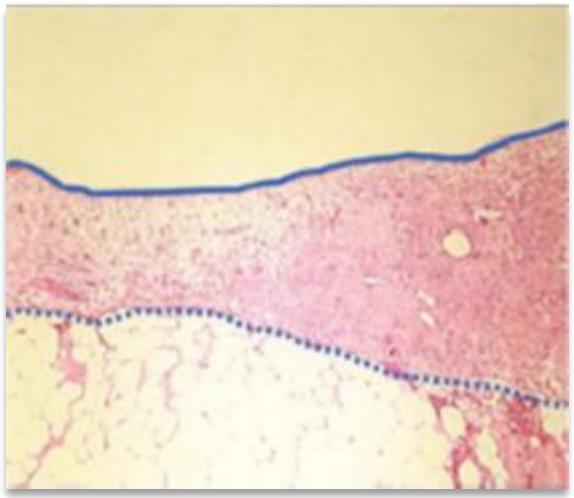


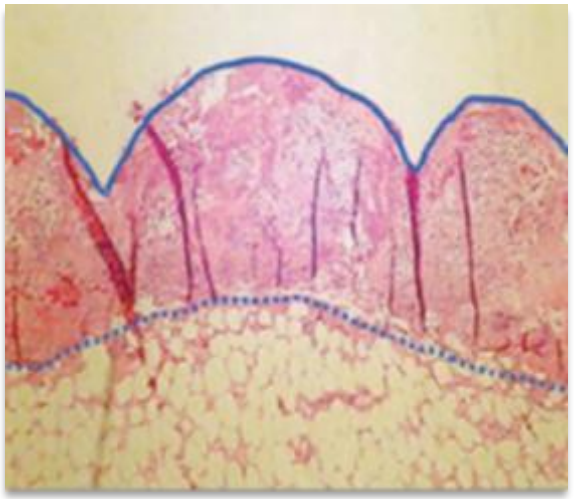
Morykwas MJ, et al. *Ann Plast Surg*. 1997;38:553-652. Ngo QD, et al. *Wound Repair Regen*. 2011;20(1):83-90.

Micromechanical Deformation









(Above, left) Schematic depiction of NPWT applied to a wound, covered with an occlusive dressing, and connected to a vacuum pump.

(Above, right) The finite element analysis model suggests that differences in pressures and a mismatch between the elasticity of the wound and the sponge struts result in microscopic wound undulations and strain.

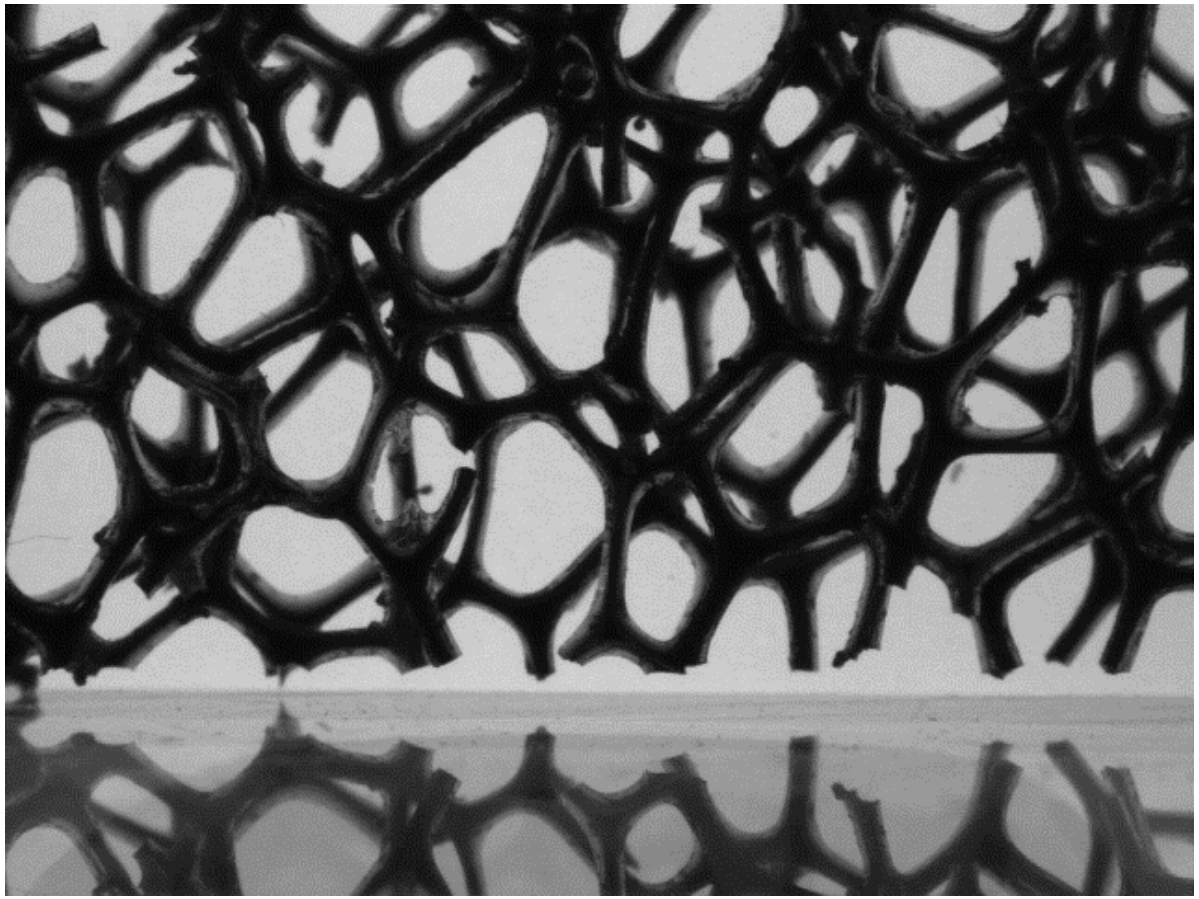
(Below, left) Histologic section of wound biopsy specimen at 7 days without the application of NPWT sponge.

(Below, right) Different area of same wound tissue after 7 days of NPWT application shows increased undulation and vascularity.

Wolters Kluwer. Copyright © 2018 American Society of Plastic Surgeons. Saxena V, et al. *Plast Reconstr Surg*. 2004;114(5):1086-1096.

NPWT with the 3M™ V.A.C.® Therapy System

- We all use it
- Studied across multiple care settings and wound types
- It does manage exudate well





Granulation Tissue: What Should We See?



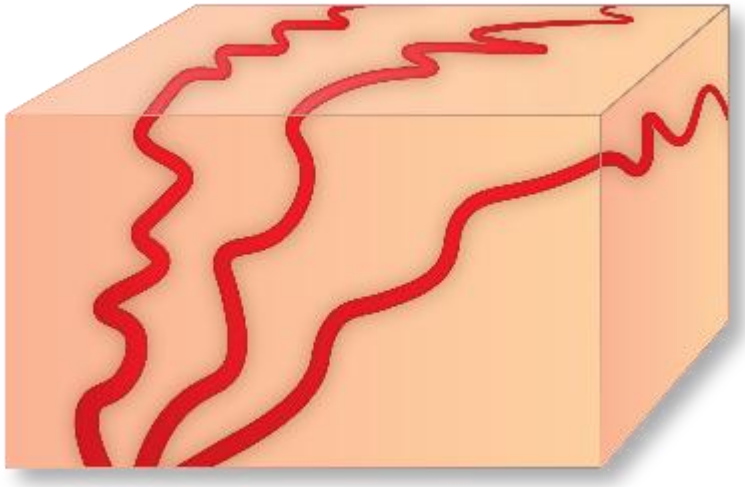






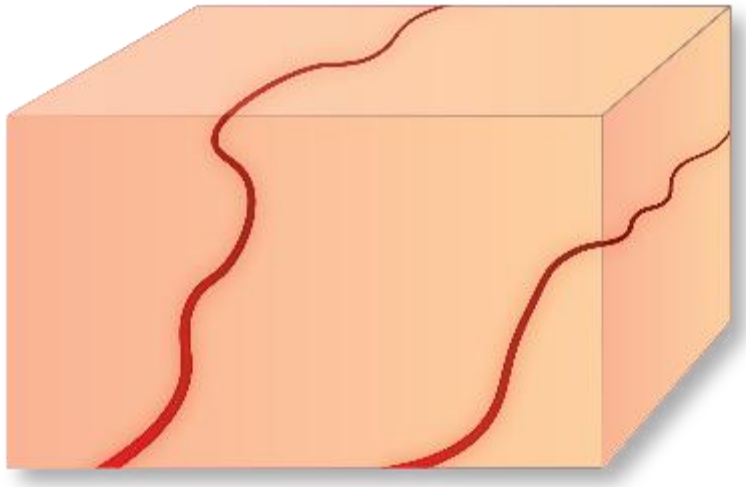
2 Weeks

Edema Reduction/Tissue Decompression



Normal Tissue

Tissue edema is at minimum, perfusion is ideal



Edematous Tissue

Tissue volume ↑, vascular density ↓, perfusion distance ↑, and blood flow decreases

Panayi AC, Leavitt T, Orgill DP. *World J Dermatol*. 2017;6(1):1-16.

It’s Become Routine Care

NPWT to prep wound (1mo)

NPWT 5 days post-graft

Graft at 11 days



Infected Diabetic Foot






- Inpatient admission for grossly infected foot secondary to plantar diabetic foot ulcer
- Surgical drain and washout of foot, leaving total of 3 wounds
- Surgeon recommending amputation
- Reluctantly agreed to let us try NPWT, applied in hospital on day of discharge

- Timeline uncertain; in WCC ultrasound debridement done
- Transitioned to portable system





WCC = wound care center.



7wks of portable NPWT, post-ultrasound debridement



8wks

3 Months



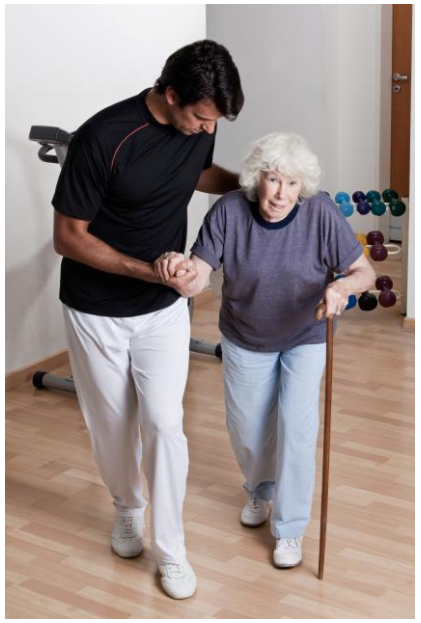


Life Goes On – Outpatients Have Other Needs

- Patients still need to work
- Mobility can be a concern
  - Weight of powered devices
  - Fall risk
- Privacy
- Sleep disturbance













Then Portable Became Wearable
“The Smartphone or Watch”











Single-Use NPWT

- Closed surgical incisions
- Small, low exudating wounds
- Ambulatory/working patients
- Compromised patients







Indications for Use

Single-use NPWT is indicated for

- Patients who would benefit from wound management via the application of negative pressure, particularly as the device may promote wound healing through the removal of excess exudate, infectious material, and tissue debris
- The removal of small amounts of exudate from
  - Chronic, acute, traumatic, sub-acute, and dehisced wounds
  - Ulcers (such as diabetic, venous, or pressure)
  - Surgically closed incisions, flaps, and grafts



Breast Pocket Wound

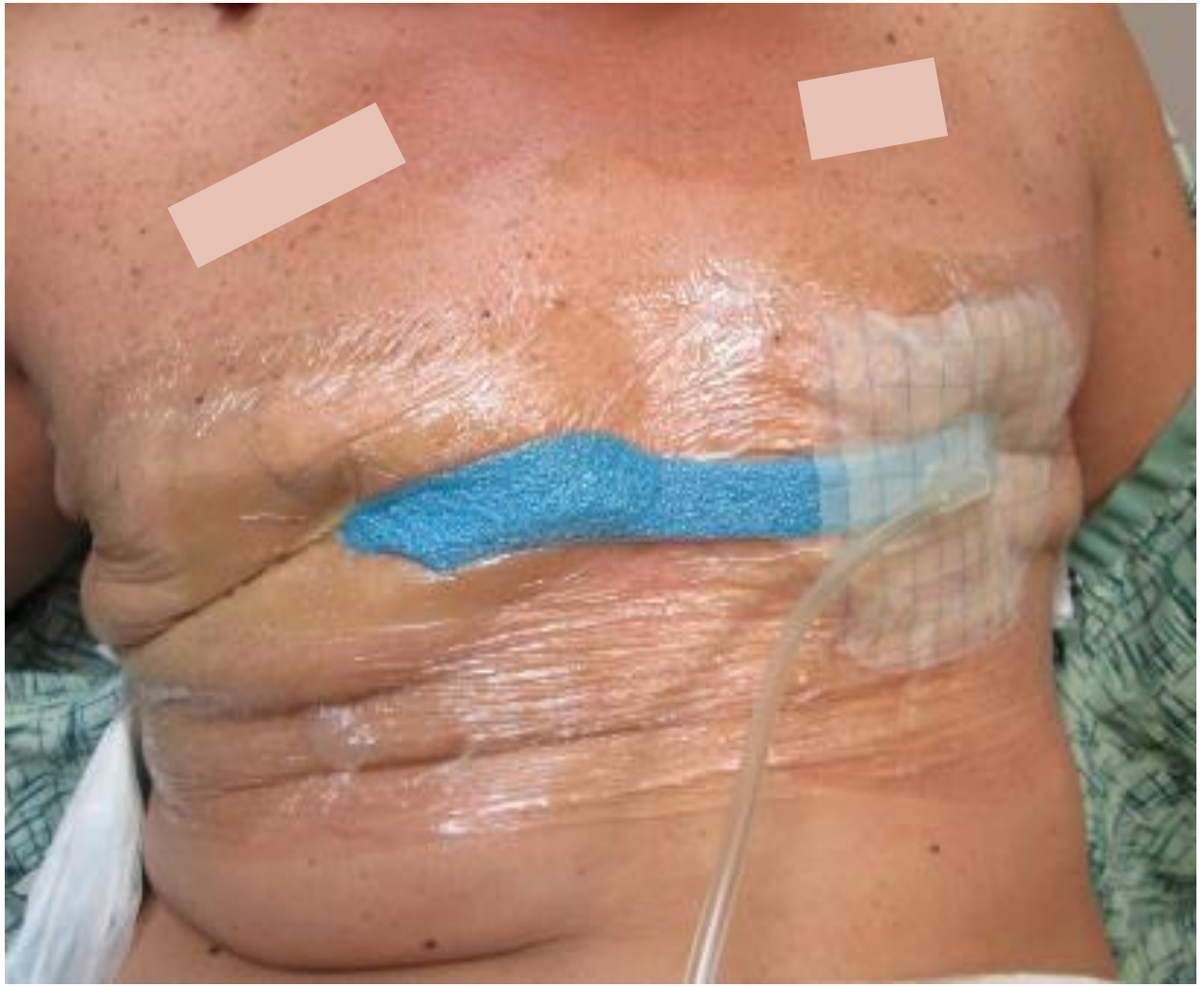
- 52yo Female, works in hotel industry
- No significant PMH but strong family history of breast cancer
- Positive biopsy, had bilateral mastectomies with implants
- Implants became infected and removed



PMH = past medical history.

Breast Pocket Wound

- Patient had returned to work in sales at hotel
- Uncomfortable with presence of powered system
- Exudate was minimal
- Able to change to MP-NPWT so that it would be hidden



MP-NPWT = mechanically-powered negative pressure wound therapy.

Breast Pocket Wound

- Closed after 6wks: 2wks powered, 3wks non-powered



Super-Mom

- 38yo Female, mother of 3
- Obese
- VERY familiar with NPWT
  - Had 2 C-sections with dehiscence that were managed with NPWT
- s/p pilonidal cyst excision
- No other health issues; significant sensitivity to most adhesives

s/p = status-post.

Super-Mom



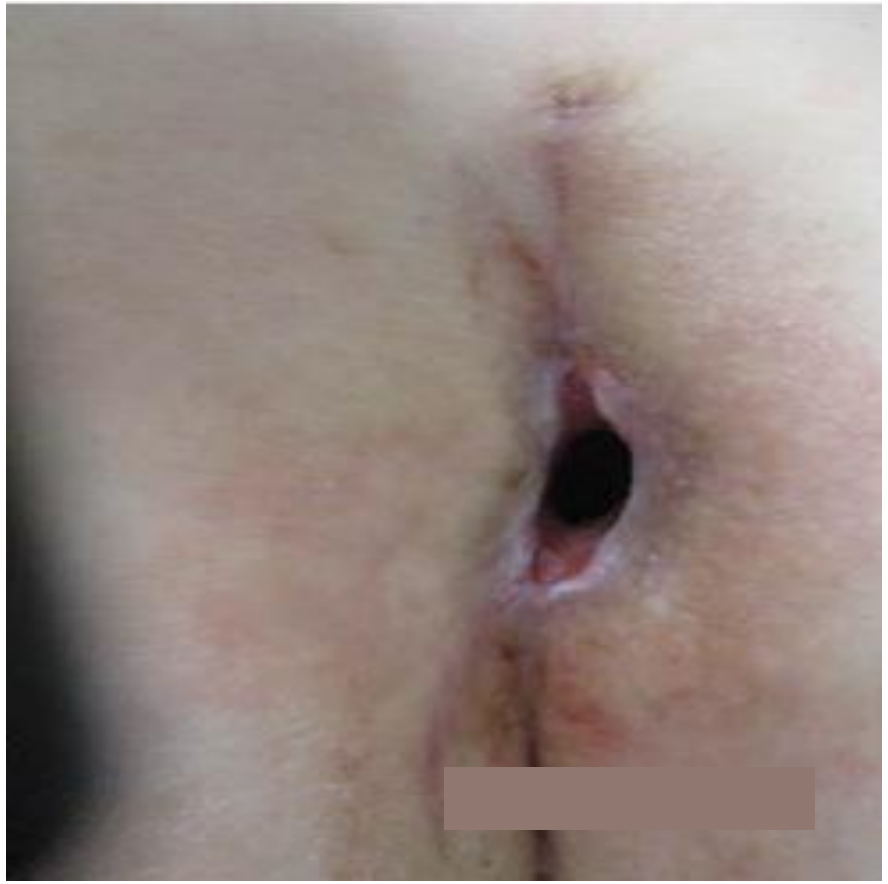
- Measurements: 2.5 x 0.6 x 7.0 cm
- Undermining 5 cm circumferentially
- PVA gelling fiber and superabsorbent foam



- 2wks later, measurements: 2.0 x 0.9 x 5.6 cm
- Undermining 6.1 cm circumferentially
- Began NPWT system

PVA = polyvinyl alcohol.

Super-Mom



- Day 12 NPWT
- 2.0 x 0.6 x 4.0 cm
- Undermining resolved



- 1.4 x 0.7 x 1.5 cm
- Day 42: Portable system discontinued, began MP-NPWT

Super-Mom



- Day 4 with MP-NPWT
- 0.8 x 0.5 x 1.1 cm



- Day 15, MP-NPWT
- 0.5 x 0.5 x 0.5 cm

Trauma/Hematoma/Ulceration: Lower Extremity

- 62yo Male
- PMH: Hypertension, type 2 diabetes (controlled)
- Works in appliance store
- Dishwasher dropped onto right lower leg
- Developed hematoma, went to ED initially
- Had used only antibiotic ointment to date



ED = emergency department.

Traumatic Lower Extremity Wound

- Initial visit
- Measurements: 7.5 x 3.0 x 0.4 cm (22.5 cm^2)
- Hematoma debrided
- Began antimicrobial foam with secondary foam dressing
- Powered NPWT ordered



Traumatic Lower Extremity Wound



Day 1, awaiting NPWT system



Day 4

Traumatic Lower Extremity Wound



Day 15



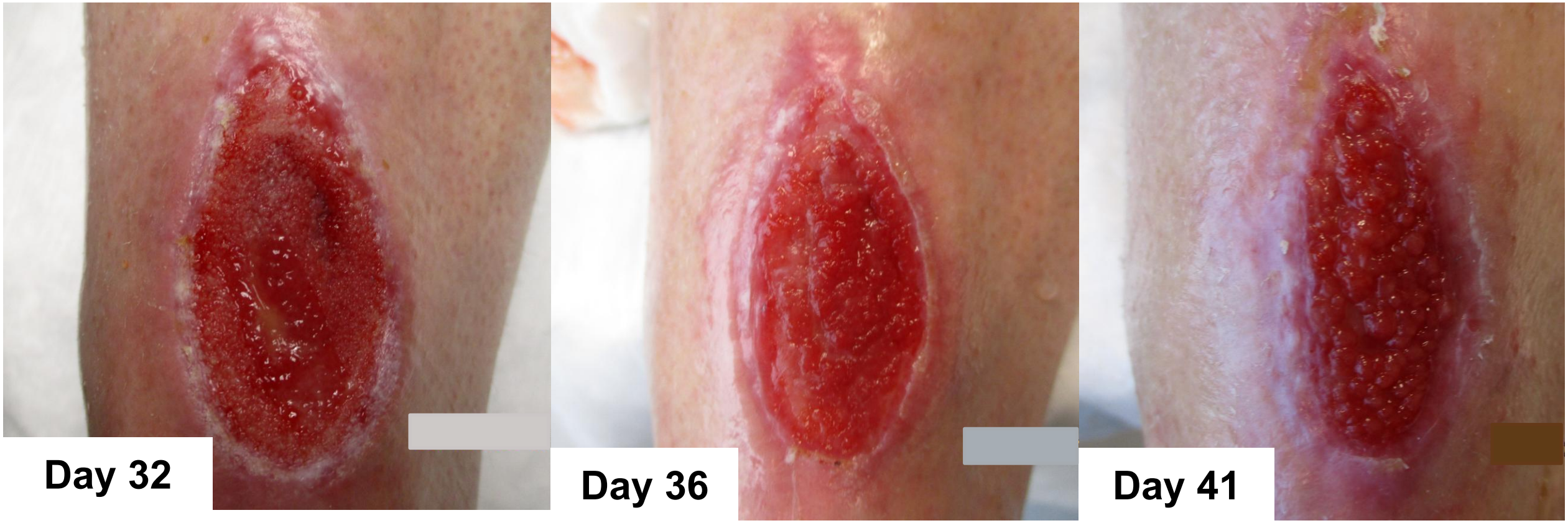


Day 32

Began portable NPWT system

Changed to MP-NPWT system

Traumatic Lower Extremity Wound

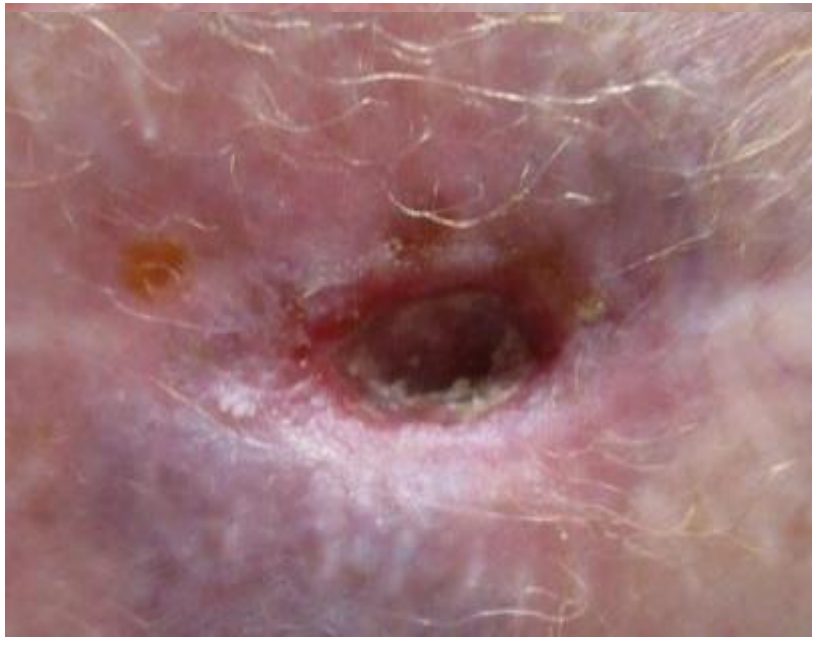


MP-NPWT stopped, returning to work

The Need to Manage Exudate

- 71yo
- Venous leg ulcer
- s/p fem/pop bypass
- Venous wound: No problem
  - Gelling fiber, foam, and 2-layer wrap
- Thigh wound with copious exudate, presumed lymphatic
- MP-NPWT x 3 changes, 6 days, exudate stopped





The Need to Manage Exudate

- 75yo Female, removal of lipoma resulting in lymph leak
- 2wks, MP-NPWT changed 4x
- Depth decreased from 2.5 cm to 0.6 cm
- Exudate from copious to minimal





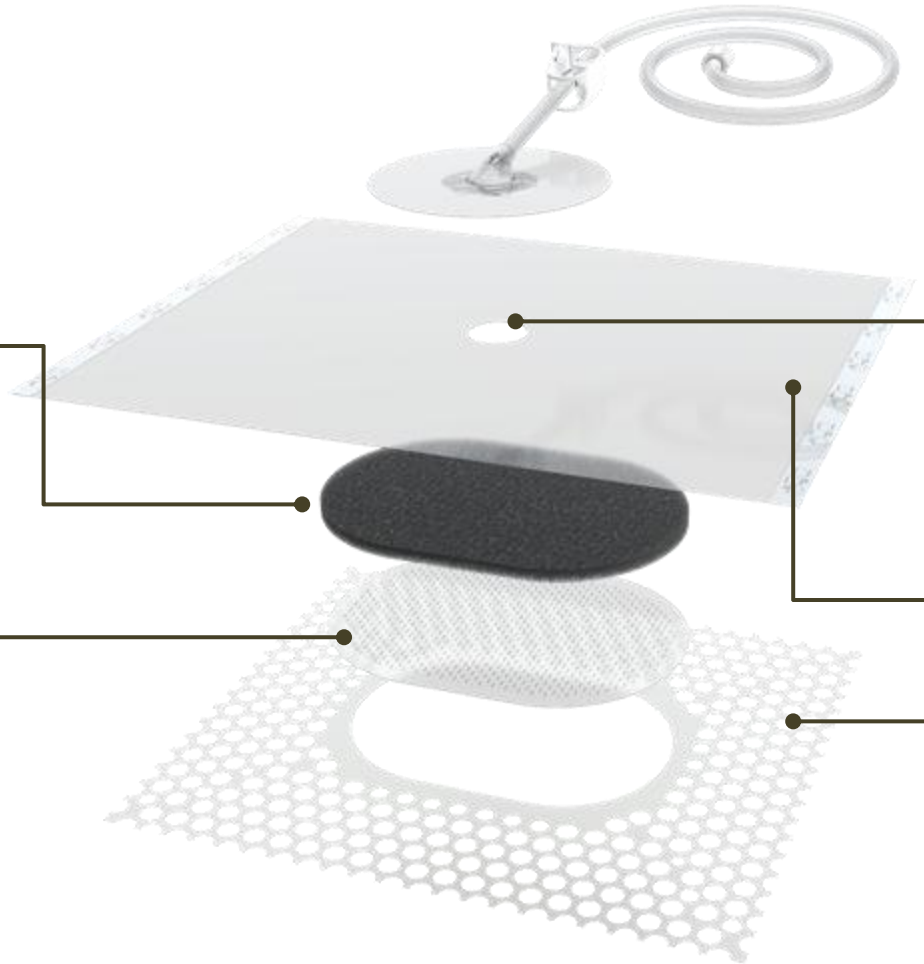
Clinical Pearls

- The choice to use NPWT is driven by the needs of the wound, not the size of the wound
- They aren’t “drainage” devices, they are “suction” devices; the magic is in the interaction with the wound bed and surrounding tissues
- Technology has made NPWT available for all sites of care
- Ambulatory/disposable devices improve quality of life

Peel and Place Dressing in NPWT

Kara Couch, MS, CRNP, CWCN-AP, FAAWC
Director of Wound Care Services, George Washington University Hospital
Associate Research Professor of Surgery, George Washington University School of Medicine and Health Sciences
President, Association for the Advancement of Wound Care
Washington, D.C.

All-in-One Design



Pad hole

Open-pore foam

Perforated non-adherent layer

Hybrid drape
(acrylic on top,
silicon adhesive on bottom)

The Bottom of the Dressing

The integrated perforated non-adherent layer was designed to

- Provide longer wear time (up to 7 days), due to reduced risk of tissue ingrowth
- Decrease foam adhesion to the wound bed
- Minimize disruption of the wound bed during dressing changes*
- When used in conjunction with NPWT, it allows for removal of exudate and infectious material
- Allows the dressing to extend onto intact periwound skin without the need to pre-drape



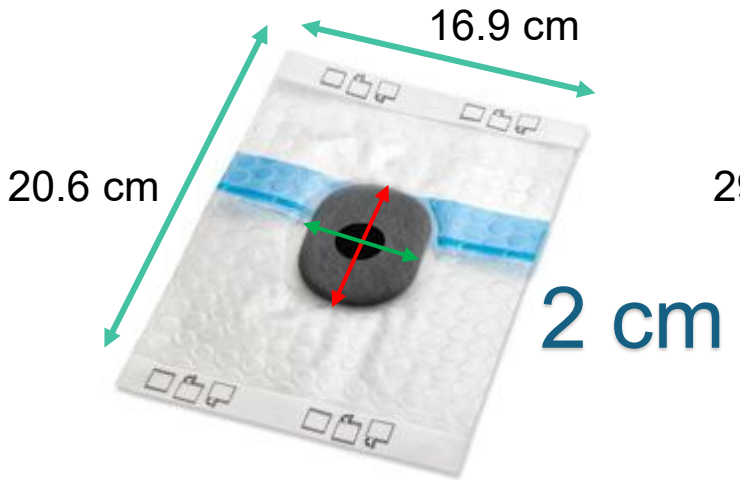
Example perforations circled in red

*Information contained within conducted animal studies has not been evaluated by the U.S. Food & Drug Administration.

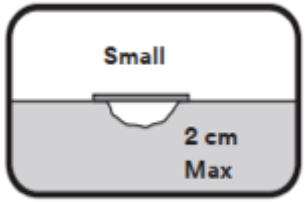
SAT-MTF-05-982101 Evaluation of 3M V.A.C.® Peel and Place Dressing Concepts in Full-Thickness Excisional Wounds. 2023. Allen D, et al. *Wound Repair Regen*. 2023;31:349-359. Allen D, et al. *Adv Wound Care (New Rochelle)*. 2024;13(6):291-307.

Peel and Place Dressing Sizes

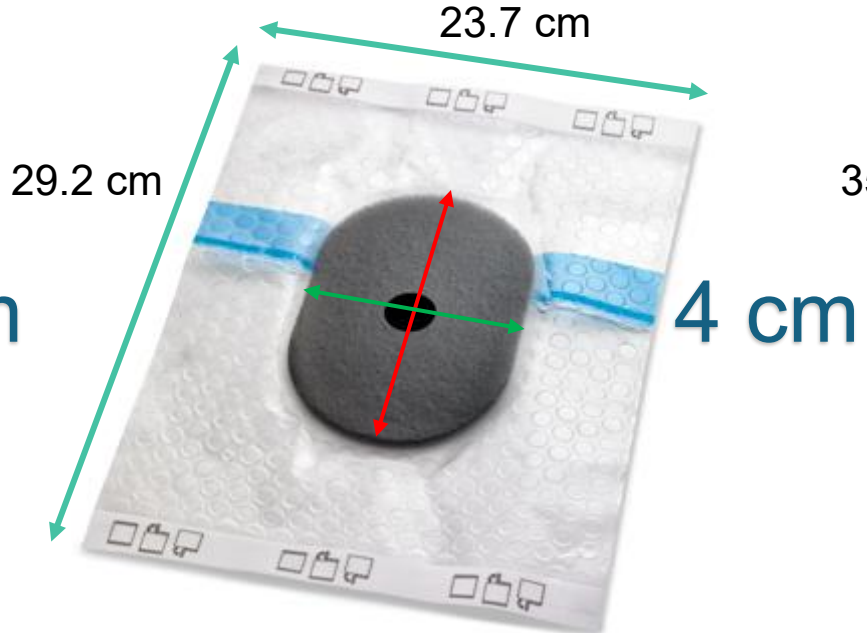
Small Dressing



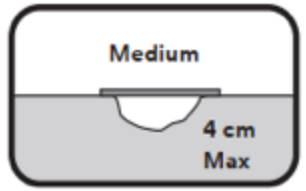
Foam size
- 8.6 cm
- 6.1 cm



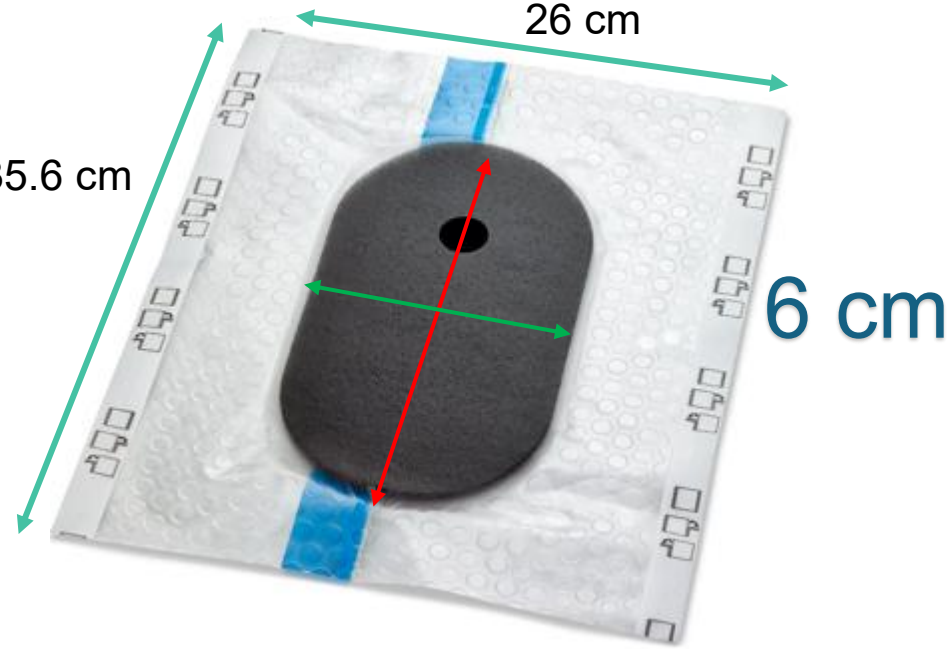
Medium Dressing



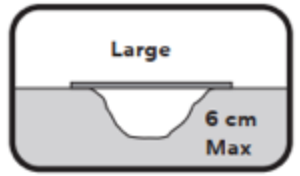
Foam size
- 16.6 cm
- 11.1 cm



Large Dressing



Foam Size
- 24.2 cm
- 13.6 cm



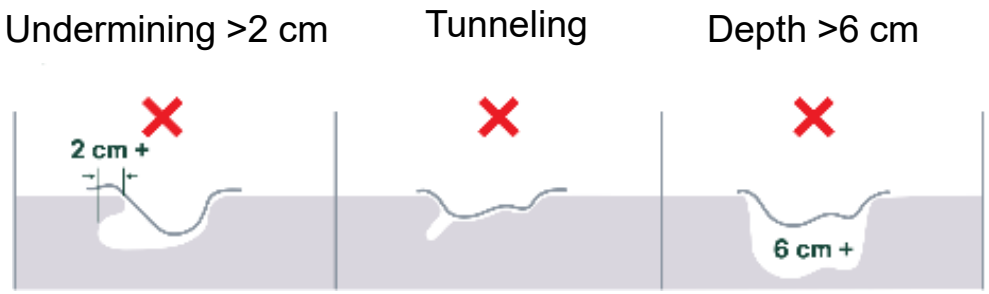
Integrated dressing oval has a thickness of **0.6 cm**

Considerations

Dressing should cover the entire wound bed and extend onto intact skin.



Undermining must be ≤2 cm, and no tunneling can be present.





Considerations

Drape tips

- Apply loosely over the wound area
- Leave ≥5 cm border of drape wherever possible
- Can reposition within 20min of initial application; repositioning not recommended if skin prep is used, as this may disrupt adherence
- For curved anatomy, slits may be cut in the drape portion of the dressing to help reduce overlap, drape folds, or remove wrinkles

Do not

- Cut foam
- If skin barrier/protectant is used under the adhesive portion of the dressing, do not reposition the dressing, as adhesive properties may be reduced
- Use with other NPWT dressing kits or foams, as they have a shorter indicated wear time
- Push foam portion of the dressing down; allow the dressing to draw down and conform to the wound bed as negative pressure is applied
- Stretch dressing



Application and Removal

PLACE



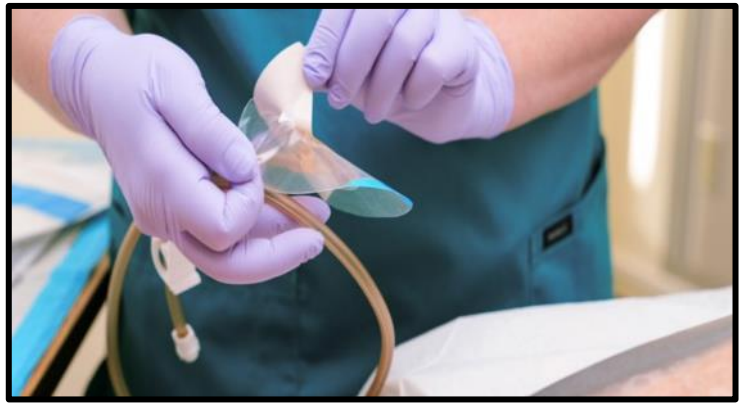
Place the peel and place dressing pad with the pre-cut hole facing up. Leave at least 5 cm of drape beyond the encased reticulated polyurethane foam dressing for sealing.

CHECK



Check the initial placement and reposition if needed. Once ready, smooth any wrinkles, press down on the drape border, and remove the handling bars to establish a seal.

CONNECT



Remove both backing layers. Center the peel and place dressing pad over the pre-cut hole and press it down gently onto the dressing. Connect tubing to the NPWT unit and begin therapy.

A minimum pressure of -75 mm Hg is recommended, **-75 to -150 mm Hg in continuous mode only.**

Removal

The integrated design of the peel and place dressing allows the dressing to be worn for **up to 7 days**.

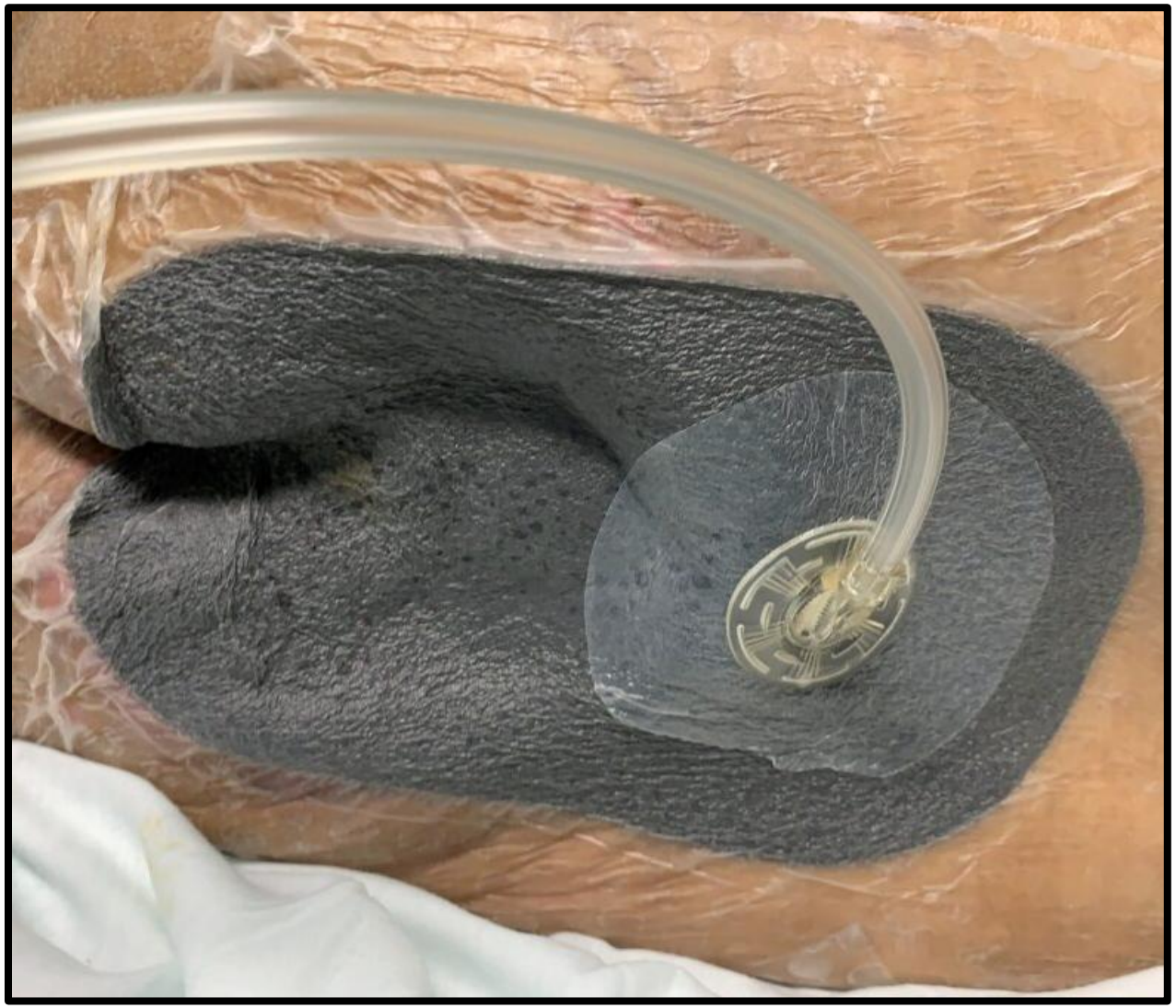
Conforming to the Wound Bed Surface Is Imperative

What it is

- For diffuse tissue engagement to occur, the dressing should conform to the interior contours of the wound

What to do

- Consider sizing up or another peel and place dressing for deeper wounds



Courtesy of Solventum, Chile CPE.

Peel and Place Dressing Is Indicated with Many Therapy Units

Acute care settings





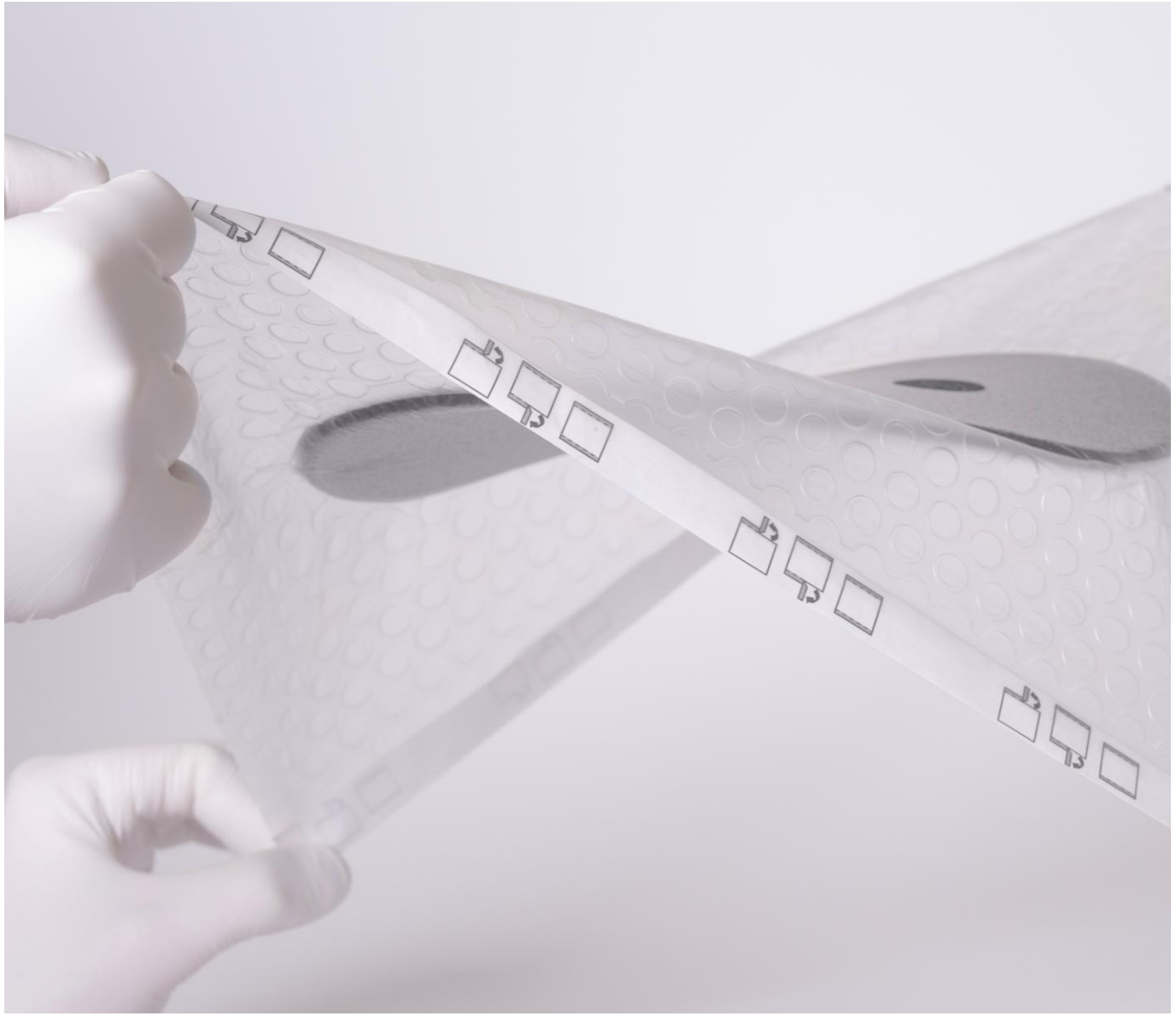
Out-of-Hospital care settings





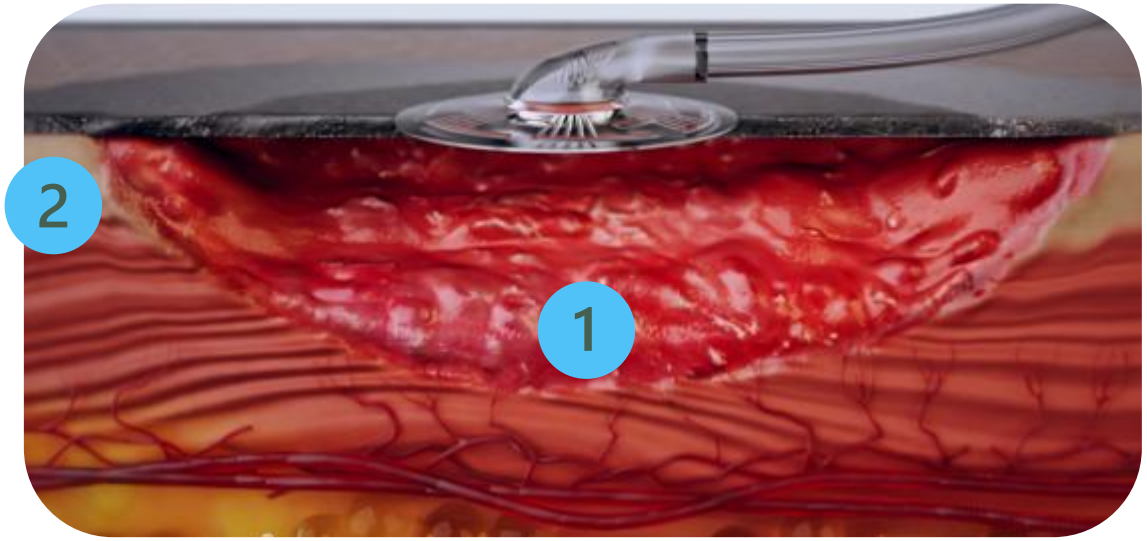


Mechanism of Action: What We Know

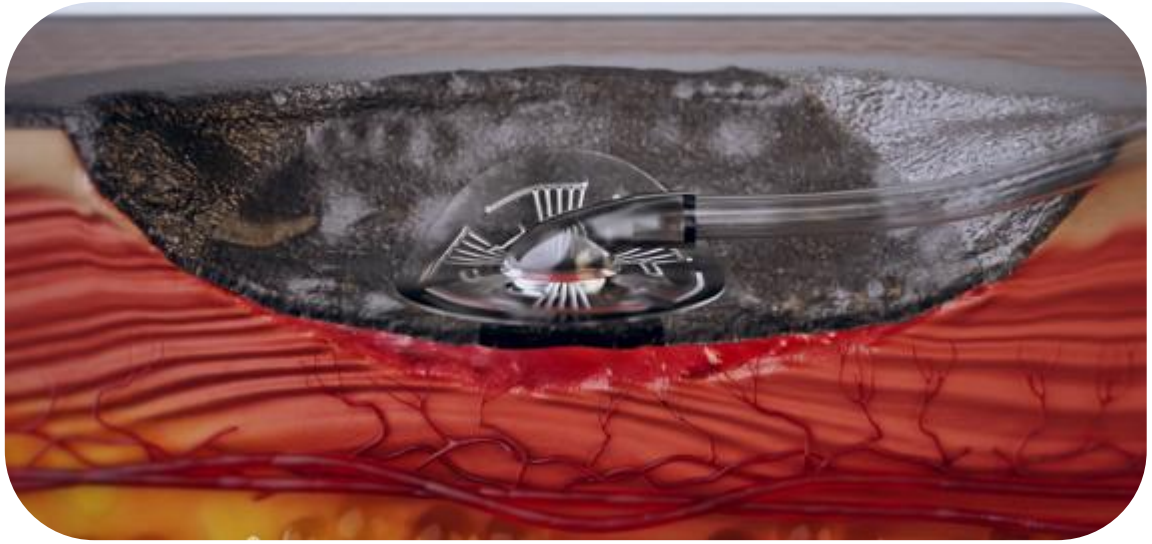


Peel and Place Dressing Draw Down

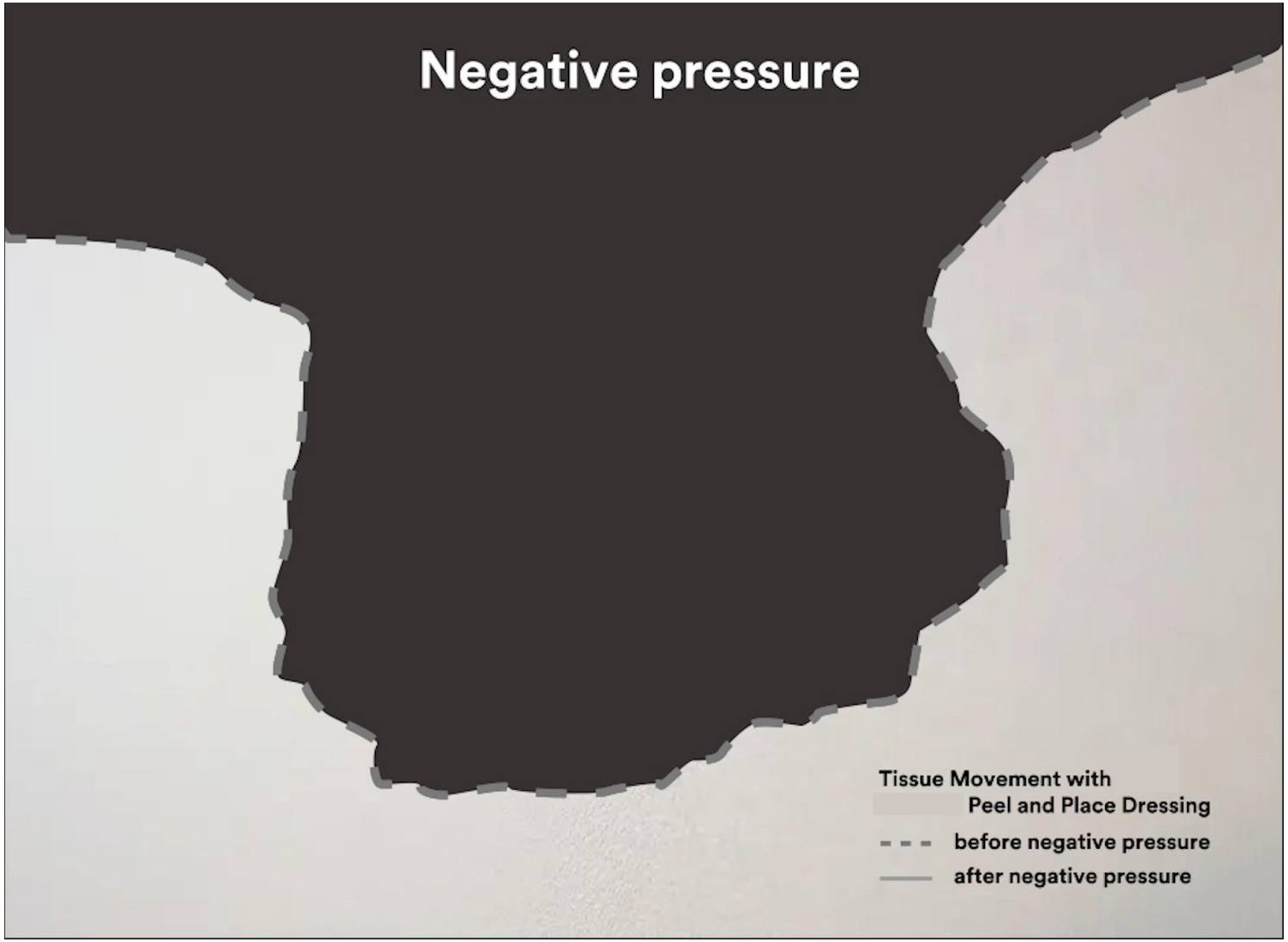
Before Negative Pressure



After Negative Pressure



Peel and Place Dressing Draw Down



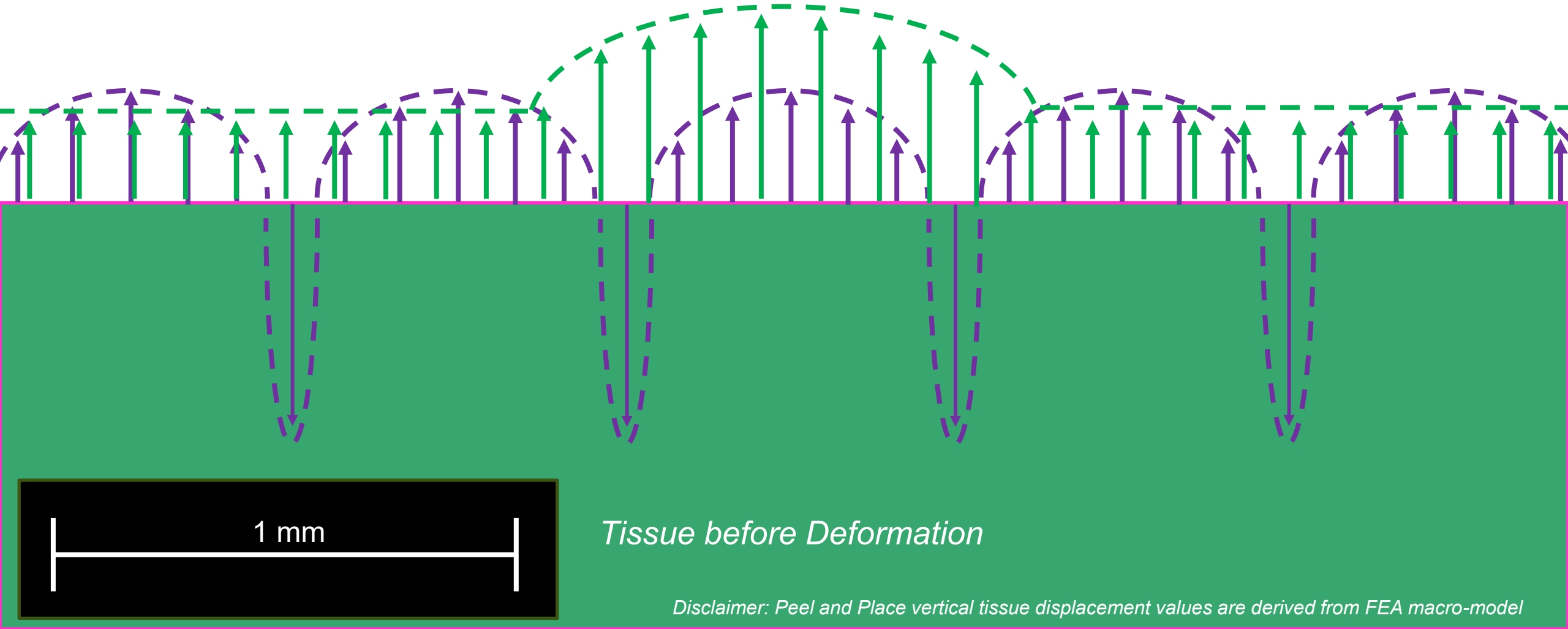
Hypothesized/Predicted Vertical Tissue Displacement Illustration

Tissue Surface Displacement w/ Reticulated Open-Cell Foam

- Heterogeneous with tensile **and** compressive strain zones

Tissue Surface Displacement w/ Peel and Place

- Homogeneous with predominantly **tensile** strain field
- **More** total cells stimulated



Disclaimer: Peel and Place vertical tissue displacement values are derived from FEA macro-model

Publication in the *Advances in Wound Care* Journal

This publication reports on

- The impact of the presence of fibrinous/proteinaceous material via longer in-life preclinical studies in a porcine model
- The evaluation of peel and place dressing up to wound closure

Preclinical Assessments of a Novel Peel and Place Extended-Wear Negative-Pressure Wound Therapy Dressing for up to 35 Days in a Porcine Model

Diwi Allen,* Samantha Mann, Timothy Robinson, Marisa Schmidt, and Kristine Kieswetter

Medical Solutions Division, 3M Health Care, San Antonio, Texas, USA.

Objective: While the use of negative pressure wound therapy (NPWT) with reticulated open cell foam (ROCF) is well established, the characteristics of ROCF do not allow for extended-wear use. There is the potential for dressing tissue ingrowth if left in place for greater than the recommended 2–3 days. An easy to use, novel peel and place dressing has been designed for extended wear with the wound management advantages of ROCF while alleviating the challenges of tissue ingrowth.
Approach: Paraspinal, full-thickness or deep muscle excisional wounds were created in 11 and 2 swine, respectively, dressings applied with continuous negative pressure at –125 mmHg, and dressings changed weekly. Full-thickness excisional wounds were treated for 13 days and deep muscle wounds for 35 days. Wound dimensions were assessed. Granulation tissue thickness and re-epithelialization were measured via digital morphometry. Tissue quality, fibrinous material prevalence, and dressing removal peel force were analyzed.
Results: The peel and place dressing substantially reduces dressing tissue ingrowth, is easy to remove with markedly low dressing peel force and promotes more granulation tissue at day 13 than ROCF with an interface layer. The extended-wear peel and place dressing, when applied to deep muscle wounds with weekly dressing changes, was applied for a total of 35 days. Successful wound closure was evident without any negative impact on wound healing.
Innovation: This study assessed the wound management capabilities of an extended-wear peel and place NPWT dressing used until wound closure.
Conclusion: The peel and place dressing is a suitable extended-wear NPWT dressing.

WHS Wound Healing Society

Open camera or QR reader and scan code to access this article and other resources online.



Diwi Allen, MS

Submitted for publication July 26, 2023. Accepted in revised form January 9, 2024.
*Correspondence: Medical Solutions Division, 3M Health Care, 6203 Farinon Dr., San Antonio, TX 78249, USA
(e-mail: dlallen@solventum.com).

Allen D, et al. *Adv Wound Care (New Rochelle).* 2024;13(6):291-307.

Prevalence of Proteinaceous Material Decreased over Time, and Healing Progressed to Wound Closure in 35-Day Study

Representative wound images



ROCF = reticulated open-cell foam; IFL = interface layer.

Allen D, et al. *Adv Wound Care (New Rochelle).* 2024;13(6):291-307.

Pro-Wound Healing Biomarkers

Comparable or elevated pro-wound healing biomarkers in wound beds treated with peel and place dressing vs traditional NPWT foam dressing after 7 days

Biomarker classification	Biomarker	Effect on healing	Prevalence compared to traditional NPWT foam dressing
Growth factor proteins	Fibroblast growth factor-2 (**FGF-2**)	Promotes good tissue quality wound fill with its role in granulation tissue formation and angiogenesis	●
	Platelet-derived growth factor-AB/BB (**PDGF-AA/BB**)	Promotes deposition of granulation tissue by inducing fibroblast proliferation and collagen production	●
Immune system-related proteins	Interleukin-1 receptor antagonist (**IL-1ra**)	Helps ensure wound healing progression as an anti-inflammatory protein	●

● Elevated ● Comparable

Le TM, et al. *PLoS One*. 2019;14(2):e0208658. Yadav JP, et al. *Obes Med*. 2024;47:100535. Macleod T, et al. *Front Immunol*. 2021;12:808012..

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations (2026)

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Michael N. Desvigne, MD, CWS; Misael C. Alonso, MD, CWSP; Kara Couch, MS, CRNP, CWCN-AP; Emily Greenstein, APRN, CNP, CWON; Robert Klein, DPM, CWS; Catherine Milne, APRN, MSN, ANP, CWOCN-AP; Ralph J. Napolitano, Jr, DPM, CWSP; and Dot Weir, RN, CWON, CWS

Background

A new dressing configuration combining reticulated open-cell foam dressing, perforated non-adherent contact layer, and acrylic-silicone hybrid drape has recently become available for use with negative pressure wound therapy (NPWT). A panel meeting was held to develop best practice recommendations for this therapy combination.

Purpose

To develop expert consensus-based best practice recommendations for the use of a new all-in-one NPWT dressing that combines reticulated open-cell foam, a non-adherent contact layer, and a hybrid acrylic-silicone drape, due to limited published clinical evidence.

Study Design

Expert panel meeting

Objectives

- Identify appropriate patient candidates
- Define suitable wound types and care settings
- Recommend therapy parameters and dressing change frequency
- Establish application techniques and contraindications
- Provide preliminary clinical guidance until more evidence becomes available

Methods

- Expert panel meeting held September 3, 2025, in Las Vegas, Nevada
- Participants: 8 wound care experts, including: Certified wound care nurse (1), Nurse practitioners (3), Podiatrists (2), Plastic and reconstructive surgeon (1), Internal medicine physician (1)
- Recommendations were developed through open discussion and consensus rather than a formal Delphi process

Desvigne MN, et al. *Wounds*. 2026;38(8):218-223.

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Recommended Wound Types

Patient Population

Suitable for patients

- Bridging to wound closure
- Transitioning from inpatient to outpatient care
- Experiencing pain with traditional NPWT dressing changes
- Able to adhere to treatment plans

Recommended Care Setting

- Acute care hospitals
- Skilled nursing facilities
- Rehabilitation facilities
- Outpatient clinics
- Physician offices
- Home health settings



Desvigne MN, et al. *Wounds*. 2026;38(8):218-223.

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Recommended Wound Types

Chronic Wounds



Acute and Traumatic Wounds





Subacute/Dehisced



Partial-Thickness Burns



Diabetic Ulcers



Pressure Ulcers



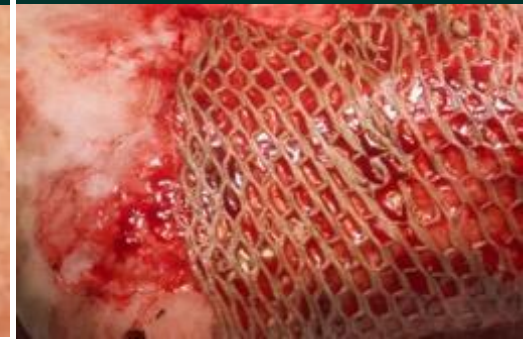
Venous Ulcers



Flaps



Grafts and/or Donor Sites



Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Therapy Settings and Dressing Changes

Recommended Negative Pressure

Standard: **-125 mm Hg continuous**

Up to -150 mm Hg for

- Larger wounds
- Highly exudative wounds
- Clinician discretion cases

Dressing Changes

Routine: Every 5-7 days

Highly exudative wounds: Every 3-4 days

Desvigne MN, et al. *Wounds*. 2026;38(8):218-223.

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Contraindications

The panel recommended against use in

- Untreated osteomyelitis
- Untreated malignancy
- Active abscess
- Inadequate hemostasis
- Non-enteric or unexplored fistulas
- Necrotic tissue with eschar
- Wounds deeper than 6 cm
- ≥2 cm undermining
- Tunneling wounds
- Situations where offloading cannot be achieved
- Patients unable to adhere to the treatment plan
- Exposed blood vessels, organs, or nerves; anastomotic sites
- Wound area larger than the largest dressing size

Desvigne MN, et al. *Wounds*. 2026;38(8):218-223.

Negative Pressure Wound Therapy with All-in-One Dressing: Best Practice Recommendations

Application Best Practices



Press dressing into place during application.



Avoid stretching the drape. Lay, don't pull or place drape passively.



Use hydrocolloid rings/dressings around toes to maintain seal integrity.



Use larger dressings when bridging is required.



Offset the sensor pad from the wound bed to minimize tissue deformation.



For hyperhydration/periwound moisture

- Wipe excess moisture with dry gauze
- Increase pressure if clinically appropriate
- Change dressings more frequently

Conclusions

The expert panel recommends NPWT with the all-in-one dressing for a broad range of acute and chronic wounds, including partial-thickness burns, ulcers, grafts, flaps, donor sites, and dehisced wounds. Standard therapy should typically be delivered at -125 mm Hg continuously with dressing changes every 5-7 days. Appropriate patient selection, awareness of contraindications, and adherence to application techniques are critical for optimal outcomes. These recommendations are intended as initial guidance and should evolve as additional clinical evidence emerges.

Desvigne MN, et al. *Wounds*. 2026;38(8):218-223.

Peel and Place Dressing Is Not for Every Wound

- **Select the right wounds for initial placements to maximize success**
- If the wound is a clinical challenge for traditional NPWT, it won't be a good first placement for peel and place dressing

Most Ideal Wounds for Initial Dressing Placements



Grafts

Why:

Time savings, including reduced OR time, and fewer supplies needed.



Dehisced Surgical wounds

Why:

If only part of the wound is dehisced, can easily cover and treat the whole incision.



Less complex wounds

Why:

Help ensure success, not your train wrecks or super complicated placements.



Multiple wounds

Why:

Even greater efficiency—dressing can be placed over intact skin between wounds.



Wound clinic patients that can't get home health

Why:

Patients can follow up in WCC weekly.



Irregular shapes

Why:

Can be placed over intact skin. No need to cut, big time savings.

Less than Ideal Wounds for Initial Dressing Placements



High exudate in dependent position

Why:

Exudate sometimes pools and may cause maceration on the skin.



Skinny and deep

Why:

Dressing is unable to conform to the bottom of the wound bed and can result in exudate pooling.



Active bleeding or lack hemostasis

Why:

All peel and place dressings require hemostasis to be achieved and may cause blockage.



DFU with inadequate offloading

Why:

Exudate is squeezed out of the tissue and may over-wet or macerate the peri-wound skin. Examples: bedrest, scooters, etc.



Pressure injury with inadequate offloading

Why:

Source of the injury is not addressed, so wound is not likely to progress. Examples: turning, positioning, padding, etc.



Wounds receiving compression

Why:

Not indicated together. Compression may lead to reduced exudate removal and maceration, or a pressure point.

Case #1

70yo Female with dehisced abdominal wound after reversal of colostomy, lysis of adhesions, and exploratory laparotomy

Was on traditional NPWT therapy for approximately 3 days

Large peel and place dressing applied across 3 open abdominal wounds

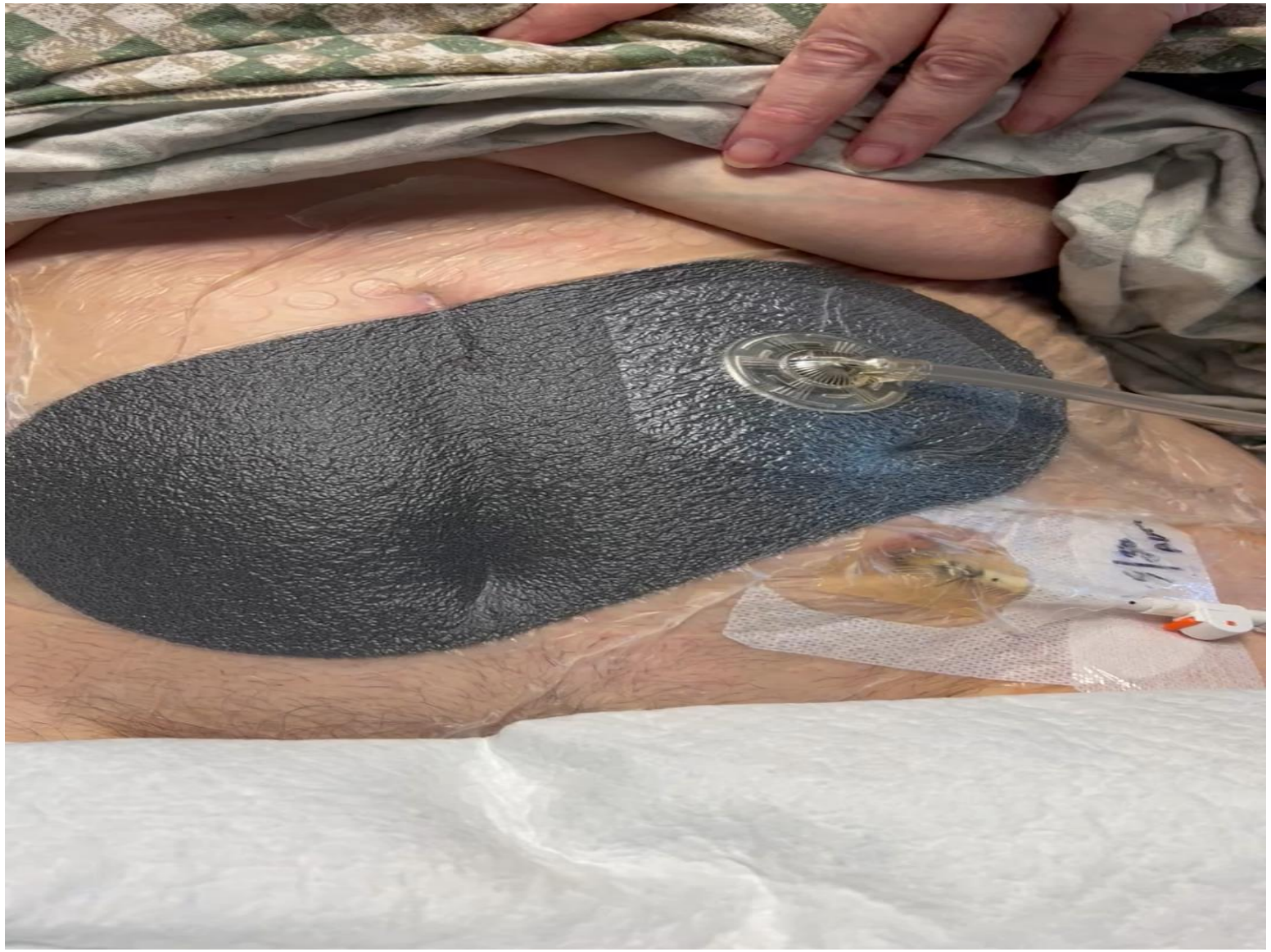
LLQ drain was in NPWT field

LLQ = left lower quadrant.

Initial Application: Size Large Dressing







Second Application: 5 Days Later







Second Clinic Visit: 12 Days Total with Peel and Place Dressing







Pyoderma Gangrenosum with Open Trans-Tibial Amputation







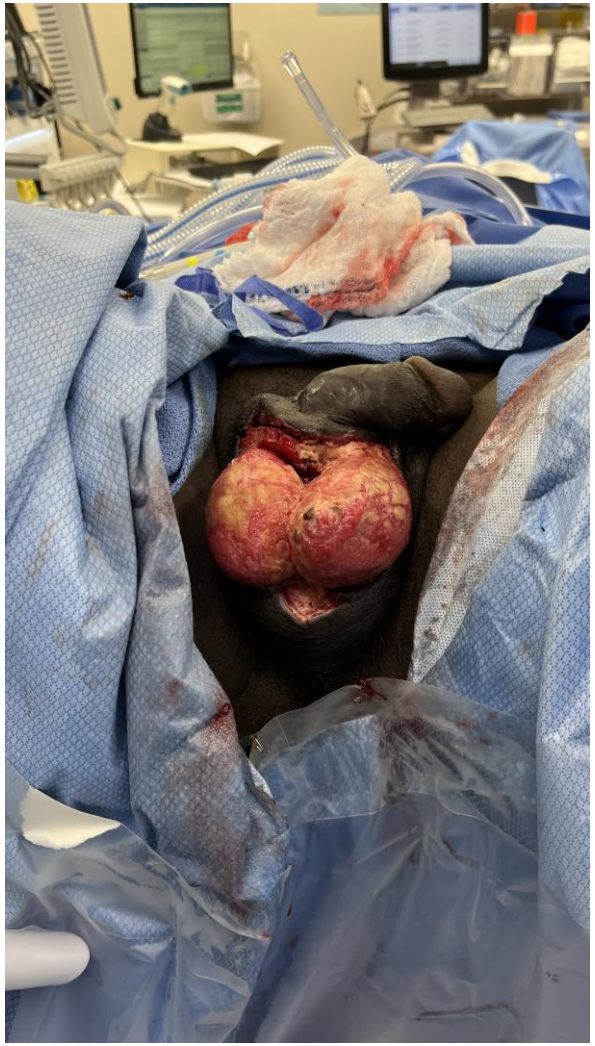


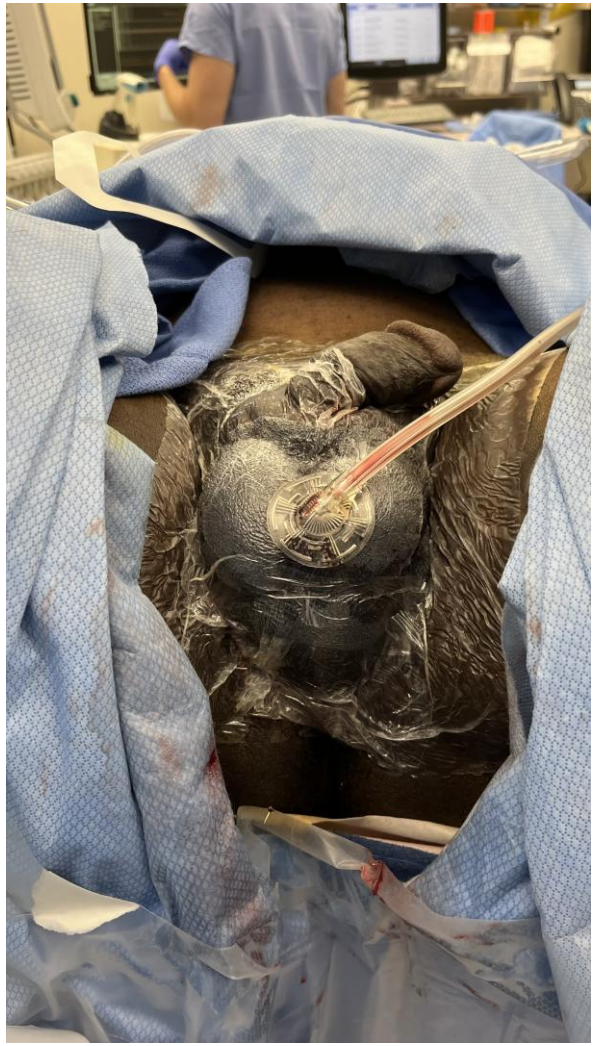
3 Weeks + 3 Changes of a Large Peel and Place Dressing

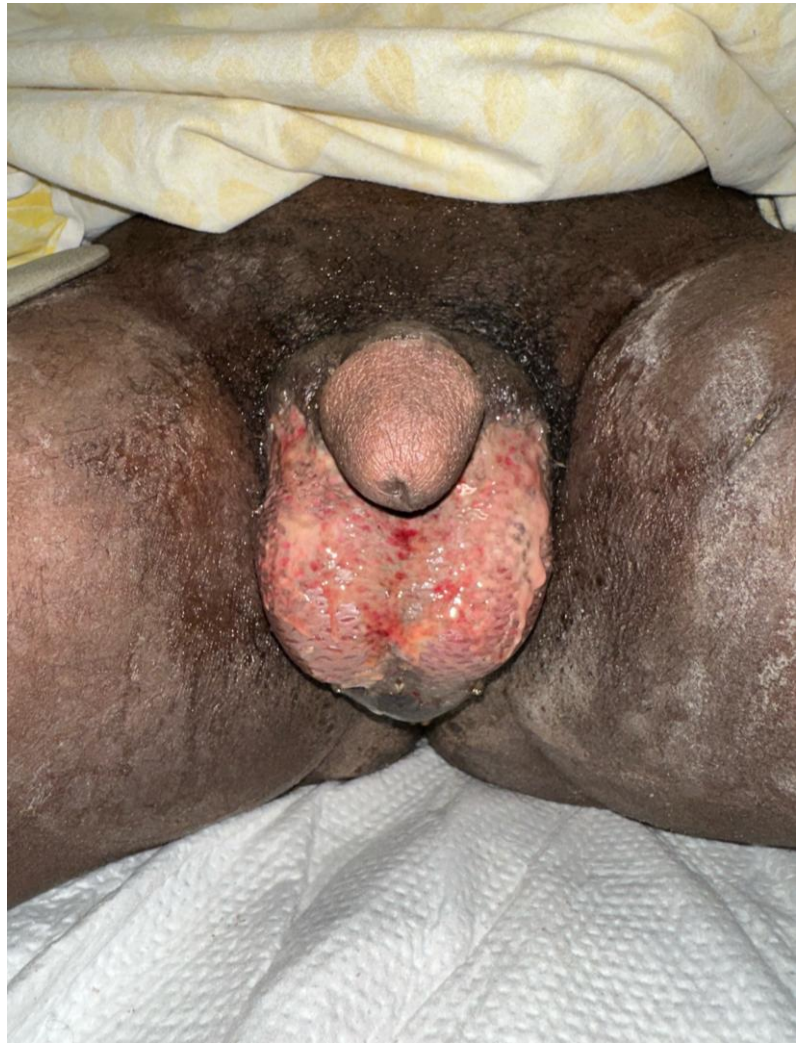




4 Days Post-STSG: Fournier's Gangrene







STSG = split-thickness skin graft.

Hidradenitis Resection prior to STSG







STSG Donor Site: POD5 vs POD12



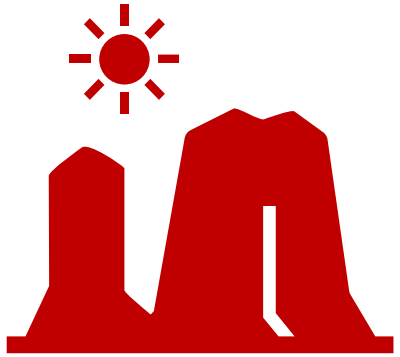


POD = post-operative day.

Initial Peel and Place Case



Lessons Learned



Skinny and Deep Don’t Work

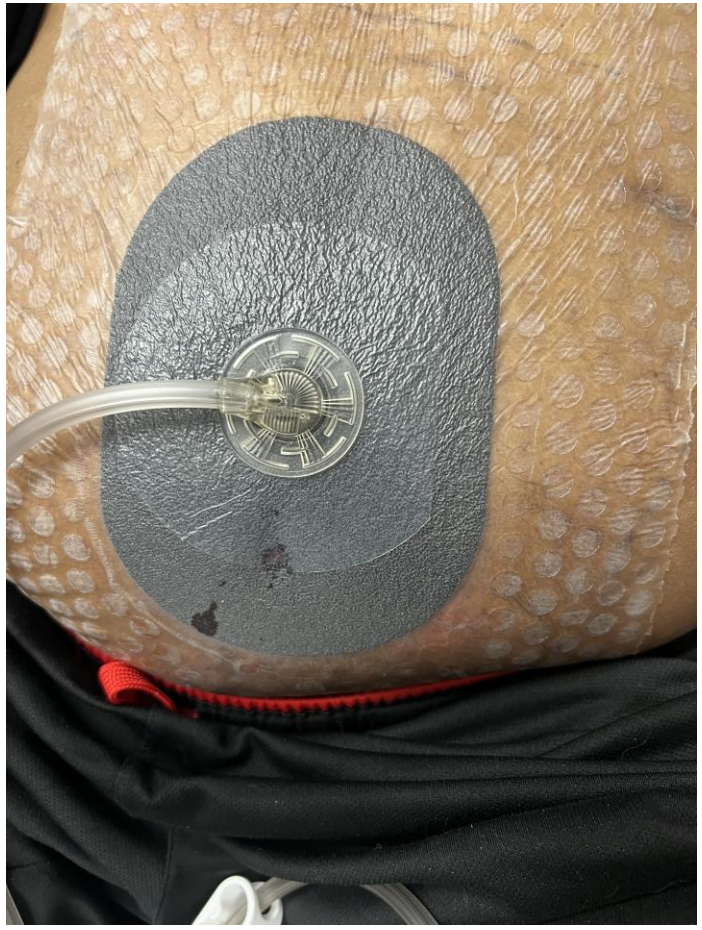




One Week Later







Abscess Walled Off...





Caution



Anticoagulants



“Oozy” patients







Beware the Bleeders!





Not Great





Recommendations to the Team

Is home health involved?

Does the clinic staff know how to use PnP?

Monitor for challenging cases

What's the backup plan?

Does your ED know about PnP?

PnP = peel and place dressing.

Surgical Site Infections

Megan Oltmann, DPM, FACFAS
Assistant Professor of Orthopedic Surgery, Case Western Reserve University SOM
Head of Podiatric Surgery and Wound Care, Lorraine and Bill Dodero Limb Preservation Center, University Hospitals
Cleveland, OH

Surgical Site Infections (SSIs)

- Infections that occur at the incision site within 30 days of a surgery, or within 1yr when an implant is involved

SSI = surgical site infection.

Giacometti A, et al. *J Clin Microbiol*. 2000;38:918-922.

The Surgical Site Complication Cascade



Incision



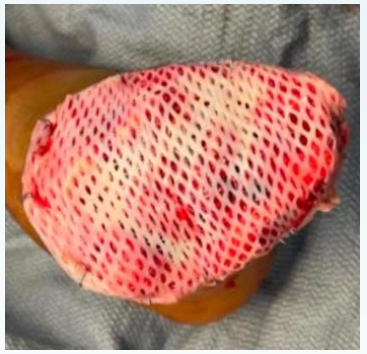
Dehiscence



Infection



Readmission



Reoperation



Delayed Rehabilitation

Surgical Site Infections

- Infections within 30 days of a surgery, or within 1yr when an implant is involved
  - Based on location and depth of infection
- Superficial SSIs
  - MC type, 50% of SSI, confined to skin and adjacent subcutaneous tissue
    - Purulence
    - Organism isolated from surgical site
    - Clinical diagnosis of SSI by the surgeon
    - Intentional incision of wound, accompanied by one of the following: Edema, erythema, pain, or warmth

MC = modic change.

Rezaei AR, et al. *J Trauma Inj*. 2025;38(2):71-81. Giacometti A, et al. *J Clin Microbiol*. 2000;38:918-922. Long DR, et al. *Anesthesiology*. 2022;137:252-262.

Surgical Site Infections

- Deep SSIs
  - Tissues beneath incision
  - Affects muscles and fascia surrounding surgical site
  - Requires more extensive treatment
- Organ/Space SSIs
  - Least common, most severe
  - Affect organs or spaces between organs
  - Purulent discharge from a drain
  - Abscess formation
  - Life-threatening



Long DR, et al. *Anesthesiology*. 2022;137:252-262.

Risk Factors for SSIs and Delayed Healing

Patient-related risk factors

- Age >65
- Immunocompromised
- Smoking
- Obesity
- Diabetes
- Malnutrition
- Hypovolemia
- Steroid use
- Previous infections
- Prolonged pre-op hospital stay
- Poor pre-operative skin antisepsis

Procedure-related

- Surgery type
- Duration of surgery
- Open surgery
- Use of drains
- Foreign material
- Improper hair removal
- Hypothermia
- Abnormal fluid collection
  - Hematoma
  - Seroma

External factors

- Contamination
  - Equipment
  - Site
  - Personnel
- Sharpness of surgical instruments
- Inadequate ventilation
- Increased OR traffic

OR = operating room.

Dancer SJ, et al. *J Hosp Infect*. 2012;81:231-238. Rezaei AR, et al. *J Trauma Inj*. 2025;38(2):71-81. Baviskar AS, et al. *Int J Crit Illn Inj Sci*. 2019;9:16-20.

Surgical Site Infections

- 1-30%, depending on procedure and patient-related factors
- 21.8% of healthcare-associated infections (HAIs)
  - A leading cause of unplanned hospital readmission
  - Of the top 5 HAIs, SSI compromises 33.7%
- Higher rates in lower- to middle-income countries
- Growing antimicrobial resistance further complicates management
- Higher risk of ICU admission
- Increased mortality risks: 2-11x greater risk
- Other common complications include dehiscence, hematoma, and seroma formation

HAI = healthcare-associated infection; ICU = intensive care unit.

Rezaei AR, et al. *J Trauma Inj*. 2025;38(2):71-81.

Surgical Site Infections

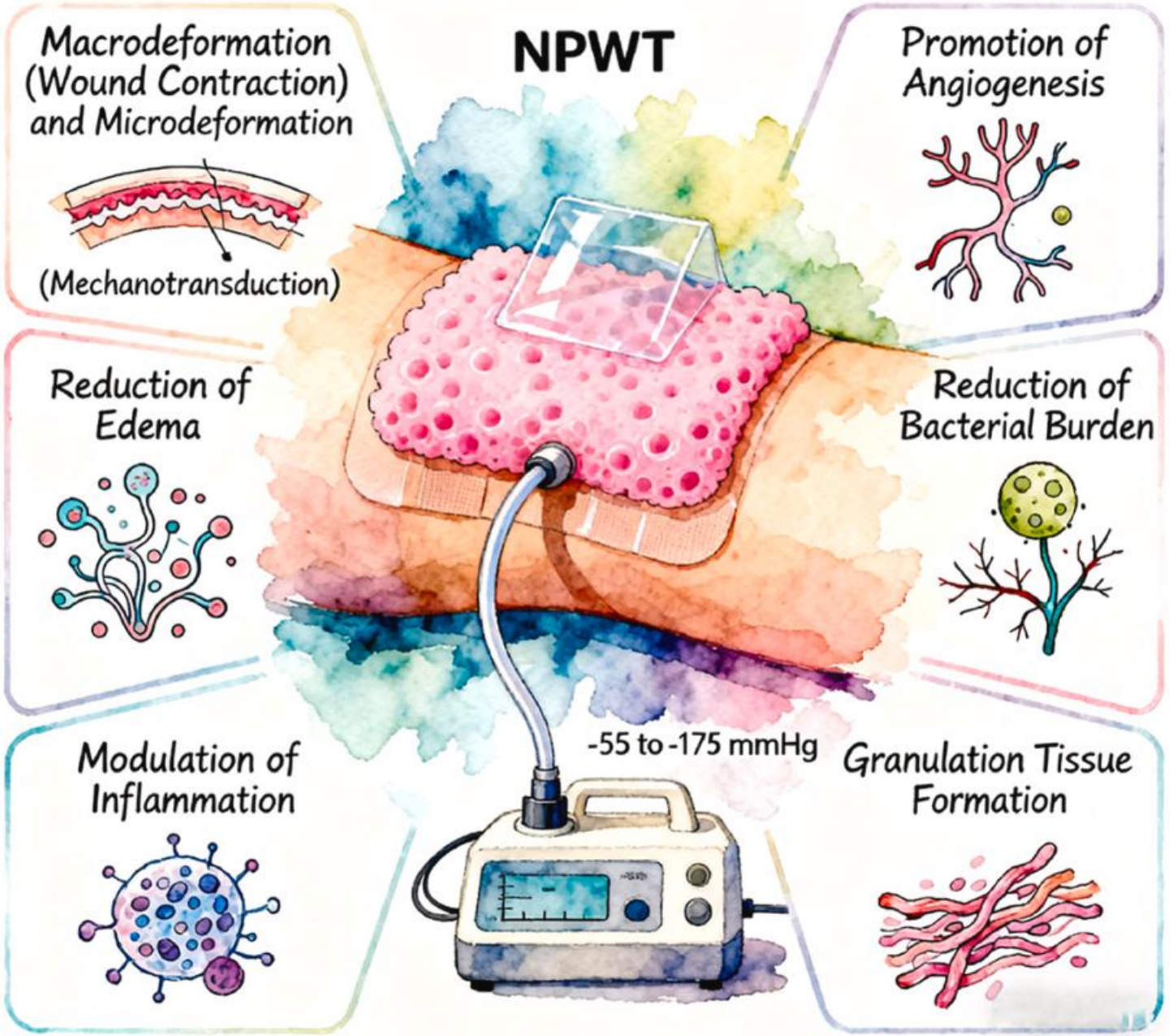
21.8% of hospital-acquired infections are surgical site infections

Economic Impact



Magill SS, et al. *N Engl J Med*. 2014;370(13):1198-1208. Zhan C, et al. *JAMA*. 2003;290(14):1868-1874. Zimlichman E, et al. *JAMA Intern Med*. 2013;173(22):2039-2046. Urban JA. *Surg Infect (Larchmt)*. 2006;7(Suppl 1):S19-S22. Rezaei AR, et al. *J Trauma Inj*. 2025;38(2):71-81.

Continuous -125 mm Hg pressure for 7-14 days



Aids in preventing seroma/hematoma

Barrier to contamination

Zeng Y, et al. *J Tissue Viability*. 2026;35(1):100982.

Incisional Negative Pressure Wound Therapy (iNPWT)

Is the benefit simply fluid management, or does ciNPWT mechanically stabilize the incision?

iNPWT = incisional negative pressure wound therapy; ciNPWT = closed incisional negative pressure wound therapy.

Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy

High-Risk Incisions

- Obesity
- Diabetes
- Poor vascular status
- Smoke
- Steroid use
- Large LE or abdominal incisions

Problem

- Traditional sutures and staples create focal stress concentrations that can
  - Increase tissue ischemia
  - Promote tissue injury
  - Predispose to dehiscence and infection

Hypothesis

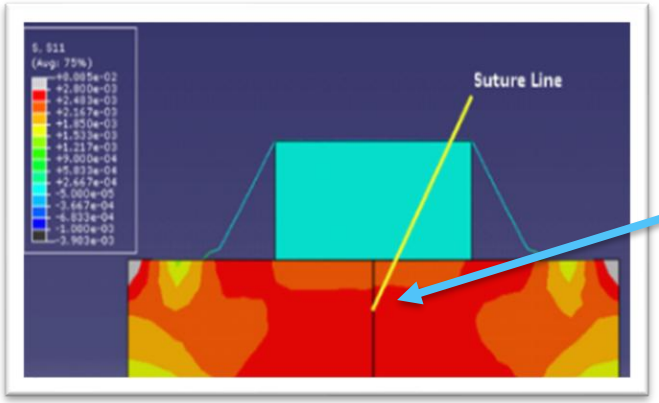
- Applying ciNPWT over closed incisions reduces lateral tension and improves biomechanical stability

LE = left extremity.

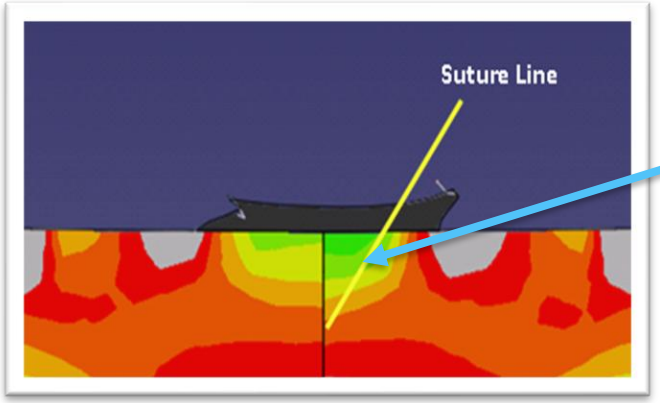
Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy

3D Finite element computer modeling showed iNPWT can reduce lateral tension around a suture line by approximately 50%.



- Lateral stress at 0 mm HG
- Red = areas of high lateral strain



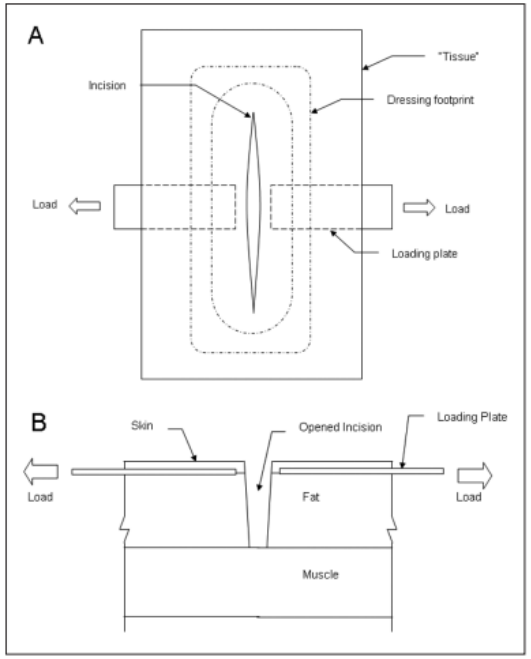
- -125 mm Hg was applied to dressing
- Yellow/Green = areas of low lateral strain

3D = three-dimensional.

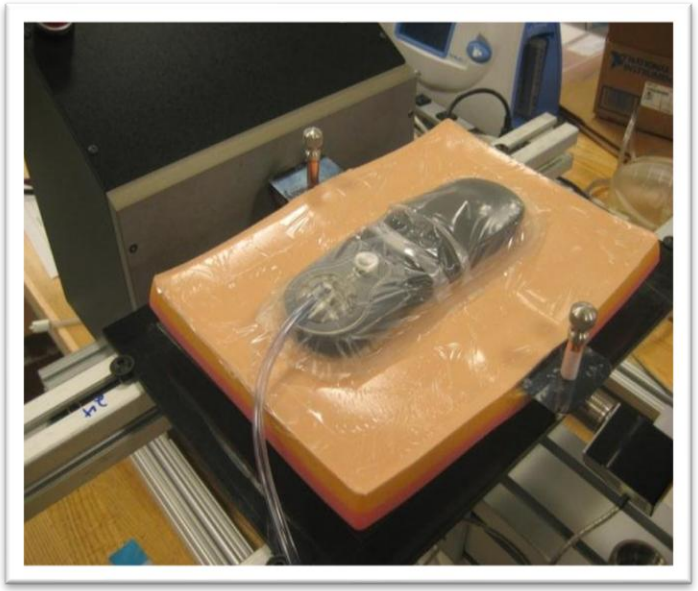
Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy

Bench study of oppositional forces



- **With iNPWT**
- Sutures
  - 51% stronger approximation
  - 61.7 N w/o NPWT vs 92.2 N w/ NPWT (51%)
- Staples
  - 43% stronger approximation
  - 69.3 N w/o NPWT vs 98.8 N w/ NPWT (43%)



****Force required to stretch incision 10 mm****

Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy

More realistic tissue model

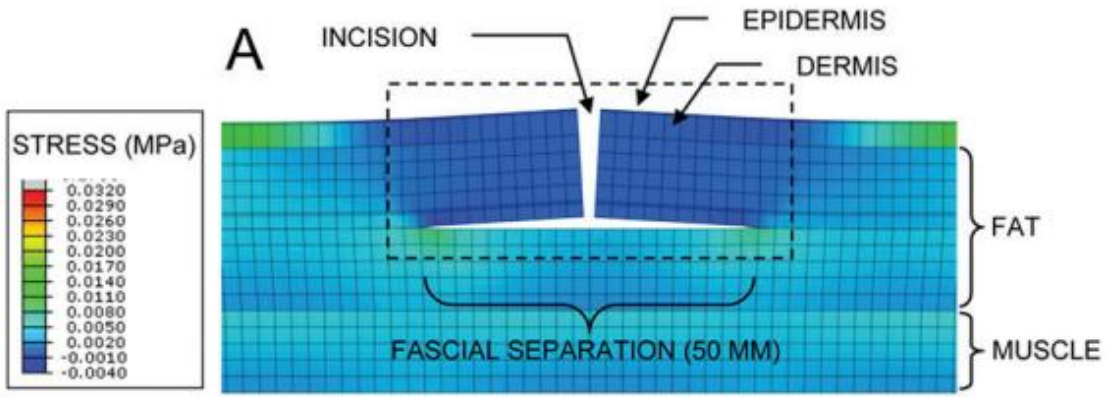
- Epidermis
- Dermis
- Fat
- Muscle
- Fascial separation beneath incision

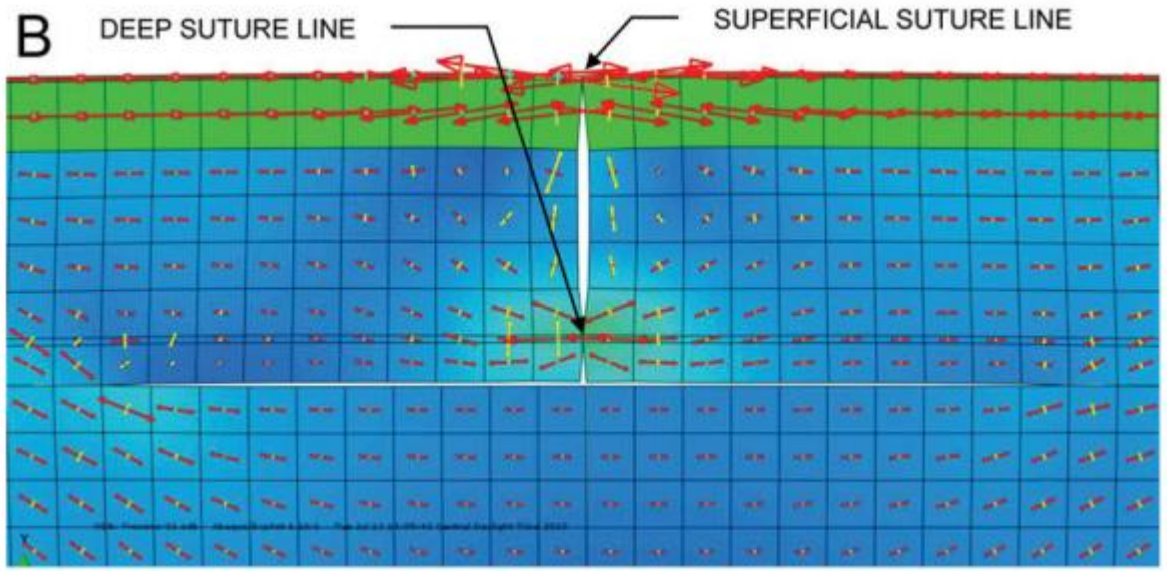
Findings after ciNPWT

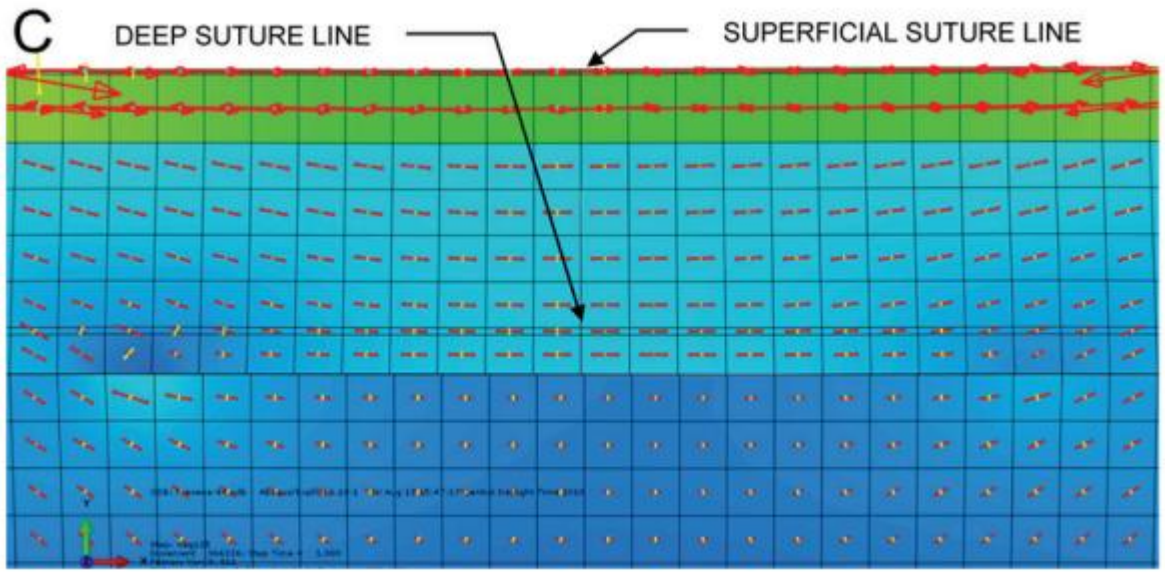
- Superficial sutures stress decreased 45%
- Deep suture stress decreased 50%
- Epidermal lateral stress decreased 47%
- Shear stresses decreased 82-97%
- Stress vectors returned to a more physiologic orientation

Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy







Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75.

Incisional Negative Pressure Wound Therapy

- Several recent meta-analyses completed
  - **Vascular Surgery**: Inguinal incisions following arterial surgeries are notorious for high infection rates; recent meta-analysis shows ciNPWT reduces groin SSIs by 47%
  - **Emergency General Surgery**: Adults undergoing emergency laparotomy see overall wound morbidity slashed roughly in half when treated with ciNPWT upon primary abdominal closure
  - **Orthopedic and Joint Arthroplasty**: Meta-analyses looking at total hip (THA) and total knee arthroplasty (TKA) show excellent clinical outcomes, significantly reducing post-operative drainage, seromas, dehiscence reoperations, and overall cost savings of $932 per patient

THA = total hip arthroplasty; TKA = total knee arthroplasty.

Labib M, et al. *JVS Vasc Insights*. 2026;4(In Progress). Ahmad J, et al. *World J Emerg Surg*. 2026;21:16. Cooper H, et al. *Arthroplasty Today*. 2023;21:101120.

Incisional Negative Pressure Wound Therapy

- Continuous -125 mm Hg pressure from 7-14 days
- Helps prevent seroma/hematoma formations
- Barrier to contamination
- Reduces edema
- Narrower scar formation
- Increases angiogenesis
- Improves lymphatic flow
- Reduces surgical site complications
  - Infections
  - Seromas



First medical device FDA-approved to reduce SSIs and seromas in high-risk patients

Lytle CD, et al. *Sex Transm Dis*. 1990;17(2):58-62. Wilkes RP, et al. *Surg Innov*. 2012;19(1):67-75. Kilpadi DV, Cunningham MR. *Wound Repair Regen*. 2011;19:588-596. Glaser DA, et al. *Wounds*. 2012;24(11):308-316. Kilpadi DV, et al. *Aesthet Plast Surg*. 2014;38(4):767-778. Timmers MS, et al. *Ann Plast Surg*. 2005;55:665-671. Shah A, et al. *Ann Plast Surg*. 2019;82(4S Suppl 3):S222-S227. Chang B, et al. *J Surg Res*. 2020;254:408-416.

Incisional Negative Pressure Wound Therapy







Case #1

- 66yo Male with a history of ESRD, s/p 2 deceased donor kidney transplants, DM2, HTN, interstitial lung disease, asthma, prior DVT, and cryptogenic organizing pneumonia, who was admitted for evaluation of right foot infection and worsening SOB

- During hospitalization
  - Right hallux OM
  - Chronic CLTI RLE: Underwent right lower extremity angiogram and angioplasty, including PTA of the anterior tibial and dorsalis pedis arteries
  - + blood and wound cultures with MRSA
  - Amputation of partial first ray RLE with delayed primary closure

ESRD = end-stage renal disease; DM2 = diabetes mellitus type 2; HTN = hypertension; DVT = deep vein thrombosis; SOB = shortness of breath; OM = osteomyelitis; CLTI = chronic limb-threatening ischemia; RLE = right lower extremity; PTA = percutaneous transluminal angioplasty; MRSA = methicillin-resistant *Staphylococcus aureus*.

Case #1



Intra-op



Intra-op



2wks post-op



1mo post-op

Case #2

- 38yo Male with a history of chronic osteomyelitis (s/p amputation of the L&R first and second digits), uncontrolled DM1, polysubstance use disorder (cocaine, alcohol, cannabis, tobacco), who presented with a 2-wk history of left foot pain and swelling
- Concerning for acute osteomyelitis of the L second metatarsal following recent amputation of the L second toe
- Last HbA1c: 12.1%

- During hospitalization
  - First surgery: Partial second metatarsal ray resection, bone biopsy third metatarsal
  - Third metatarsal + bone culture
  - Second surgery: TMA, left foot

L = left; R = right; DM1 = diabetes mellitus type 1; TMA = transmetatarsal amputation.

Case #2



Intra-op



Intra-op



Intra-op



21 days post-op

Case #3

2 days post-op: Drain removed, iNPWT placed, patient discharged



Pre-op



Intra-op



Intra-op



6mo post-op

Case #4







Case #5







Clinical Pearls

- Reduced surgical site complications
  - ciNPWT dressings significantly lower risk of SSIs, dehiscence, and seroma formation by managing exudate and promoting a closed environment for faster healing
- Enhanced wound healing
  - By applying continuous negative pressure, ciNPWT improves perfusion, reduces edema, and enhances tissue approximation, leading to faster epithelialization and decreased scar formation
- Patient outcomes and satisfaction
  - ciNPWT has been shown to decrease post-op pain, reduce the need for dressing changes, and lead to better cosmetic outcomes, contributing to higher patient satisfaction

Labib M, et al. *JVS Vasc Insights*. 2026;4(In Progress). Ahmad J, et al. *World J Emerg Surg*. 2026;21:16.

NPWT with Instillation and Dwell Time: When, Why, and How

Cyaandi Dove, DPM
Director, Diabetes Foot Program
Division of Endocrinology, Diabetes, and Clinical Nutrition
Harold Schnitzer Diabetes Health Center, OHSU
Portland, OR

Questions

- What is instillation therapy?
- When should NPWT with instillation be utilized?
- What are the appropriate settings for instillation therapy?

What This Section Should Accomplish

Define NPWTi-d

How instillation + dwell differs from traditional NPWT

Know when it helps

Which wounds may benefit, and when it isn't the answer

Translate the cycle

Solution, dwell time, negative pressure, and dressing choice in practice

Apply it to cases

Connect wound-bed goals to therapy selection, transition, and closure

The mental model

NPWTi-d is a bridge: Contaminated/complex wound bed → prepared wound bed → closure, coverage, or step-down therapy.

The safety frame

Complements—not replaces—source control, debridement, vascular assessment, offloading, antibiotics, and surgical judgment.

"What problem am I trying to solve in this wound today?"

NPWTi-d = negative pressure wound therapy with instillation and dwell time.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Garwood CS, Steinberg JS. *Diabetes Metab Res Rev*. 2016;32(S1):268-274. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067.

Why Instillation Entered the NPWT Toolkit

Traditional NPWT does well

Exudate management, macro/microdeformation, edema reduction, granulation support, and stabilization of the wound environment.

But some wounds stall

Residual debris, heavy exudate, high bioburden, undermining/tunnels, and repeated dressing failure can limit progress.

Instillation adds a cycle

A topical solution is delivered, allowed to dwell, then removed under negative pressure to support cleansing between dressing changes.

Use instillation when the "job to be done" is wound-bed preparation, not simply because a wound is open.

Garwood CS, Steinberg JS. *Diabetes Metab Res Rev*. 2016;32(S1):268-274. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067.

The NPWTi-d Cycle: A Practical Translation

1	2	3	4
Instill	**Dwell**	**NPWT**	**Repeat**
Deliver a compatible topical solution into the foam and wound interface	Pause negative pressure long enough for solution distribution/contact	Remove solution/exudate and reapply suction	Automated cycles maintain intermittent cleansing between dressing changes

One programmed treatment cycle, then it repeats automatically between dressing changes.

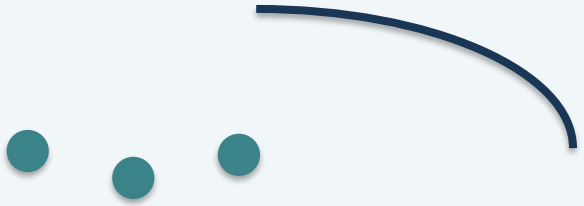
Key teaching point:
Settings are not “set and forget”—match the wound goal and reassess at every dressing change.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067.

Why the Dwell Phase Matters

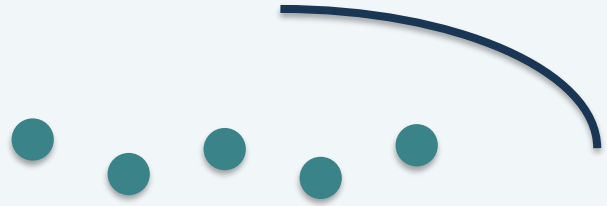
Fluid dynamics change when negative pressure is temporarily interrupted

Continuous flow/no soak



Solution may follow preferential pathways, leaving portions of complex wound geometry with less uniform exposure.

Instillation + dwell



A programmed soak phase allows solution to spread more uniformly across the wound bed before suction resumes.

Mechanistic takeaway: Contact time is part of the therapy, not a pause in the therapy.

Garwood CS, Steinberg JS. *Diabetes Metab Res Rev*. 2016;32(S1):268-274. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067. Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126.

Where NPWTi-d Tends to Fit Clinically

Complex acute wounds

Trauma, dehiscence, staged surgical wounds, wounds after operative washout/debridement.

Infected/contaminated wounds

After source control, where repeated cleansing and exudate management are desired.

Chronic lower-extremity wounds

DFU/VLU/pressure injuries when wound-bed preparation is limiting progress.

Undermining/dead space

Wounds where fluid distribution and removal can help manage complex geometry.

Bridge to closure/coverage

Before graft/flap/secondary closure, or transition to traditional NPWT or advanced dressings.

Not the first answer

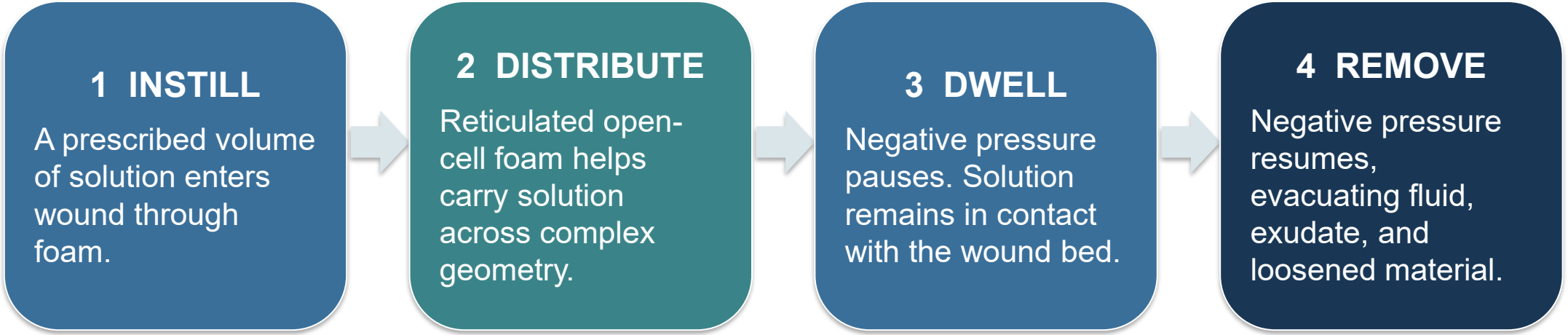
Do not use as a substitute for debridement, vascular workup, offloading, or antibiotics when needed.

DFU = diabetic foot ulcer; VLU = venous leg ulcer.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125.

NPWTi-d: What Is Happening inside the Wound?

A programmed cycle of fluid delivery, contact time, and negative-pressure evacuation



The key distinction: NPWTi-d is not continuous irrigation.
The dwell phase intentionally interrupts suction so the solution can achieve broader wound bed contact before evacuation.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Garwood CS, Steinberg JS. *Diabetes Metab Res Rev*. 2016;32(S1):268-274. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067. Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126.

Contained Cleansing vs Lavage

Preclinical and bench models highlight a different mechanical approach

LAVAGE



- Externally applied hydraulic force
- Tissue trauma increased with irrigation pressure in *ex vivo* testing
- Low-pressure lavage and NPWTi-d both reduced simulated debris by >90%

NPWT WITH INSTILLATION



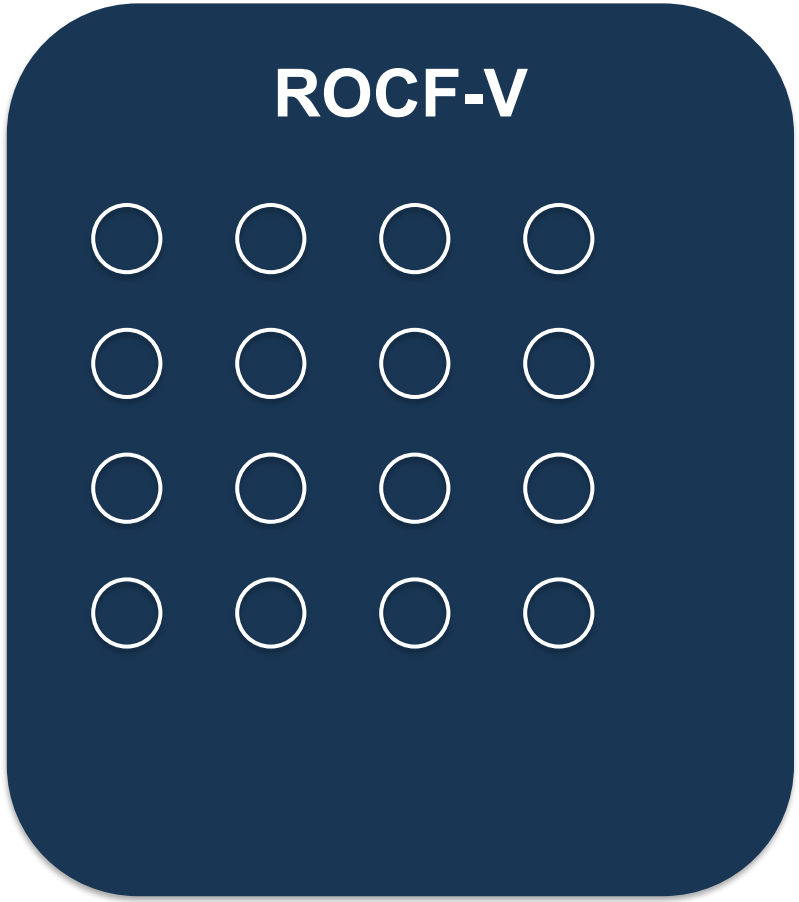
- Contained cyclic delivery rather than an open spray
- Less immediate tissue swelling than low-pressure lavage in the swine model
- No fluorescent particle cross-contamination detected in the bench model

Teaching point: Cleansing is achieved through a controlled cycle, not simply by increasing irrigation force.

Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

The Foam Is Part of the Fluid Delivery System

ROCF-V properties were engineered for wet conditions



Microdeformation preserved
Pore size and density were similar to conventional ROCF-G.

Better wet-state fluid handling
ROCF-V wicked more fluid and showed less pressure drop under wet conditions.

Preclinical granulation signal
In a porcine model, NPWTi-d with ROCF-V produced 43% greater granulation-tissue thickness at day 7 vs standard NPWT with ROCF-G.

Important: the 43% finding is preclinical, not a clinical efficacy claim.

ROCF-V = reticulated open-cell foam (VeraFlo™); ROCF-G = reticulated open-cell foam (GranuFoam™).
Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Patient Selection: Ask Four Questions First

1. **Is the wound adequately debrided?**
   If not, prioritize source control and sharp/surgical debridement when appropriate.

2. **Is perfusion adequate?**
   Assess PAD risk—no technology overcomes ischemia.

3. **What is the closure plan?**
   Closure, graft/flap, delayed primary closure, step-down NPWT, or conservative care?

4. **Can the system be maintained?**
   Seal integrity, staffing, patient tolerance, location of care, and follow-up.

NPWTi-d works best when the team can name the endpoint before starting therapy.

PAD = peripheral artery disease.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186.

Contraindications and Precautions: Keep the Red Flags Visible

Do not cover the unknown

Untreated osteomyelitis, unexplored fistula to organs/cavities, necrotic tissue with eschar, or malignancy require careful reassessment.

Protect what can bleed

Exposed vessels, organs, nerves, anastomoses, or friable tissue require protection and may be inappropriate for therapy.

Avoid “fluid creep”

Instillation near cavities, grafts/flaps, or compromised seals can lead to maceration/leakage and therapy failure.

Consider pain and tolerance

Dwell volume, foam contact, suction changes, and dressing removal can be limiting factors.

Know the solution rules

Use compatible solutions per labeling and institutional policy—avoid improvised mixtures.

Escalate early

Bleeding, sepsis, worsening infection, ischemia, or unexpected deterioration should trigger reassessment.

Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Dressing Choice: Match Foam to Wound Bed Goal

ROCF-V Dressing

For wounds where the primary goal is instillation + NPWT delivery to support wound-bed preparation and granulation.

Best fit: Clean wound bed/granulation support

ROCF-CC Dressing

For wounds with thick exudate, slough, fibrinous material, or non-viable tissue when cleansing is a key goal.

Best fit: Cleansing/removal of thick exudate

Choose the dressing for the wound you have today, not the wound you hope to have next week.

Practical reminders

Reassess dressing choice at each change as the wound improves or declares itself.

Avoid overpacking; protect periwound; document number of foam pieces.

ROCF-CC = reticulated open-cell foam (Cleanse Choice™).

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Borys S, et al. *Eur J Clin Invest*. 2019;49(4):e13067.

Solutions and Settings: Start with the Clinical Objective

Solution	Normal saline is commonly used; other compatible wound-cleansing solutions may be considered per policy/labeling and clinical need.
Dwell time	Often ~10min in published protocols, individualized by wound size, location, seal, pain, and solution volume.
NPWT phase	Commonly around -125 mm Hg with cycles repeated every few hours, adjusted per patient and IFU.

Example: instill → dwell ~10min → NPWT phase ~2-3.5hr → repeat

If therapy alarms or leaks repeatedly, the “setting problem” may be a wound-geometry or dressing problem. Settings should evolve as the wound moves from cleansing → granulation → closure readiness.

IFU = instructions for use.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Evidence Snapshot: What the Literature Suggests

Wound bed preparation – More rapid readiness for closure/coverage reported in selected complex wounds

Surgical burden – Some comparative studies report fewer operative visits/debridements

Bioburden/debris – Greater reduction in bacterial burden or wound debris reported in selected infected/contaminated wounds

Closure outcomes – Meta-analyses and systematic reviews generally support NPWTi-d use in heterogeneous complex wounds, with limitations in evidence quality

Use the evidence to justify appropriate selection, not to imply every wound needs instillation.

Diabetic Foot/Lower-Extremity Lens

Debride/source control

Vascular status, infection control, debridement, offloading, glycemic context, edema management, footwear plan.

NPWTi-d bridge

After debridement/washout when the wound still needs cleansing, exudate control, and prep for closure/coverage.

Closure/step-down

Define success: Less slough, healthy granulation, controlled drainage, graft/flap readiness, or standard NPWT.

Clinical pearl: In a DFU, NPWTi-d may prepare the wound bed, but offloading and perfusion decide whether progress is durable.

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Case #1: Infected DFU after Debridement

Scenario

Neuropathic plantar-lateral midfoot ulcer after I&D/debridement. Moderate exudate, residual fibrinous tissue, no exposed major vessel. Antibiotics started; vascular assessment acceptable; offloading in place.

Decision

NPWTi-d considered as a short bridge to reduce debris/exudate burden and prepare for delayed closure or graft/dermal matrix.

Endpoint

At each dressing change: Less slough, controlled drainage, improving granulation, no spreading infection, no maceration, tolerable pain.

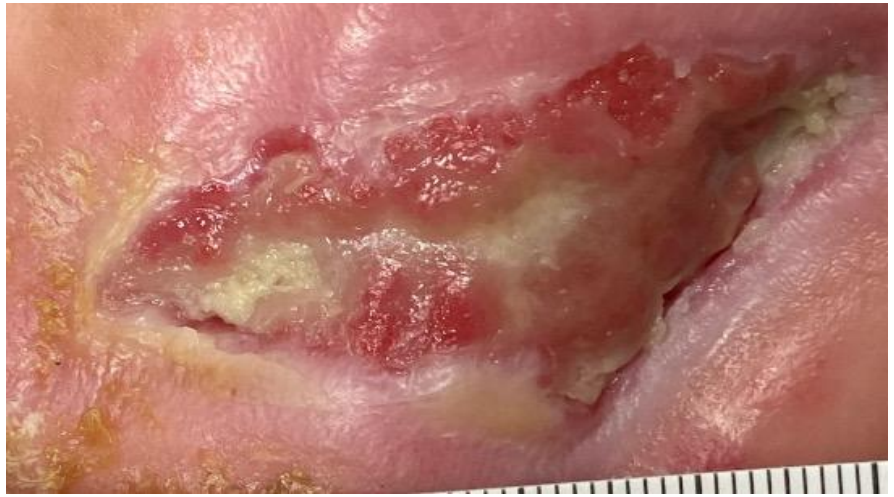
What would make you stop, step down, or escalate?

I&D = incision and drainage.

Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Case #1: 20-Month-Old Dorsal Foot Ulcer with Palpable Hardware

- 62yo Female with diabetes
- s/p 1st MPJ fusion
- Multiple comorbidities
- Due to high surgical risk, forced to be managed as an outpatient

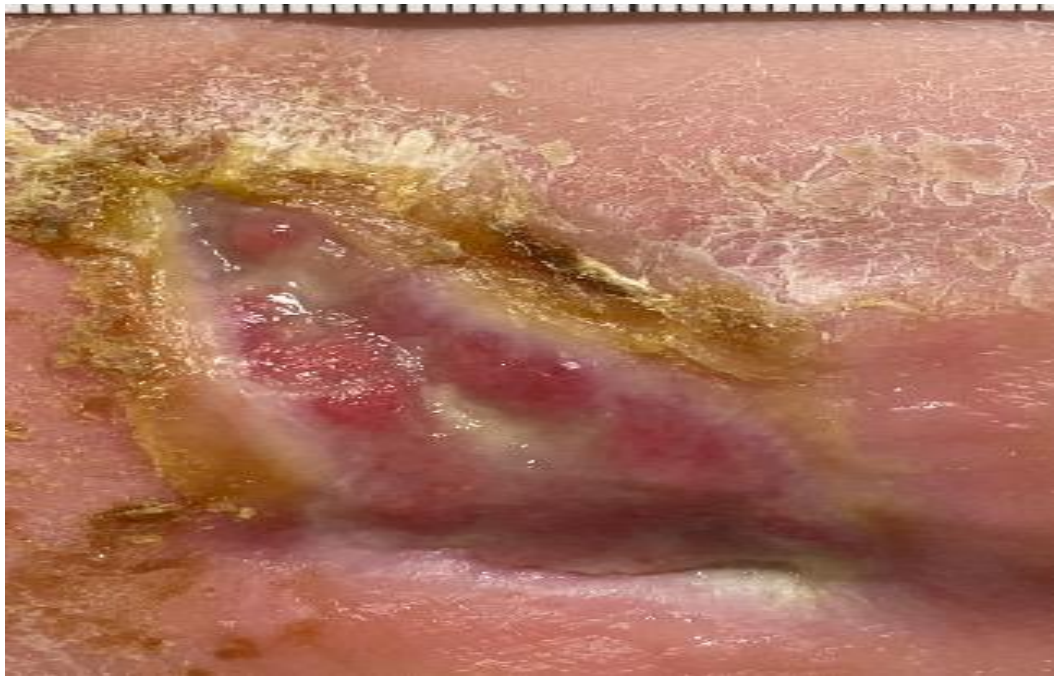


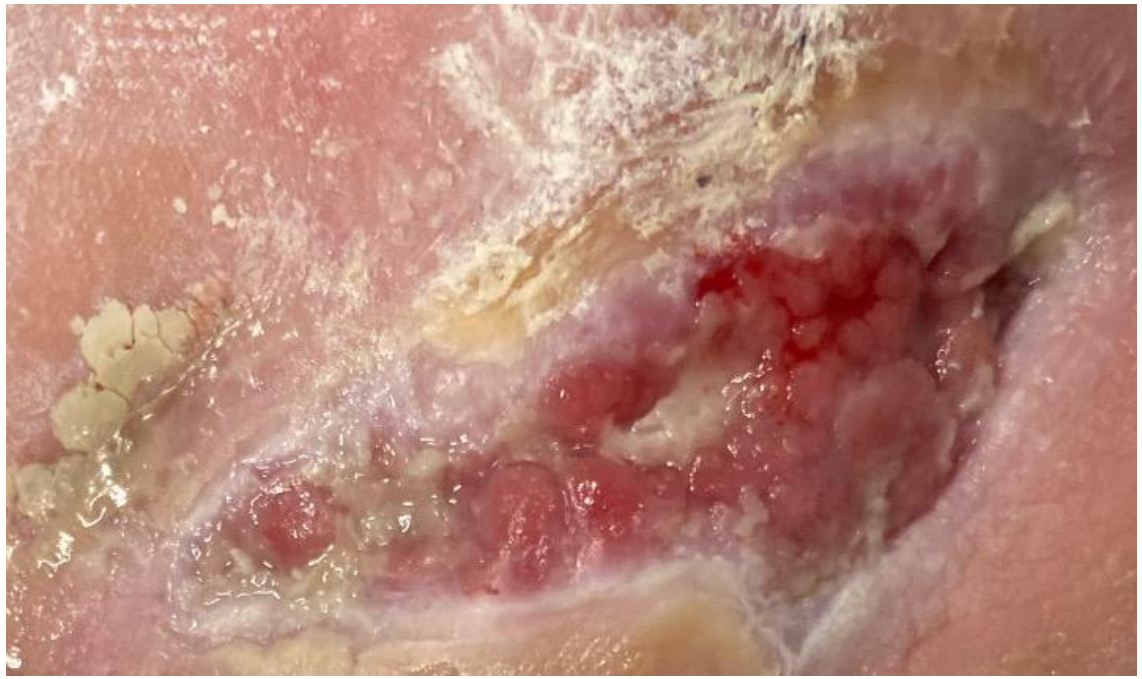


MPJ = metatarsophalangeal joint.

Case #1

- 4-wk status initiation of NPWTi-d: Decreased depth, hardware is no longer palpable





Case #1

- 8wks s/p initiation of NPWTi-d: Changed to standard NPWT
- Wound healed at wk 12
- Hardware intact and minimal scar





Case #2: Dehisced Surgical Wound

Problem

Incision dehiscence with drainage after lower-extremity procedure. No uncontrolled bleeding; deeper structures protected. Surgeon planning staged closure.

NPWTi-d role

Short-term wound-bed preparation when drainage/debris prevent a clean transition to closure or standard NPWT.

Exit strategy

Move to closure/coverage, standard NPWT, or an appropriate dressing once cleansing goals are met.

Decision checkpoint

Is the wound ready for closure, or are we just continuing therapy out of habit?

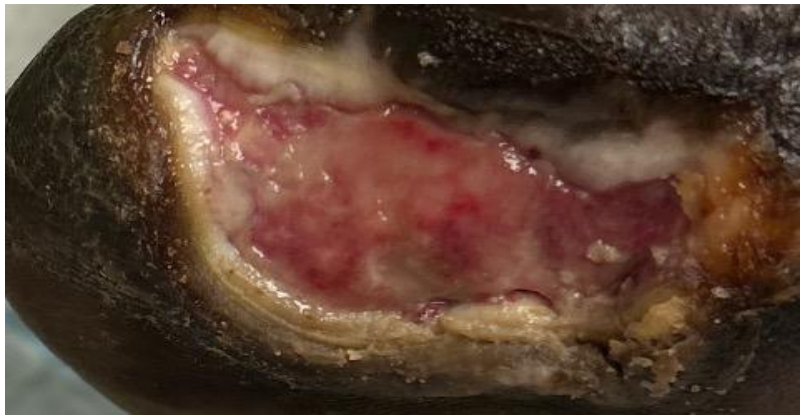
Is the seal reliable enough for the care setting?

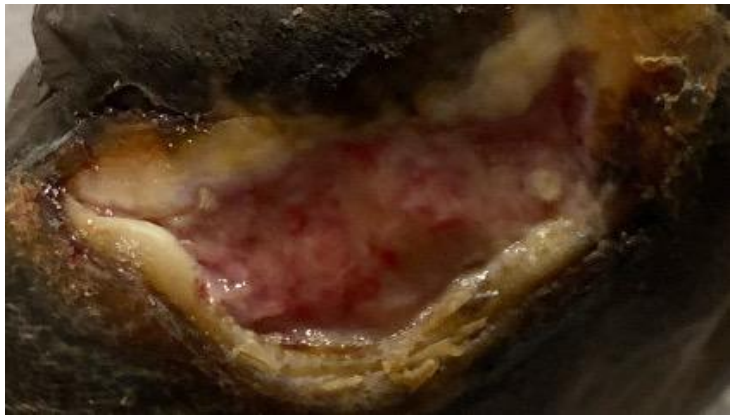
Does the surgical team agree on the next step?

Kim PJ, et al. *Int Wound J*. 2019;17(1):174-186.

Case #2

- 57yo patient with diabetes
- 1 pack-per-day smoker
- Has a nonhealing TMA, refusing HBOT
  - Patient high risk, vascularity has been optimized via endovascular interventions
  - Wound is 11mos old
  - Minimal soft tissue coverage of underlying metatarsal stumps





HBOT = hyperbaric oxygen therapy.

Case #2

- 4wks s/p initiation of NPWTi-d: Surface area decrease, but also granulation tissue is robust
- By wk 5, wound is shallow, with healthy, non-friable granulation tissue
  - Wound ready for de-escalation





Workflow: The 5-Step Application Conversation

1	2	3	4	5
Assess	**Prepare**	**Select**	**Monitor**	**Transition**
Wound goal, perfusion, infection, pain, exudate	Debride, protect structures, protect periwound	Foam/dressing, solution, settings, seal strategy	Alarms, output, pain, maceration, progress	Closure, graft/flap, standard NPWT, dressings

Best practice: Document the “why” for NPWTi-d and the criteria for stopping before the first dressing goes on.

Theodorakopoulos G, Armstrong DG. *Diabetology*. 2025;6(11):126. Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Troubleshooting: What Alarms and Failures Usually Mean

Leaks

Check wound geometry, folds, periwound moisture, bridged tubing, creases near joints, patient movement.

Blockage/poor removal

Consider thick exudate, foam choice, inadequate tubing position, small bridge, or clot/debris.

Pain

Reassess pressure, dwell volume, foam contact, exposed structures, dressing removal technique, analgesia.

Maceration

Reduce leak/overflow; reassess fill volume, seal, periwound protection, and dressing frequency.

No progress

Revisit debridement, ischemia, infection, edema/offloading, nutrition, and endpoint choice.

Care setting mismatch

If the device cannot be supported safely, choose a more reliable therapy plan.

Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Transition and Step-Down: Know When the Bridge Has Worked

Stay on NPWTi-d

Ongoing debris/exudate problem is improving and therapy is tolerated; endpoint not yet met.

Cleansing need high

Step down

Wound is cleaner, drainage controlled, granulation adequate; traditional NPWT or advanced dressings can maintain progress.

Improving wound bed

Close/cover

Wound is ready for graft, flap, delayed primary closure, or matrix-based approach with appropriate adjuncts.

Closure-ready

Do not let a successful bridge become a parking lot.

Liu Y, et al. *Int J Surg*. 2024;110(12):8107-8125. Boxall S, et al. *Int Wound J*. 2017;14(6):950-954.

Clinical Pearls

1. Start with the problem, not the product.
2. Debride and control infection first; instillation is adjunctive.
3. In DFU, perfusion and offloading determine durability.
4. Settings should match the wound goal and be reassessed.
5. Define the exit strategy before applying the dressing.
6. Alarms are clinical clues—troubleshoot the wound and the device.

Navigating a Complex Road

Karen Bauer, DNP, APRN-FNP, CWS, FAPWCA
Nurse Practitioner, George Washington University Hospital
Washington, D.C.

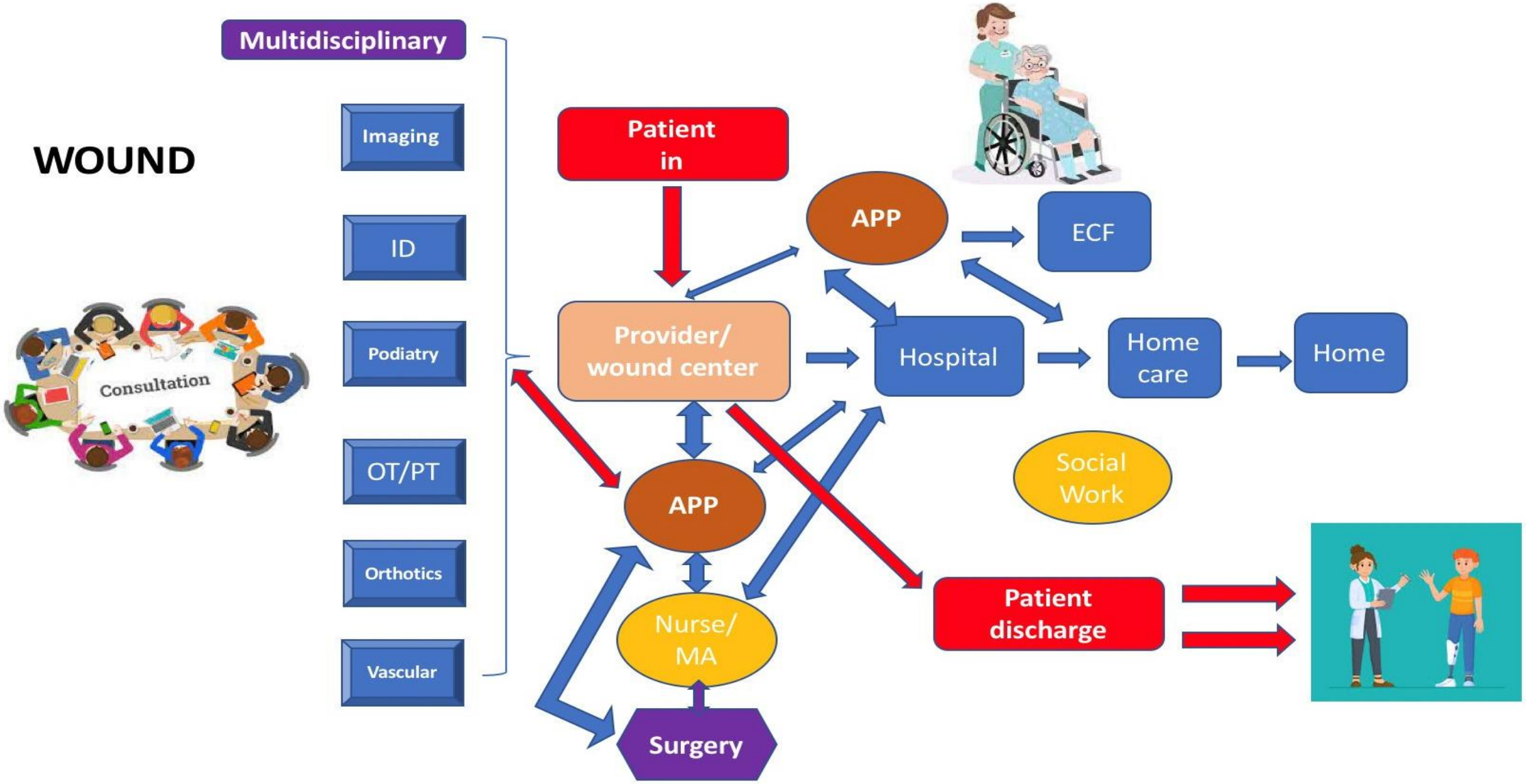
Roadmap Overview

- Care setting transition
  - Collaborative and careful planning
  - Focus on patient education, staff training
  - Ensure access to necessary supplies
  - Ongoing support

- **NPWT can improve patient satisfaction, reduce cost, and allow for a comfortable environment**
- **No clear “best” answer for many specific scenarios**
- **Needs diligent and HOLISTIC care**

Keenan C, et al. *Adv Wound Care (New Rochelle)*. 2025;14(1):33-47.

A Not-So-Linear Trip



ID = infectious disease; OT/PT = occupational therapy/physical therapy; APP = advanced practice provider; MA = medical assistant; ECF = extended care facility.

Driving Toward Success

- **Reduced Hospital Stays**: Shorter hospitalizations, quicker transitions
- **Improved Patient Outcomes**: Promote healing, reduce surgical needs, improve QoL

Cost Reduction



Mobile NPWT Systems: Easier to manage wounds in outpatient setting

QoL = quality of life.

Roadblocks and Detours

- **Training**: NPWT, proper wound care techniques, troubleshooting
- **Logistics**: Access to supplies, equipment, timely communication
- **Patient Education**: Benefits, complications, maintenance
- **Patient Adherence**: NPWT protocols
- **Wound Complexity**: Careful assessment and planning



Care Transition Tactic: Before discharge, name one owner for supplies, teaching, and follow-up, and give the patient all three names

Discharge Transitions: High-Risk Period

Most critical period:* *The first few days after discharge

- Hospital-to-home transition is the most consistently identified vulnerability point for NPWT patients
- Discharge is prolonged and stressful: Planning, communication, clinician information
- Patients don’t realize their role in NPWT management until home
- Lack verbal and written instructions; don’t know where to seek help

Patient-Centered Tactic: Use teach-back and call within 24-48hrs of discharge, before the first dressing change

Monsen C, et al. *J Clin Nurs*. 2017;26(9-10):1405-1413.

Discharge Process Challenges in an Academic Vascular Surgery Service

- High rates of unplanned readmissions
- Discharge process itself has been little studied
- 8 focus groups with patients and providers at an academic vascular surgery service
- Ineffective communication, insufficient time for discharge education, limited access to providers after discharge
- Specialized coordinators, care partner support, and informal problem-solving helped offset these gaps

Care Transition Tactic: Use a structured handoff (eg, SBAR): Settings, dressing type, change schedule, next visit

SBAR = Situation, Background, Assessment, Recommendation.

Doss ER, et al. *Res Nurs Health*. 2023;46(2):210-219.

Closed Incision

- Support needed
- Conceal tubing/dressing
- Expand involvement and self-care
- Individually tailored information is essential for transition from hospital to home
- Written information needs improvement

Journal of Vascular Nursing 41 (2023) 171–179

Contents lists available at ScienceDirect

Journal of Vascular Nursing

journal homepage: www.sciencedirect.com/journal/journal-of-vascular-nursing

Patient experiences of closed-incision negative pressure therapy on groin incisions after discharge following peripheral arterial surgery: A qualitative study

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Patient-Centered Tactic: Offer discreet clothing and carry options

Graversen CB, et al. *J Vasc Nurs.* 2023;41(4):171-179.

NPWT-Specific Care Coordination Considerations

***Standardized protocols* and clearer documentation improve NPWT transitions**

- 2026 expert panel offers simplified NPWT recommendations for hospital and community settings
- EWMA guidance echoes: Better organization of care, documentation, and communication
- 1wk of inpatient NPWT followed by 4wks of home NPWT achieved 60% wound healing in limb salvage patients with diabetes
- Findings support standardized transition pathways as a route to more consistent outcomes

Care Transition Tactic: 1-page NPWT order: Pressure, mode, dressing, change frequency, supplier, alarm contact

Portou M, et al. *J Wound Care.* 2026;35(4):292-298. Apelqvist J, et al. *J Wound Care*. 2017;26(Sup3):S1-S154. Lim K, et al. *Int Wound J*. 2020;17(3):531-539.

Discharge Education Best Practices

***Consensus:* Verbal + written instructions, hands-on training, clear escalation contacts**

- Need verbal and written instructions on device operation—gaps cause the greatest anxiety in first days home
- Hands-on training with return demonstration before discharge: Involve patient and care partners
- Clear contact information for problems
- Explicitly discuss the patient's self-management role

Patient-Centered Tactic: Teach on the home device, in plain and preferred language, with care partners present

Monsen C, et al. *J Clin Nurs*. 2017;26(9-10):1405-1413.

Follow-Up and Transition Models

***Structured pathways* and remote monitoring extend education beyond discharge**

- **Telehealth**: Tang et al. (2019) – guide via video and voice platform
- **Structured protocol**: Lim et al. paired 1wk of inpatient NPWT with 4wks of home NPWT plus scheduled wound-nurse visits
- **Caregiver training**: Dwivedi et al. (2016, 2017) taught patients and care partners device charging (every 5-6hrs) and dressing changes
- **Across models, scheduled follow-up and clearly defined tasks appear central to success**

Care Transition Tactic: Book the first visit or video check before discharge; confirm the device and supplies have arrived home

Tang Y, et al. *Nurs Integrated Trad Chinese Western Med*. 2019;5:8. Shi J, et al. *Cochrane Database Syst Rev*. 2023;5(5):CD011334. Lim K, et al. *Int Wound J*. 2020;17(3):531-539. Lim X, et al. *J Wound Care*. 2021;30(12):1006-1010. Dwivedi MK, et al. *J Wound Care*. 2016;25(4):199-200, 202-204, 206-207. Dwivedi MK, et al. *J Wound Ostomy Continence Nurs*. 2017;44(4):343-349.

Gaps and Opportunities

No validated, standardized NPWT discharge checklist exists

- Evidence is fragmented – no single validated discharge education checklist for NPWT
- Follow-up can be in-person or via telehealth but should be scheduled with contact info

Patient-Centered Tactic: Co-design the checklist with patients and care partners—they know where the process breaks down

Monsen C, et al. *J Clin Nurs*. 2017;26(9-10):1405-1413. Tang Y, et al. *Nurs Integrated Trad Chinese Western Med*. 2019;5:8. Lim K, et al. *Int Wound J*. 2020;17(3):531-539. Dwivedi MK, et al. *J Wound Care*. 2016;25(4):199-200, 202-204, 206-207. Dwivedi MK, et al. *J Wound Ostomy Continence Nurs*. 2017;44(4):343-349.

Components of a Potential NPWT Discharge Checklist

***9 domains* consistently identified across qualitative and expert-panel literature**

1. **Device operation**
   Charging, on/off steps, pressure settings
2. **Alarm management**
   Causes and fixes—top anxiety driver
3. **Dressing and seal care**
   When to change; loss-of-suction steps
4. **Canister management**
   Change timing; expected drainage
5. **Escalation warning signs**
   Bleeding, infection, pain, malfunction
6. **Contact information**
   Who to call; 24/7 availability
7. **Care partner/family training**
   Return demonstration, patient + care partner
8. **Follow-up plan**
   Scheduled visits; telehealth check-ins
9. **Daily living adaptations**
   Mobility, bathing, sleeping, device carry

Kapp S, et al. *Int Wound J*. 2022;19(3):714-723. Monsen C, et al. *J Clin Nurs*. 2017;26(9-10):1405-1413. Portou M, et al. *J Wound Care*. 2026;35(4):292-298.

Consignment at Discharge

- Discharge processes are complicated and involve many cross-institutional complexities
- Delays in hospital patient discharge are associated with increased cost and risk of infection,
- Study looke standard
- Inpatient LO 0.8 days) – potential pe
- Consignmer ch reduces the service burc
- Over 5000 h

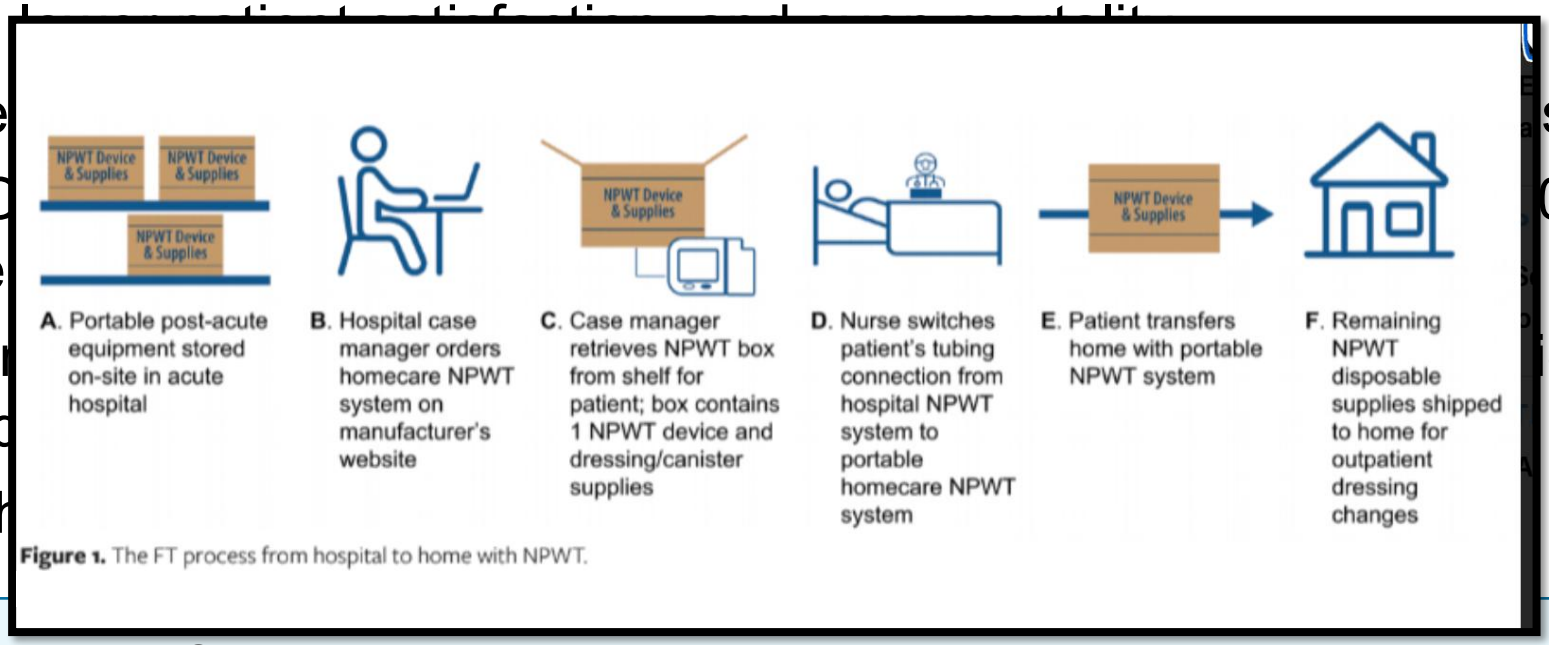


Figure 1. The FT process from hospital to home with NPWT.

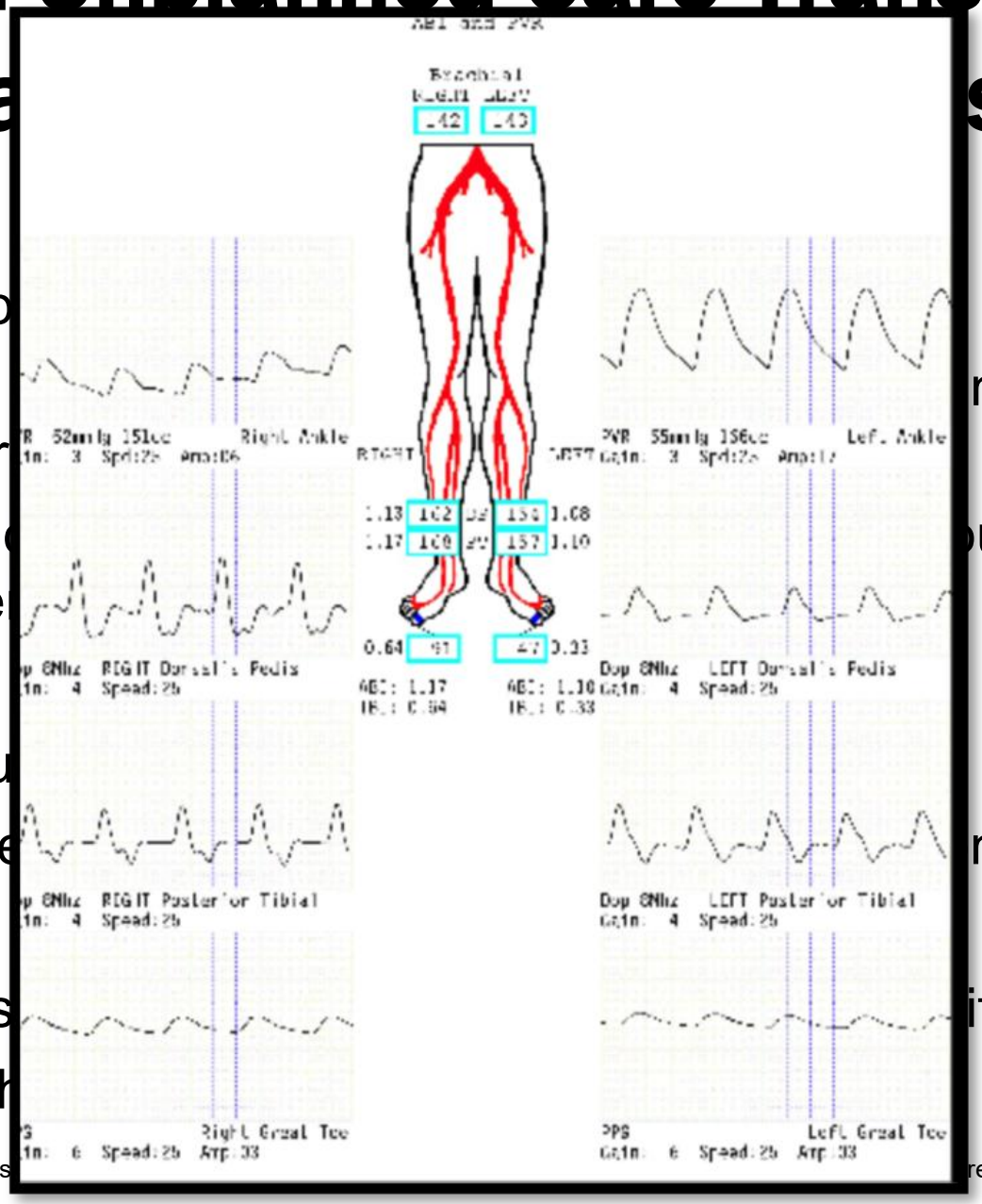
Care Transition Tactic: Switch to the portable unit at the bedside so therapy does not pause between hospital and home

LOT = length of therapy; FT = facilitated transition.
Boti L, et al. *Wounds*. 2022;34(12):E118-E120.

Putting It All Together: Case Study

Case: Unplanned Care Transitions a s

- 68yo Female
- PMH/PSH: Gastric byp
- Presented with diffuse ng, blistering, and bruising; malaise; anor
- CT: Atrophic pancreati us jejunojejunostomy, nonspecific colitis, ede anasarca
- Laparascopic-assisted
- Rheumatology – vascu
- ECHO: Noted clot in pe n
- Venous DUS negative
- Biopsy of LLE wound s ific (dermatopathology)
- High-dose steroids with



PMH/PSH = patient medical history/patient surgical his reatography; ECHO = echocardiogram; DUS = duplex ultrasound; LLE = left lower extremity.



Day 1





1 Month

NPWTi-d after OR with HOCl

10min dwell time q2hrs at
-125 mm Hg, 3x/wk





Multidisciplinary coordination
GIM; ID; Rheumatology; Vascular

HOCl = hypochlorous acid; GIM = general internal medicine.

Real-World Obstacles

Challenges

- Pain control
- Health literacy
- Isolation
- Ulcer location
- Etiology not fully delineated
- NPWT varied
- **Care transition**

Portable NPWT with nonadherent over tendon, black foam, -75 mm Hg with titration goal -125 mm Hg, as tolerated



Patient-Centered Tactic: Treat pain, health literacy, and isolation as part of the plan

Interrupted NPWT: Consider All Factors!



Day 1
NPWT held prior at ECF
Readmitted, started novel NPWT

Patient-Centered Tactic: Ask why therapy stopped, then confirm the receiving facility can run the device



Day 4
Discharged on portable NPWT
Non-adherent, black foam, -75 mm Hg

Multi-Modal Therapy



Day 1
CTP/Wash-out booked



Day 9
1wk post-CTP: Portable NPWT
Non-adherent, black foam, -75 mm Hg



Day 21
Portable NPWT
Non-adherent, black foam, -75 mm Hg

CTP = cellular and/or tissue-based product.

Inpatient to Outpatient Transitions – Coordination



Day 1
Inpatient: Peel and place



Day 8
Portable NPWT
Non-adherent, black foam, -75 mm Hg



Day 80
Collagen, off dapsone

Clinical Pearls

- Clinical algorithm useful
- Need for flexibility
  - Care setting
  - Skill/training/comfortability of teams
  - Insurance
  - Patient tolerance and needs
- Step down consideration with subsequent monitoring – can backtrack if needed
- Safety first
- Shared decision-making!

Care Transition Tactic: Warm handoff, plus the first follow-up booked before discharge

Patient-Centered Tactic: Teach-back, a “when to call” card, and goals set with the patient and care partner

TEAMs









Thank You!

Questions?