MASSACHUSETTS

Blue Cross Blue Shield of Massachusetts is an Independent Licensee of the Blue Cross and Blue Shield Association

Medical Policy

Negative Pressure Wound Therapy in the Outpatient Setting

Table of Contents

Policy Number: 543

BCBSA Reference Number: N/A
NCD/LCD: N/A; See Negative Pressure Wound Therapy Interpretive Guidelines

Related Policies

- Skin Contact Monochromatic Infrared Energy as a Technique to Treat Cutaneous Ulcers, Diabetic Neuropathy, and Miscellaneous Musculoskeletal Conditions, #507
- Electrostimulation and Electromagnetic Therapy for Treating Wounds, #655
- Noncontact Ultrasound Treatment for Wounds, #657
- Bio-Engineered Skin and Soft Tissue Substitutes, #663

Policy

Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity

Initiation of a powered negative pressure wound therapy (NPWT) system is considered **MEDICALLY NECESSARY** when the individual meets **all** of the criteria (1, 2, 3, 4 and 5) below:[1]

1. A complete wound care program, which meets ALL of the requirements below, has been tried:
   - Documentation in the individual's medical record of evaluation, care, and wound measurements by a licensed medical professional; **AND**
   - Application of dressings to maintain a moist environment; **AND**
   - Debridement of necrotic tissue if present; **AND**
   - Evaluation of and provision for adequate nutritional status; **AND**
   - Underlying medical conditions (e.g., diabetes, venous insufficiency) are being appropriately managed; **AND**
2. An eligible condition is documented (individual must meet one or more of the following):
   - Stage III or IV pressure ulcers (see key terms below) at initiation of vacuum assisted wound therapy, in individuals who meet ALL of the following:
     - The individual has been appropriately turned and positioned; **AND**
     - The individual has used a group 2 or 3 support surface for pressure ulcers on the posterior trunk or pelvis (no special support surface is required for ulcers not located on the trunk or pelvis); **AND**
     - The individual's moisture and incontinence have been appropriately managed, **OR**
   - Neuropathic ulcers in individuals who meet BOTH of the following:
     - The individual has been on a comprehensive diabetic management program; **AND**

    - Reduction in pressure on a foot ulcer has been accomplished with appropriate modalities; **OR**
- Ulcers related to venous or arterial insufficiency, in individuals who meet ALL of the following:
    - Compression bandages and/or garments have been consistently applied; **AND**
    - Reduction in pressure on a foot ulcer has been accomplished with appropriate modalities; **AND**
    - For initiation of therapy in the home setting, presence of the ulcer for at least 30 days; **OR**
- Dehisced wounds or wound with exposed hardware or bone; **OR**
- Post sternotomy wound infection or mediastinitis; **OR**
- Complications of a surgically created wound where accelerated granulation therapy is necessary and cannot be achieved by other available topical wound treatment; **OR**
- Skin graft success is questionable and hospital admissions will be avoided (coverage is provided for 5 days); **OR**
- Wounds with massive exudate/transudate where normal dressings fill up quickly and macerate the wound

3. The wound to be treated is free from all of the following absolute contraindications to vacuum assisted wound therapy:
    - Exposed anastomotic site; **OR**
    - Exposed nerves; **OR**
    - Exposed organs; **OR**
    - Exposed vasculature; **OR**
    - Malignancy in the wound; **OR**
    - Necrotic tissue with eschar present; **OR**
    - Non-enteric and unexplored fistulas; **OR**
    - Untreated osteomyelitis, **OR**
    - Macroscopic contamination.
4. The powered negative pressure wound therapy (NPWT) system is being used as an adjunct therapy or as an alternative to surgery, **AND**
5. The medical record documents that the patient is willing and able to comply with using continuous or intermittent V.A.C. application 22 of 24 hours per day.

Continued use of electrically powered vacuum assisted wound therapy is considered **MEDICALLY NECESSARY** when:

- The initial trial has resulted in documented objective improvements in the wound, **AND**
- Weekly assessment of the wound's dimensions and characteristics by a licensed health care professional is documented; **AND**
- Documentation of progressive wound healing is demonstrated.

Continued use of electrically powered vacuum assisted wound therapy is considered **NOT MEDICALLY NECESSARY** when the continuation of treatment criteria above have not been met.

Electrically powered vacuum assisted wound therapy is considered **INVESTIGATIONAL and NOT MEDICALLY NECESSARY** for all other applications not meeting the medical necessity criteria above, including when any absolute contraindications to vacuum assisted wound therapy are present.

Non-electrically powered vacuum assisted wound therapy (for example, the SNaP™ Wound Care Device) is considered **INVESTIGATIONAL and NOT MEDICALLY NECESSARY** for all conditions.

Portable, battery powered, single use (disposable) vacuum assisted wound therapy devices (for example, the PICO™ Single Use Negative Pressure Wound Therapy System or the V.A.C.Via™ Negative Pressure Wound Therapy System) are considered **INVESTIGATIONAL and NOT MEDICALLY NECESSARY** for all conditions.

Medicare HMO Blue[SM] and Medicare PPO Blue[SM] Members

Medical necessity criteria and coding guidance for **Medicare Advantage members living in Massachusetts** can be found through the links below.

Negative Pressure Wound Therapy Interpretive Guidelines March 2012

For medical necessity criteria and coding guidance for M**edicare Advantage members living outside of Massachusetts**, please see the Centers for Medicare and Medicaid Services website for information regarding your specific jurisdiction at https://www.cms.gov.

Prior Authorization Information

Inpatient

- For services described in this policy, precertification/preauthorization **IS REQUIRED** for all products if the procedure is performed **inpatient**.

Outpatient

- For services described in this policy, see below for products where prior authorization **might be required** if the procedure is performed **outpatient**.

	Outpatient
Commercial Managed Care (HMO and POS)	Prior authorization is **required**.
Commercial PPO and Indemnity	Prior authorization is **not required**.
Medicare HMO Blue[SM]	Prior authorization is **required**.
Medicare PPO Blue[SM]	Prior authorization is **not required**.

CPT Codes / HCPCS Codes / ICD Codes

Inclusion or exclusion of a code does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage as it applies to an individual member.

Providers should report all services using the most up-to-date industry-standard procedure, revenue, and diagnosis codes, including modifiers where applicable.

The following codes are included below for informational purposes only; this is not an all-inclusive list.

The above medical necessity criteria MUST be met for the following codes to be covered for Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity:

CPT Codes

CPT codes:	Code Description
97605	Negative pressure wound therapy (e.g., vacuum-assisted drainage collection), including topical application(s), wound assessment, and instruction(s) for ongoing care, per session; total wound(s) surface area less than or equal to 50 square centimeters
97606	Negative pressure wound therapy (e.g., vacuum-assisted drainage collection), including topical application(s), wound assessment, and instruction(s) for ongoing care, per session; total wound(s) surface area greater than 50 square centimeters

HCPCS Codes

HCPCS codes:	Code Description
A6550	Wound care set, for negative pressure wound therapy electrical pump, includes all supplies and accessories
A7000	Canister, disposable, used with suction pump, each
A7001	Canister, nondisposable, used with suction pump, each

E2402	Negative pressure wound therapy electrical pump, stationary or portable
K0743	Suction pump, home model, portable, for use on wounds
K0744	Absorptive wound dressing for use with suction pump, home model, portable, pad size 16 sq in or less
K0745	Absorptive wound dressing for use with suction pump, home model, portable, pad size more than 16 sq in but less than or equal to 48 sq in
K0746	Absorptive wound dressing for use with suction pump, home model, portable, pad size greater than 48 sq in

The following CPT and HCPCS codes are considered investigational for Commercial Members: Managed Care (HMO and POS), PPO, and Indemnity:

CPT Codes

CPT codes:	Code Description
97607	Negative pressure wound therapy, (eg, vacuum assisted drainage collection), utilizing disposable, non-durable medical equipment including provision of exudate management collection system, topical application(s), wound assessment, and instructions for ongoing care, per session; total wound(s) surface area less than or equal to 50 square centimeters
97608	Negative pressure wound therapy, (eg, vacuum assisted drainage collection), utilizing disposable, non-durable medical equipment including provision of exudate management collection system, topical application(s), wound assessment, and instructions for ongoing care, per session; total wound(s) surface area greater than 50 square centimeters

HCPCS Codes

HCPCS codes:	Code Description
A9272	Mechanical wound suction, disposable, includes dressing and all accessories and components, each

Description

Chronic Wounds
Management

The management and treatment of chronic wounds, including decubitus ulcers, is challenging. Most chronic wounds will heal only if the underlying cause (ie, venous stasis, pressure, infection) is addressed. Also, cleaning the wound to remove nonviable tissue, microorganisms, and foreign bodies are essential to create optimal conditions for either re-epithelialization (ie, healing by secondary intention) or preparation for wound closure with skin grafts or flaps (ie, healing by primary intention). Therefore, debridement, irrigation, whirlpool treatments, and wet-to-dry dressings are common components of chronic wound care.

Negative pressure wound therapy (NPWT) involves the use of a negative pressure therapy or suction device to aspirate and remove fluids, debris, and infectious materials from the wound bed to promote the formation of granulation tissue. The devices may also be used as an adjunct to surgical therapy or as an alternative to surgery in a debilitated patient. Although the exact mechanism has not been elucidated, it is hypothesized that negative pressure contributes to wound healing by removing excess interstitial fluid, increasing the vascularity of the wound, reducing edema, and/or creating beneficial mechanical forces that lead to cell growth and expansion.

A nonpowered (mechanical) NPWT system has also been developed; the Smart Negative Pressure Wound Care System is portable and lightweight (3 oz) and can be worn underneath clothing. This system consists of a cartridge, dressing, and strap; the cartridge acts as the negative pressure source. The

system is reported to generate negative pressure levels similar to other NPWT systems. This system is fully disposable.

The focus of this evidence review is the use of NPWT in the outpatient setting. It is recognized that patients may begin using the device in the inpatient setting as they transition to the outpatient setting.

Summary

Negative pressure wound therapy (NPWT) involves the use of negative pressure or suction device to aspirate and remove fluids, debris, and infectious materials from the wound bed to promote the formation of granulation tissue and wound healing.

For individuals who have diabetic lower-extremity ulcers or amputation wounds who receive outpatient NPWT, the evidence includes randomized controlled trials (RCTs) and a systematic review of RCTs. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. There was a higher rate of wound healing and fewer amputations with NPWT, although the studies were at risk of bias due to lack of blinding. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have chronic pressure ulcers who receive outpatient NPWT, the evidence includes RCTs and systematic reviews. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. All trials are of low-quality and at high-risk of bias. Also, most study populations were treated in inpatient settings. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have lower-extremity ulcers due to venous insufficiency who receive outpatient NPWT, the evidence includes an RCT and a systematic review. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. A single RCT in patients with nonhealing leg ulcers who were treated with skin grafts found a faster rate of healing with NPWT when used in the inpatient setting. No studies were identified on the effectiveness of NPWT as a primary treatment for leg ulcers or for the use of NPWT in the outpatient setting. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have burn wounds who receive outpatient NPWT, the evidence includes RCTs, systematic reviews, and case series. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. An interim report of an RCT evaluating NPWT in partial-thickness burns, summarized in a Cochrane review, did not permit conclusions on the efficacy of NPWT for this indication. A separate RCT comparing NPWT with split-skin grafts in patients with full-thickness burns did not show differences in graft take and wound epithelialization. A retrospective case series reported functional outcomes for most patients who were treated with NPWT at a single-center. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have traumatic or surgical wounds who receive outpatient NPWT, the evidence includes RCTs and systematic reviews. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. There are limited data on NPWT as a primary treatment of partial-thickness burns. One RCT found no benefit of NPWT on graft take and wound epithelialization in patients with full-thickness burns. NPWT showed no benefit in the treatment of patients with surgical wounds or skin grafts healing by primary intention, and a systematic review of NPWT for traumatic and surgical wounds found no differences between standard dressing and NPWT for any wound outcome measure. However, a small RCT has suggested that prophylactic NPWT may reduce the number of dressing changes and pain when used in an outpatient setting. A small retrospective study reported improved epithelialization with NPWT in patients free of comorbidities. Additional study in larger samples is needed to evaluate this outcome measure. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have any wound type (acute or nonhealing) who receive portable single-use outpatient NPWT, the evidence includes RCTs. The relevant outcomes are symptoms, change in disease status, morbid events, quality of life, and treatment-related morbidity. The evidence includes an RCT of

the PICO Single Use Negative Pressure Wound Therapy System, an RCT of the nonpowered Smart Negative Pressure Wound Care System, and a pseudorandomized study of the Prevena Incision Management System. The PICO device was studied in an adequately powered but unblinded RCT of combined in- and outpatient use following total joint arthroplasty; also, a 2017 RCT compared the PICO device with standard dressing following abdominal surgery. Results showed some benefits, though not statistically significant. One study with the Smart Negative Pressure nonpowered Wound Care System showed noninferiority to a vacuum-assisted closure device. However, interpretation of this trial is limited by a high loss to follow-up and lack of a control group treated with dressings. These studies are insufficient to draw conclusions about its efficacy. Well-designed comparative studies with larger numbers of patients are needed to determine the effects of these technologies with greater certainty. The evidence is insufficient to determine the effects of the technology on health outcomes.

Overall, the evidence from comparative clinical trials has demonstrated there is a subset of problematic wounds for which the use of NPWT may provide a significant clinical benefit. However, due to clinical variability and limited data, it is not possible to determine prospectively which wounds are most likely to respond favorably to NPWT. In addition, clinical input supports a therapeutic trial of NPWT for chronic pressure ulcers that have failed to heal, for traumatic or surgical wounds that have failed to close when there is exposed bone, cartilage, tendon, or foreign material within the wound, and for nonhealing wounds in patients with underlying clinical conditions known to negatively impact wound healing. Therefore, a therapeutic trial of NPWT of not less than 14 days may be considered medically necessary for chronic wounds that have failed to heal, despite intense conventional wound therapy for at least 90 days, or for wounds of at least 30 days that have a high probability of failure to heal due to compounding factors involving the wound and the patient. For continued use of NPWT beyond 14 days to meet criteria for medical necessity, there must be objective evidence of wound healing, such as the development of healthy granulation tissue and progressive wound contracture.

Policy History

Date	Action
3/2019	BCBSA National medical policy review. Description, summary and references updated. Policy statements unchanged.
2/2018	New references added from BCBSA National medical policy.
2/2017	New references added.
3/2016	New references added from BCBSA National medical policy.
3/2015	New references added from BCBSA National medical policy. Clarified coding information.
1/2015	Clarified coding information.
7/2014	Updated Coding section with ICD10 procedure and diagnosis codes, effective 10/2015.
4/2014	New references added from BCBSA National medical policy.
3/2014	Coding information clarified.
2/1/2013	BCBSA National medical policy review. No change in medical policy statement.
2/1/2013	New policy describing ongoing coverage and non-coverage statements.

Information Pertaining to All Blue Cross Blue Shield Medical Policies

Click on any of the following terms to access the relevant information:
Medical Policy Terms of Use
Managed Care Guidelines
Indemnity/PPO Guidelines
Clinical Exception Process
Medical Technology Assessment Guidelines

References

1. U.S. Food and Drug Administration. UPDATE on Serious Complications Associated with Negative Pressure Wound Therapy Systems: FDA Safety Communication. 2011 Feb; https://wayback.archive-

it.org/7993/20170406071858/https://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm244211.htm. Accessed January 2, 2018.
2. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Vacuum-assisted closure in the treatment of chronic wounds. TEC Assessments. 2000;Volume 15:Tab 23. PMID
3. Rhee SM, Valle MF, Wilson LM, et al. Negative Pressure Wound Therapy Technologies For Chronic Wound Care in the Home Setting. Evidence Report/Technology Assessment (Contract No. 290-201-200007-I) Rockville, MD: Agency for Healthcare Research and Quality; 2014.
4. Rhee SM, Valle MF, Wilson LM, et al. Negative pressure wound therapy technologies for chronic wound care in the home setting: A systematic review. Wound Repair Regen. Jul-Aug 2015;23(4):506-517. PMID 25845268
5. Sullivan N, Snyder DL, Tipton K, et al. Technology assessment: Negative pressure wound therapy devices (Contract No. 290-2007-10063). Rockville, MD: Agency for Healthcare Research and Quality; 2009.
6. Dumville JC, Hinchliffe RJ, Cullum N, et al. Negative pressure wound therapy for treating foot wounds in people with diabetes mellitus. Cochrane Database Syst Rev. Oct 17 2013;10(10):CD010318. PMID 24132761
7. Blume PA, Walters J, Payne W, et al. Comparison of negative pressure wound therapy using vacuum-assisted closure with advanced moist wound therapy in the treatment of diabetic foot ulcers: a multicenter randomized controlled trial. Diabetes Care. Apr 2008;31(4):631-636. PMID 18162494
8. Borys S, Hohendorff J, Koblik T, et al. Negative-pressure wound therapy for management of chronic neuropathic noninfected diabetic foot ulcerations - short-term efficacy and long-term outcomes. Endocrine. Dec 2018;62(3):611-616. PMID 30099674
9. Dumville JC, Webster J, Evans D, et al. Negative pressure wound therapy for treating pressure ulcers. Cochrane Database Syst Rev. May 20 2015;5(5):CD011334. PMID 25992684
10. Wanner MB, Schwarzl F, Strub B, et al. Vacuum-assisted wound closure for cheaper and more comfortable healing of pressure sores: a prospective study. Scand J Plast Reconstr Surg Hand Surg. Mar 2003;37(1):28-33. PMID 12625392
11. Dumville JC, Land L, Evans D, et al. Negative pressure wound therapy for treating leg ulcers. Cochrane Database Syst Rev. Jul 14 2015;7(7):CD011354. PMID 26171910
12. Vuerstaek JD, Vainas T, Wuite J, et al. State-of-the-art treatment of chronic leg ulcers: A randomized controlled trial comparing vacuum-assisted closure (V.A.C.) with modern wound dressings. J Vasc Surg. Nov 2006;44(5):1029-1037; discussion 1038. PMID 17000077
13. Dumville JC, Munson C, Christie J. Negative pressure wound therapy for partial-thickness burns. Cochrane Database Syst Rev. Dec 15 2014;12(12):CD006215. PMID 25500895
14. Bloemen MC, van der Wal MB, Verhaegen PD, et al. Clinical effectiveness of dermal substitution in burns by topical negative pressure: a multicenter randomized controlled trial. Wound Repair Regen. Nov-Dec 2012;20(6):797-805. PMID 23110478
15. Runkel N, Krug E, Berg L, et al. Evidence-based recommendations for the use of Negative Pressure Wound Therapy in traumatic wounds and reconstructive surgery: steps towards an international consensus. Injury. Feb 2011;42 Suppl 1:S1-12. PMID 21316515
16. Ehrl D, Heidekrueger PI, Broer PN, et al. Topical negative pressure wound therapy of burned hands: functional outcomes. J Burn Care Res. Mar 31 2017. PMID 28368916
17. Webster J, Scuffham P, Stankiewicz M, et al. Negative pressure wound therapy for skin grafts and surgical wounds healing by primary intention. Cochrane Database Syst Rev. Oct 7 2014;10(10):CD009261. PMID 25287701
18. Dumville JC, Owens GL, Crosbie EJ, et al. Negative pressure wound therapy for treating surgical wounds healing by secondary intention. Cochrane Database Syst Rev. Jun 4 2015;6(6):CD011278. PMID 26042534
19. De Vries FE, Wallert ED, Solomkin JS, et al. A systematic review and meta-analysis including GRADE qualification of the risk of surgical site infections after prophylactic negative pressure wound therapy compared with conventional dressings in clean and contaminated surgery. Medicine (Baltimore). Sep 2016;95(36):e4673. PMID 27603360
20. Stannard JP, Volgas DA, McGwin G, 3rd, et al. Incisional negative pressure wound therapy after high-risk lower extremity fractures. J Orthop Trauma. Jan 2012;26(1):37-42. PMID 21804414
21. Stannard JP, Robinson JT, Anderson ER, et al. Negative pressure wound therapy to treat hematomas and surgical incisions following high-energy trauma. J Trauma. Jun 2006;60(6):1301-1306. PMID 16766975

22. Monsen C, Acosta S, Mani K, et al. A randomised study of NPWT closure versus alginate dressings in peri-vascular groin infections: quality of life, pain and cost. J Wound Care. Jun 2015;24(6):252, 254-260. PMID 26075373
23. Masden D, Goldstein J, Endara M, et al. Negative pressure wound therapy for at-risk surgical closures in patients with multiple comorbidities: a prospective randomized controlled study. Ann Surg. Jun 2012;255(6):1043-1047. PMID 22549748
24. Chio EG, Agrawal A. A randomized, prospective, controlled study of forearm donor site healing when using a vacuum dressing. Otolaryngol Head Neck Surg. Feb 2010;142(2):174-178. PMID 20115970
25. Biter LU, Beck GM, Mannaerts GH, et al. The use of negative-pressure wound therapy in pilonidal sinus disease: a randomized controlled trial comparing negative-pressure wound therapy versus standard open wound care after surgical excision. Dis Colon Rectum. Dec 2014;57(12):1406-1411. PMID 25380007
26. Danne J, Gwini S, McKenzie D, et al. A retrospective study of pilonidal sinus healing by secondary intention using negative pressure wound therapy versus alginate or gauze dressings. Ostomy Wound Manage. Mar 2017;63(3):47-53. PMID 28355137
27. Mir A, Guys N, Arianpour K, et al. Negative Pressure Wound Therapy in the Head and Neck: An Evidence-Based Approach. Laryngoscope. Aug 22 2018. PMID 30134500
28. Javed AA, Teinor J, Wright M, et al. Negative Pressure Wound Therapy for Surgical-site Infections: A Randomized Trial. Ann Surg. Oct 10 2018. PMID 30308616
29. Sahebally SM, McKevitt K, Stephens I, et al. Negative Pressure Wound Therapy for Closed Laparotomy Incisions in General and Colorectal Surgery: A Systematic Review and Meta-analysis. JAMA Surg. Nov 1 2018;153(11):e183467. PMID 30267040
30. Tanaydin V, Beugels J, Andriessen A, et al. Randomized Controlled Study Comparing Disposable Negative-Pressure Wound Therapy with Standard Care in Bilateral Breast Reduction Mammoplasty Evaluating Surgical Site Complications and Scar Quality. Aesthetic Plast Surg. Aug 2018;42(4):927-935. PMID 29442143
31. Armstrong DG, Marston WA, Reyzelman AM, et al. Comparison of negative pressure wound therapy with an ultraportable mechanically powered device vs. traditional electrically powered device for the treatment of chronic lower extremity ulcers: a multicenter randomized-controlled trial. Wound Repair Regen. Mar-Apr 2011;19(2):173-180. PMID 21362084
32. Armstrong DG, Marston WA, Reyzelman AM, et al. Comparative effectiveness of mechanically and electrically powered negative pressure wound therapy devices: a multicenter randomized controlled trial. Wound Repair Regen. May-Jun 2012;20(3):332-341. PMID 22564228
33. Marston WA, Armstrong DG, Reyzelman AM, et al. A multicenter randomized controlled trial comparing treatment of venous leg ulcers using mechanically versus electrically powered negative pressure wound therapy. Adv Wound Care (New Rochelle). Feb 1 2015;4(2):75-82. PMID 25713749
34. Lerman B, Oldenbrook L, Eichstadt SL, et al. Evaluation of chronic wound treatment with the SNaP wound care system versus modern dressing protocols. Plast Reconstr Surg. Oct 2010;126(4):1253-1261. PMID 20885246
35. Karlakki SL, Hamad AK, Whittall C, et al. Incisional negative pressure wound therapy dressings (iNPWTd) in routine primary hip and knee arthroplasties: A randomised controlled trial. Bone Joint Res. Aug 2016;5(8):328-337. PMID 27496913
36. Schwartz JA, Goss SG, Facchin F, et al. Single-use negative pressure wound therapy for the treatment of chronic lower leg wounds. J Wound Care. Feb 2015;24 Suppl 2:S4-9. PMID 25647506
37. O'Leary DP, Peirce C, Anglim B, et al. Prophylactic negative pressure dressing use in closed laparotomy wounds following abdominal operations: a randomized, controlled, open-label trial: The P.I.C.O. Trial. Ann Surg. Jun 2017;265(6):1082-1086. PMID 27926575
38. Grauhan O, Navasardyan A, Hofmann M, et al. Prevention of poststernotomy wound infections in obese patients by negative pressure wound therapy. J Thorac Cardiovasc Surg. May 2013;145(5):1387-1392. PMID 23111014
39. Pauser J, Nordmeyer M, Biber R, et al. Incisional negative pressure wound therapy after hemiarthroplasty for femoral neck fractures - reduction of wound complications. Int Wound J. Oct 2016;13(5):663-667. PMID 25125244
40. Vig S, Dowsett C, Berg L, et al. Evidence-based recommendations for the use of negative pressure wound therapy in chronic wounds: steps towards an international consensus. J Tissue Viability. Dec 2011;20 Suppl 1:S1-18. PMID 22119531

41. Willy C, Agarwal A, Andersen CA, et al. Closed incision negative pressure therapy: international multidisciplinary consensus recommendations. Int Wound J. Apr 2017;14(2):385-398. PMID 27170231
42. Hospenthal DR, Murray CK, Andersen RC, et al. Guidelines for the prevention of infections associated with combat-related injuries: 2011 update: endorsed by the Infectious Diseases Society of America and the Surgical Infection Society. J Trauma. Aug 2011;71(2 Suppl 2):S210-234. PMID 21814089
43. Lipsky BA, Berendt AR, Cornia PB, et al. 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. J Am Podiatr Med Assoc. Jan-Feb 2013;103(1):2-7. PMID 23328846
44. Qaseem A, Humphrey LL, Forciea MA, et al. Treatment of pressure ulcers: a clinical practice guideline from the American College of Physicians. Ann Intern Med. Mar 03 2015;162(5):370-379. PMID 25732279
45. Association for the Advancement of Wound Care (AAWC). Guideline of Pressure Ulcer Guidelines. 2014; https://www.o-wm.com/article/association-advancement-wound-care-aawc-venous-and-pressure-ulcer-guidelines. Accessed November 15, 2018.
46. Association for the Advancement of Wound Care (AAWC). International Consolidated Venous Ulcer Guideline (ICVUG) 2015 (Update of AAWC Venous Ulcer Guideline, 2005 and 2010) 2015; https://aawconline.memberclicks.net/assets/docs/appendix%20b-1_icvugevidencesummarytable-v66-18aug17%20-2.pdf. Accessed January 2, 2018.
47. National Institute for Health and Care Excellence (NICE). Negative Pressure Wound Therapy for the Open Abdomen [IPG467]. 2013; https://www.nice.org.uk/guidance/ipg467. Accessed January 2, 2018.
48. National Institute for Health and Care Excellence (NICE). Diabetic Foot Problems: Prevention and Management [NG19]. 2016; https://www.nice.org.uk/guidance/ng19/evidence. Accessed January 2, 2018.

Endnotes

[1] Based on expert opinion