

# Venous Ulcers: Diabetic and Venous Ulcers, Applying the Evidence

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# Biography

- Associate Professor of Family Medicine, University of North Carolina School of Medicine
- Staff Physician, UNC Wound Healing and Podiatry Center
- FMX Sessions:
  - Integumentary: Diabetic and Venous Ulcers: Applying the Evidence, CME089, CME090

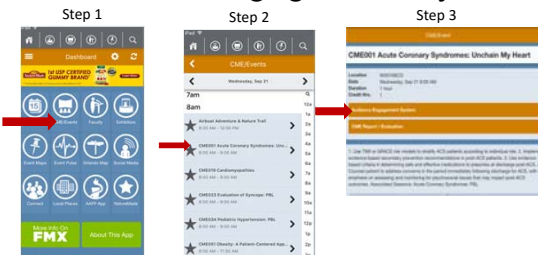


# Learning Objectives

1. Establish protocols to systematically and routinely evaluate all patients at risk of developing diabetic or venous ulcers.
2. Develop collaborative care plans with diabetic patients emphasizing diabetic foot ulcer prevention strategy adherence; and develop collaborative care plans with patients with venous ulcers, emphasizing adherence to strategies aimed at prevention of recurrence.
3. Apply current evidence-based recommendations and guidelines for treatment of diabetic or venous ulcers, coordinating referral to subspecialists as indicated.
4. Establish and coordinate multidisciplinary teams, utilizing a patient-centered care approach, for the care and management of patients with diabetic and venous ulcers.



# Audience Engagement System



## AES Question

Primary care providers who practice in Wound Care Centers:

- YES
- NO

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## Presentation Topics

- Evaluation of diabetic and venous ulcers
- Management of diabetic and venous ulcers
- Engaging the patient

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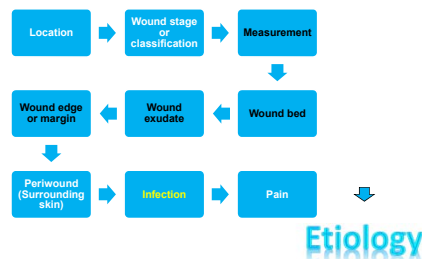
## Presentation Topic #1: Evaluation of Diabetic and Venous Ulcers

### Learning objective:

- Establish protocols to systematically and routinely evaluate all patients at risk of developing diabetic or venous ulcers.

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## Evaluation of Diabetic and Venous Ulcers: Detailed Wound Assessment

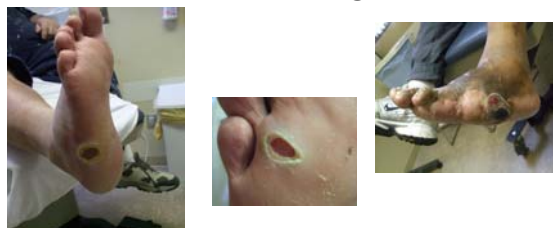


## Wound Assessment: Etiology

	Diabetic	Venous
Location	Foot	Above malleolus (gastrocnemius)
Color (base)	Normal	Ruddy
Granulation tissue	Present	Present
Necrotic tissue	Variable	Rarely present
Exudate	Variable	Moderate to heavy
Depth	Variable	Usually shallow
Wound margins	Well defined	Irregular
Surrounding skin	Flaking, callus	Erythematous, scaly, excoriated, hyperpigmented (stasis dermatitis)
Edema	Variable	Moderate to severe
Skin temperature	Normal or warm	Normal or warm
Infection	Frequent	Less common, variable
Pain	Painless	Minimal unless infected or dehiscent
Peripheral pulses	Present/palpable	Present/palpable
Capillary refill	Normal (<3 sec)	Normal (<3 sec)

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## Wound Assessment: Etiology Diabetic Foot Ulcer



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## Wound Assessment: Etiology Venous Leg Ulcer



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## AES Question

Risk assessment tools for the diabetic foot help screen at-risk patients. Validation studies measuring their diagnostic accuracy have found them to have:

- A. Good positive predictive value (PPV) and positive likelihood ratio (+LR)
- B. Good negative predictive value (NPV) and negative likelihood ratio (-LR)
- C. Both A and B
- D. None of the above

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## Evaluation of Diabetic Ulcers: Who to Screen

- Diabetic Foot Ulcer (DFU)
  - Evidence to support screening interventions to prevent ulceration or amputation among diabetics? **Insufficient (SORT A)**<sup>1</sup>
  - Recommendation: All diabetics should be screened yearly by a trained health care professional, or more frequently if with risk factors for ulceration. (SORT C)<sup>2</sup>

1. Cochrane Database Syst Rev. 2015;(8):CD007610.  
2. Diabetes Care. 2008;31(8):1679-1685.

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## Evaluation of Diabetic Ulcers: How to Screen

- DFU
  - Recommendation: Use any of the several diabetic foot risk stratification systems (e.g., UT, ADA, IWGDF, SIGN, Seattle) [SORT C]<sup>3</sup>
    - Accurate, most have been validated, excellent for screening (good NPV and -LR)
    - If patient does not have neuropathy, PVD, foot deformity, prior ulcer or amputation – very low risk of ulcer or amputation within 12-24 months
    - Issue: if test is positive, no strong evidence that post-screening interventions are effective

3. Eur J Endocrinol. 2012;(3):401-7.

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## Evaluation of Diabetic Ulcers: How to Screen

- DFU
  - History:
    - Prior DFU
    - Prior amputation
    - Age, duration of diabetes
  - Clinical Exam:
    - Neuropathy – 10g monofilament/SWM (5 areas each foot); 128Hz tuning fork (distal phalanx, great toe)
    - PVD – check dorsalis pedis and posterior tibial pulses
    - Foot deformity – able to use off-shelf shoes?

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## Evaluation of Diabetic Ulcers: Post-screening Intervention (SORT C)<sup>4</sup>

ADA Category	Definition	Recommendations	Follow-up
0	No loss of protective sensation (LOPS), No PAD, No deformity	• Pt education on foot care, including appropriate footwear	Yearly (PCP or specialist)
1	LOPS w/wo deformity	• Consider prophylactic surgery if shoes cannot accommodate deformity • Pt education • Prescriptive or accommodative footwear	q3-6 mos (PCP or specialist)
2	PAD w/wo LOPS	• Accommodative footwear • Consider vascular consult	q2-3 mos (specialist)
3	H/o ulcer or amputation	• Pt education on foot care • Consider vascular consult	q1-2 mos (specialist)

4. Diabetes Care. 2008;31(8):1679-1685.

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## AES Question

Strong evidence supports interventions toward:

- A. Primary prevention of venous leg ulcers
- B. Secondary prevention of venous leg ulcers
- C. Both A and B
- D. None of the above

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## Evaluation of Venous Ulcers: Who to Screen

- Venous Leg Ulcer (VLU)
  - Evidence to support screening for secondary prevention of VLU? YES (SORT A)<sup>5</sup>
  - Recommendation:
    - Identify patients in your practice with prior VLU; they are good candidates for compression therapy to prevent recurrence. (SORT A)<sup>5</sup>
    - Insufficient evidence on use of compression for primary prevention of VLU. (SORT A)<sup>6</sup>

5. Cochrane Database Syst Rev. 2014;(9):CD002303.  
6. Cochrane Database Syst Rev. 2013;(12):CD008819.

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## Evaluation of Diabetic Ulcers: Systematic Evaluation

- Evaluation of diabetic pt with foot ulcer<sup>7</sup>
  - Assess neurologic and vascular status of foot
  - Cleanse, debride
  - Detailed wound assessment, probe ulcer
  - Assess for purulence or signs of inflammation
  - Obtain appropriate specimens for culture
  - Consider x-ray or MRI
  - Obtain other appropriate labs (ESR, CBC, Bld cx)
  - Consider ABI or LE arterial dopplers
  - Assess medical comorbidities and psychosocial factors
  - Determine need for surgical consultation

7. Diabetes Metab Res Rev. 2012;28(suppl 1):164.

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## Evaluation of Diabetic Ulcers: DFU Risk Stratification

### Diabetic Foot Infection (DFI) Classification<sup>8</sup>

Clinical description	Infectious Diseases Society of America	International Working Group on the Diabetic Foot
Wound without guidance or any manifestations of inflammation	Uninfected	1
Manifestations of inflammation limited to skin or superficial subcutaneous tissue, or presence of any cellulitis or erythema extending to the local complications or systemic illness	Mild	2
Infection in a patient who is hemodynamically stable and neurologically stable but has any of the following: cellulitis extending to lymphatics, spread beneath fascia, deep tissue abscess, gangrene, osteitis, tendon or joint involvement	Moderate	3
Infection in a patient with hemodynamic instability (e.g., fever, chills, tachycardia, hypotension, confusion, vomiting, tachypnea, anuria, hyperglycemia) or amputation	Severe	4

- Prospectively validated in 1,166 pts
- Reliably predicts hospitalization and amputation

8. Clin Infect Dis. 2007;44(4):562-565.

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## Evaluation of Venous Ulcers: Systematic Evaluation

- Evaluation of pt with venous leg ulcer
  - Assess vascular status of foot
  - Cleanse, debride, detailed wound assessment
  - Assess for signs of clinical infection
  - Obtain appropriate specimens for culture
  - Consider ABI or LE arterial dopplers; venous reflux studies
  - Assess medical comorbidities and psychosocial factors
  - Determine need for surgical consultation
  - Consider use of classification and scoring methods (e.g., CEAP, VCSS, QoL) to quantify burden of disease (SORT C)<sup>9</sup>

9. Phlebology. 2014;29(1 suppl):153-156.

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## Presentation Topic #2: Management of Diabetic and Venous Ulcers

### Learning objectives:

- Establish and coordinate multidisciplinary teams, utilizing a patient-centered care approach, for the care and management of patients with diabetic and venous ulcers.
- Apply current evidence-based recommendations and guidelines for treatment of diabetic or venous ulcers, coordinating referral to subspecialists as indicated.

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## AES Question

Primary care providers who practice inpatient medicine:

- YES
- NO

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## Management of Diabetic Ulcers: Patient-centered Team-based Approach

- Multidisciplinary foot care team
  - For **inpatient** care of pts w/ DFI (*SORT C*)<sup>10</sup>
    - Primary care, surgery, podiatry, ID, endocrine, nursing, nutrition, rehab, social work, care manager
    - **Primary care** – experts in **care coordination**
  - Need for a **care pathway** for managing each pt (*SORT C*)<sup>11,12</sup>
  - Approach must be centered on the patient

10. *BMJ*. 2011;342:d1280.  
11. *Vasc Surg*. 2010;52(3 suppl):35–165.  
12. *Endocrine*. 2010;38(1):87–92.

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## Management of Diabetic Ulcers: Treatment Based on Severity<sup>13</sup>

IDSA Class	Pathogen	Antibiotics	MRSA Coverage
Uninfected		No	
Mild, Moderate	G+ cocci	<b>Oral (1-2wks duration)</b>	
		Amoxicillin/clavulanate, Cefdinir, Cephalexin, Dicloxacillin, Levofloxacin, Clindamycin*	No
		Doxycycline, TMP-SMX, Clindamycin*, Linezolid	Yes
Moderate, Severe	G+ cocci; G-rods; anaerobes	<b>Intravenous (2-3 wks duration)</b>	
		Ampicillin/sulbactam, Cefoxitin, Ceftriaxone, Clindamycin/fluoroquinolones*, Ertapenem, Imipenem/cilastin, Moxifloxacin, Piperacillin/tazobactam, Ticarcillin/clavulanate	No
		Vancomycin, Daptomycin, Tigecycline, Linezolid	Yes

13. *Am Fam Physician*. 2013 Aug 1;88(3):177-184.

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## Management of Diabetic Ulcers: Diabetic Foot Osteomyelitis<sup>14</sup>

Bone or Joint Infection	Route of Admin	Duration of Tx
No residual infected tissue (e.g., postamputation)	PO or IV	2-5 days
Residual infected soft tissue (but not bone)	PO or IV	1-3 weeks
Residual infected (but viable) bone	Initially IV, then oral	4-6 weeks
No surgery, or residual dead bone postop	Initially IV, then oral	≥ 3 months

- No regimen, route, or duration has been found to be superior

14. *Clin Infect Dis*. 2012;54(12):e158.

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## Management of Diabetic Ulcers: Moderate to Severe DFI

- Surgical Interventions:
  - I & D of abscess
  - Debridement
  - Revascularization
  - Amputation

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## AES Question

Which DFU treatment is supported by the strongest evidence?

- A. Hyperbaric oxygen therapy (HBOT)
- B. Negative pressure wound therapy (NPWT)
- C. Off-loading with non-removable cast

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## Management of Diabetic Ulcers: Dressings

Treatment	Comments	Cochrane Reference
Hydrogel	<ul style="list-style-type: none"> <li>Effective for low-grade DFU compared to gauze dressing (possible bias in studies)</li> </ul>	15. Cochrane Database Syst Rev. 2013;(3):CD009101.
Hydrocolloid, alginate, foam	<ul style="list-style-type: none"> <li>Insufficient evidence</li> <li>Use may be justified by cost and wound mx properties (e.g., exudate mx)</li> </ul>	16. Cochrane Database Syst Rev. 2013;(3):CD009099. 17. Cochrane Database Syst Rev. 2013;(3):CD009110. 18. Cochrane Database Syst Rev. 2013;(3):CD009111.
Silver-containing dressings	<ul style="list-style-type: none"> <li>Insufficient evidence to treat DFU or to treat/prevent wound infection in general</li> </ul>	19. Cochrane Database Syst Rev. 2006;(2):CD005082. 20. Cochrane Database Syst Rev. 2010;(2):CD006478. 21. Cochrane Database Syst Rev. 2007;(2):CD005486.
Honey	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	22. Cochrane Database Syst Rev. 2015;(3):CD005083.

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## Management of Diabetic Ulcers: Topical and Systemic Therapy

Treatment	Comments	Cochrane Reference
Platelet-rich plasma (PRP), autologous	<ul style="list-style-type: none"> <li>May be effective (based on low-quality evidence)</li> </ul>	23. Cochrane Database Syst Rev. 2016;(5):CD006899.
Negative pressure wound therapy (NPWT)	<ul style="list-style-type: none"> <li>May be effective for post-op wound healing compared to moist dressings (limited evidence)</li> </ul>	24. Cochrane Database Syst Rev. 2013;(2):CD010118.
Topical negative pressure (TNP)	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	25. Cochrane Database Syst Rev. 2008;(2):CD001898.
Granulocyte-colony stimulating factors (G-CSF)	<ul style="list-style-type: none"> <li>Limited evidence suggests G-CSF:                             <ul style="list-style-type: none"> <li>not effective for ulcer healing</li> <li>Reduces need for surgery (amputations) and duration of hospitalization</li> </ul> </li> <li>*Consider adding G-CSF to usual care for limb-threatening infection</li> </ul>	26. Cochrane Database Syst Rev. 2013;(3):CD006810.

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## Management of Diabetic Ulcers: Other Therapies

Treatment	Comments	Cochrane Reference
Hyperbaric oxygen therapy (HBOT)	<ul style="list-style-type: none"> <li>Effective for healing DFU in the short term but NOT long term (methodological flaws)</li> </ul>	27. Cochrane Database Syst Rev. 2015;(6):CD004121.
Off-loading (pressure relief)	<ul style="list-style-type: none"> <li>Non-removable casts more effective than removable casts or dressings</li> <li>Non-removable casts + Achilles tendon lengthening more effective than non-removable cast alone</li> </ul>	28. Cochrane Database Syst Rev. 2013;(2):CD002302.
Debridement	<ul style="list-style-type: none"> <li>Autolytic: hydrogel increases healing rate compared to gauze or usual care</li> <li>Biologic: larval therapy better than hydrogel in reducing size of diabetic wounds</li> <li>Surgical: no better than standard tx</li> </ul>	29. Cochrane Database Syst Rev. 2010;(2):CD003556.

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## Management of Venous Ulcers: Dressings & Topical Therapy

Treatment	Comments	Cochrane Reference
Alginate, foam	<ul style="list-style-type: none"> <li>Insufficient evidence of superiority over other dressings</li> <li>Use may be justified by cost and wound mx properties (e.g., exudate mx)</li> </ul>	30. Cochrane Database Syst Rev. 2015;(8):CD010182. 31. Cochrane Database Syst Rev. 2013;(2):CD009907.
Silver-containing dressings	<ul style="list-style-type: none"> <li>Insufficient evidence to treat or prevent wound infection</li> </ul>	30. Cochrane Database Syst Rev. 2010;(2):CD006478. 21. Cochrane Database Syst Rev. 2007;(2):CD005486.
Honey	<ul style="list-style-type: none"> <li>Insufficient evidence for VLU</li> </ul>	22. Cochrane Database Syst Rev. 2015;(3):CD005083.
Cadexomer iodine dressing	<ul style="list-style-type: none"> <li>Effective for healing VLU compared to standard dressing</li> </ul>	32. Cochrane Database Syst Rev. 2014;(5):CD003557.
Ibuprofen dressings; EMLA 5%	<ul style="list-style-type: none"> <li>Effective for pain relief</li> </ul>	33. Cochrane Database Syst Rev. 2012;(3):CD001177.

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## Management of Venous Ulcers: Topical & Physical Therapies

Treatment	Comments	Cochrane Reference
Bioengineered skin (human skin equivalent)	<ul style="list-style-type: none"> <li>Bilayer artificial skin + compression: effective for VLU healing</li> </ul>	34. Cochrane Database Syst Rev. 2013;(11):CD001737.
Aloe vera	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	35. Cochrane Database Syst Rev. 2012;(2):CD008762.
Platelet-rich plasma (PRP), autologous	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	23. Cochrane Database Syst Rev. 2016;(5):CD006899.
Topical negative pressure (TNP)	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	25. Cochrane Database Syst Rev. 2008;(2):CD001898.
Therapeutic ultrasound	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	36. Cochrane Database Syst Rev. 2010;(3):CD001180.
Electromagnetic therapy	<ul style="list-style-type: none"> <li>Insufficient evidence</li> </ul>	37. Cochrane Database Syst Rev. 2013;(5):CD002933.

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## Management of Venous Ulcers: Systemic Therapies & Surgery

Treatment	Comments	Cochrane Reference
Oral pentoxifylline	<ul style="list-style-type: none"> <li>Effective adjunct to compression</li> <li>May be effective monotherapy</li> </ul>	38. Cochrane Database Syst Rev. 2012;(3):CD001733.
Oral zinc	<ul style="list-style-type: none"> <li>Not effective for VLU</li> </ul>	39. Cochrane Database Syst Rev. 2012;(2):CD001273.
Flavonoids	<ul style="list-style-type: none"> <li>Insufficient evidence for VLU</li> </ul>	40. Cochrane Database Syst Rev. 2013;(2):CD006477.
Hyperbaric oxygen therapy (HBOT)	<ul style="list-style-type: none"> <li>Insufficient evidence for VLU</li> </ul>	27. Cochrane Database Syst Rev. 2015;(6):CD004121.
Endovenous thermal ablation	<ul style="list-style-type: none"> <li>Insufficient evidence on venous ulcer healing, recurrence or QOL</li> </ul>	41. Cochrane Database Syst Rev. 2013;(10):CD009494.

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## Management of Venous Ulcers: Compression Therapy

Treatment	Comments	Cochrane Reference
Compression therapy	<ul style="list-style-type: none"> <li>Effective for treatment and secondary prevention of VLU</li> <li>Multilayer more effective than unilayer</li> <li>Two-layer = four-layer</li> <li>Higher compression better than lower compression</li> <li>Compliance is low</li> </ul>	42. Cochrane Database Syst Rev. 2012;(3):CD000265. 43. Cochrane Database Syst Rev. 2014;(3):CD002303.
Intermittent pneumatic compression (IPC)	<ul style="list-style-type: none"> <li>Effective compared to no compression</li> <li>Insufficient evidence as a substitute to compression bandages</li> <li>Limited evidence: IPC + compression more effective than compression alone</li> <li>Rapid IPC more effective than slow IPC</li> </ul>	44. Cochrane Database Syst Rev. 2014;(5):CD001899.

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## Presentation Topic #3: Engaging the Patient

### Learning objective:

- Develop collaborative care plans with diabetic patients emphasizing diabetic foot ulcer prevention strategy adherence; and develop collaborative care plans with patients with venous ulcers, emphasizing adherence to strategies aimed at prevention of recurrence.

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## Presentation Topic #3: Engaging the Patient

- Collaborative Care Plan
  - Diabetic Ulcer and Amputation Prevention
    - Primary and secondary prevention: Patient education interventions improve foot care knowledge and behavior in the short term, but NOT rates of amputation or ulceration. (SORT A)<sup>45,46</sup>
  - Venous Leg Ulcer Prevention
    - Insufficient evidence that pt education increases compliance with compression therapy. (SORT A)<sup>47</sup>

45. Cochrane Database Syst Rev. 2012;(4):CD001488.  
 46. Diabetologia. 2008 Nov;51(11):1954-61.  
 47. Cochrane Database Syst Rev. 2016;(3):CD008378.

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## Practice Recommendations

- Perform, at least, yearly diabetic foot exams and consider use of diabetic foot risk stratification tools to identify pts at risk for DFU (SORT C). Identify pts with prior VLU; they will benefit from lifelong compression therapy to prevent recurrence (SORT A).
- Systematic evaluation of pts with DFU and VLU includes neurologic (DFU only) and vascular foot assessment, cleansing, debridement, detailed wound assessment, probing (DFU only), obtaining culture, imaging & labs, assessing comorbidities, considering consultation, and using DFU and VLU risk classification tools (SORT C).
- Weak evidence supports the establishment of multidisciplinary foot care teams that utilize care pathways for inpatient management of DFU (SORT C). The primary care physician carries the important role of coordinating care among different specialties and of advocating for patients and their holistic treatment (SORT C).

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## Practice Recommendations

- Evidence-based therapies for DFU include non-removable casts w/o Achilles tendon lengthening (SORT A), use of hydrogel for dry low-grade ulcers, systemic G-CSF for severe DFI, NPWT postoperatively, and HBOT short term (SORT B). Evidence-based therapies for venous leg ulcers include compression therapy, oral pentoxifylline, and bilayer artificial skin w/ compression (SORT A). Cadexomer iodine dressings assist w/ healing (SORT B). Ibuprofen dressings and EMLA are helpful for pain control (SORT B).
- Among diabetics, collaborative care plans that focus on pt education improve knowledge and behavior in the short-term, but NOT rates of ulceration or amputation (SORT A). For VLU, compliance to compression therapy remains challenging and the role of pt education to address this remains unclear (SORT A).

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## Questions

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## References

1. Cochrane Database Syst Rev. 2015; (8):CD007610.
2. Diabetes Care. 2008;31(8):1679-1685.
3. Eur J Endocrinol. 2012;(3):401-7.
4. Diabetes Care. 2008;31(8):1679-1685.
5. Cochrane Database Syst Rev. 2014; (9):CD002303.
6. Cochrane Database Syst Rev. 2013; (12):CD008819.
7. Diabetes Metab Res Rev. 2012;28 (suppl 1):164.
8. Clin Infect Dis. 2007;44(4):562-565.
9. Phlebology. 2014;29(1 suppl):153-156.
10. BMJ. 2011;342:d1280.
11. Vasc Surg. 2010;52(3 suppl):3S-16S.
12. Endocrine. 2010;38(1):87-92.
13. Am Fam Physician. 2013 Aug 1;88(3):177-184.
14. Clin Infect Dis. 2012;54(12):e158.
15. Cochrane Database Syst Rev. 2013; (3):CD009101.
16. Cochrane Database Syst Rev. 2013; (3):CD009099.
17. Cochrane Database Syst Rev. 2013; (3):CD009110.
18. Cochrane Database Syst Rev. 2013; (3):CD009111.
19. Cochrane Database Syst Rev. 2006; (2):CD005082.

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## References

20. Cochrane Database Syst Rev. 2010; (2):CD006478.
21. Cochrane Database Syst Rev. 2007; (2):CD005486.
22. Cochrane Database Syst Rev. 2015; (3):CD005083.
23. Cochrane Database Syst Rev. 2016;(5):CD006899.
24. Cochrane Database Syst Rev. 2013; (2):CD010318.
25. Cochrane Database Syst Rev. 2008; (2):CD001898.
26. Cochrane Database Syst Rev. 2013; (3):CD006810.
27. Cochrane Database Syst Rev. 2015; (6):CD004123.
28. Cochrane Database Syst Rev. 2013; (2):CD002302.
29. Cochrane Database Syst Rev. 2010; (2):CD003556.
30. Cochrane Database Syst Rev. 2015; (8):CD010182.
31. Cochrane Database Syst Rev. 2013; (2):CD009907.
32. Cochrane Database Syst Rev. 2014; (5):CD003557.
33. Cochrane Database Syst Rev. 2012; (3):CD001177.

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## References

34. Cochrane Database Syst Rev. 2013; (1):CD001737.
35. Cochrane Database Syst Rev. 2012; (2):CD008762.
36. Cochrane Database Syst Rev. 2010; (3):CD001180.
37. Cochrane Database Syst Rev. 2013; (5):CD002933.
38. Cochrane Database Syst Rev. 2012; (3):CD001733.
39. Cochrane Database Syst Rev. 2012; (2):CD001273.
40. Cochrane Database Syst Rev. 2013; (2):CD006477.
41. Cochrane Database Syst Rev. 2013; (10):CD009494.
42. Cochrane Database Syst Rev. 2012; (3):CD000265.
43. Cochrane Database Syst Rev. 2014; (9):CD002303.
44. Cochrane Database Syst Rev. 2014; (5):CD001899.
45. Cochrane Database Syst Rev. 2012; (4):CD001488.
46. Diabetologia. 2008 Nov;51(11):1954-61.
47. Cochrane Database Syst Rev. 2016; (3):CD008378.

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## Billing & Coding

When services performed in conjunction with:

Office Visit 992xx  
Nutritional Therapy 97802-97804

Additional tests to confirm or monitor:

99490 Chronic Care Management-20 minutes monthly

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