

Wound  
Care for  
the  
Primary  
Care  
Provider

Hillary Hopkins MD

Wound Evolution Overland Park

November 13, 2021

# Objectives

- Identify common wound types
- Plan basic wound evaluation
- Evidence-based treatment plan for management of wounds
- Prevention of wounds

# Venous Ulcers

# Venous Ulcers

- Most common (1% of population)
- Location usually medial and lateral malleolar, posterior calf, lower leg
- Irregular margins with a pink or red base
- Often heavy exudate

# Venous Ulcers

- Venous hypertension is associated with histologic and ultrastructural changes in the capillary and lymphatic microcirculation that produce important physiologic changes, which include capillary leak, fibrin deposition, erythrocyte and leukocyte sequestration, thrombocytosis, and inflammation. These processes impair oxygenation of the skin and subcutaneous tissues. The clinical manifestations of severe venous hypertension and tissue hypoxia are edema, hyperpigmentation, subcutaneous fibrosis, and ulcer formation

Venous ulcer



# Venous Ulcer

Can be painful

Can be circumferential

Note tissue maceration from large drainage



# Treatment Evidence

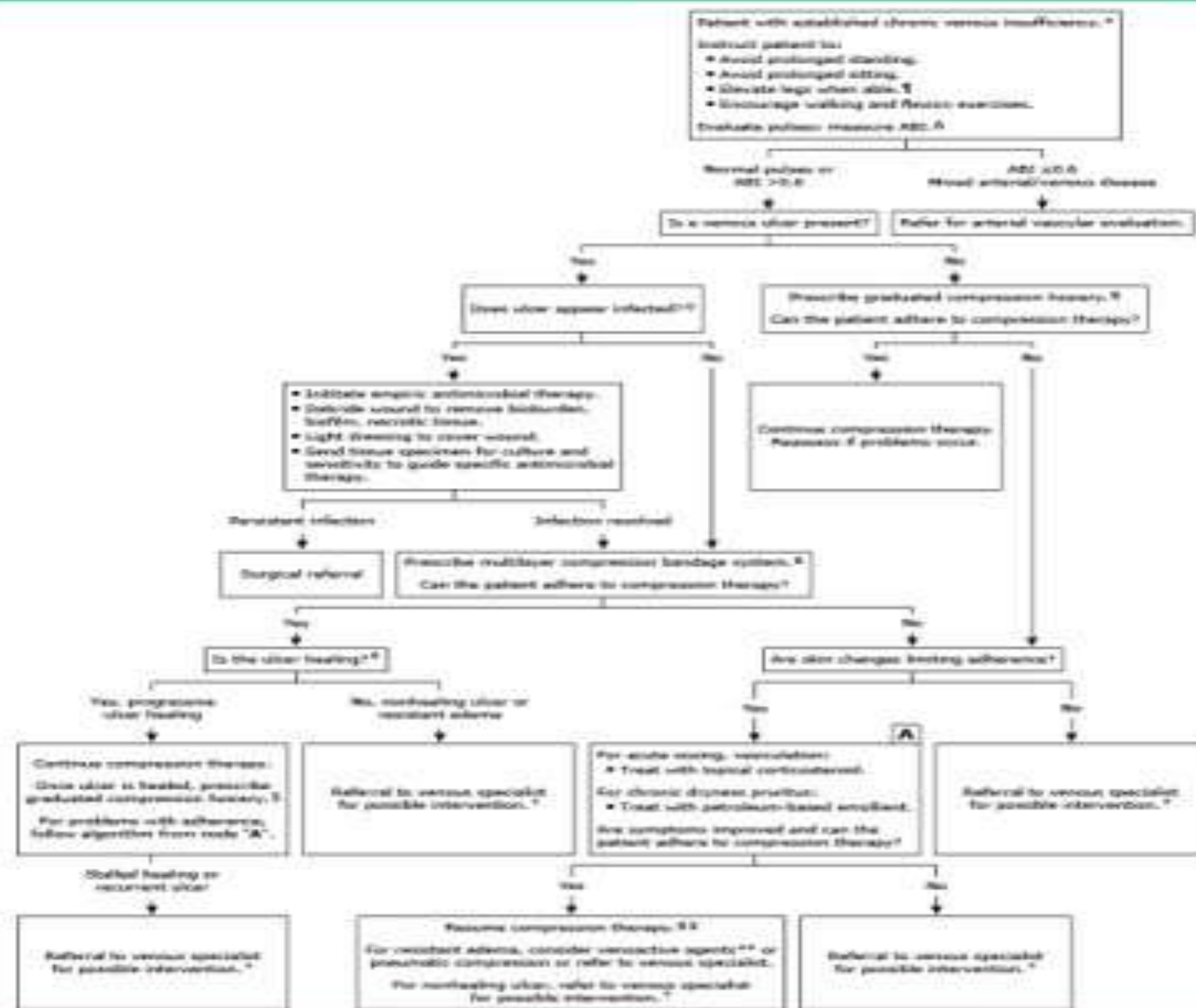
## SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	Comments
Arterial pulse examination and measurement of ankle-brachial index are recommended for all patients with suspected venous ulcers. <sup>1</sup>	C	Based on a clinical practice guideline on disease-oriented outcome
Color duplex ultrasonography is recommended in patients with venous ulcers to assess for venous reflux and obstruction. <sup>1</sup>	C	Based on a clinical practice guideline on disease-oriented outcome
Further evaluation with biopsy or referral to a subspecialist is warranted for venous ulcers if healing stalls or the ulcer has an atypical appearance. <sup>1,5</sup>	C	Based on a clinical practice guideline and clinical review on disease-oriented outcome
Compression therapy is beneficial for venous ulcer treatment and is the standard of care. <sup>1,28</sup>	A	Based on a clinical practice guideline on disease-oriented outcome and systematic review of moderate-quality evidence
Dressings are recommended to cover venous ulcers and promote moist wound healing. No one dressing type has been shown to be superior when used with appropriate compression therapy. <sup>1,18</sup>	C	Based on a clinical practice guideline on disease-oriented outcome and review article
Pentoxifylline is effective when used as monotherapy or with compression therapy for venous ulcers. <sup>1,19,39</sup>	A	Based on a clinical practice guideline on disease-oriented outcome, commentary, and Cochrane review of randomized controlled trials
Early endovenous ablation to correct superficial venous reflux improves ulcer healing rates. <sup>21</sup>	B	Based on one randomized controlled trial of more than 400 patients

**A** = consistent, good-quality patient-oriented evidence; **B** = inconsistent or limited-quality patient-oriented evidence; **C** = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <https://www.aafp.org/afpsort>.



## Algorithm for initial conservative management of chronic venous insufficiency



This algorithm is intended for use in conjunction with additional UpToDate content on chronic venous disease.

ABI: ankle-brachial index.

# Multi-layer Compression Wraps



# Unna boot

Zinc- impregnated



# Venous Ulcers - Compression

**Compression stockings in chronic venous disorders**

<b>Class</b>	<b>Pressure</b>	<b>Level of support</b>	<b>Indication</b>	<b>CEAP*</b>
OTC <sup>†</sup>	<15 mmHg	Minimal	Asymptomatic individuals as needed for comfort	0,1
I	15-20 mmHg	Mild	Minor varicosities; tired, aching legs; minor ankle, leg, or foot swelling	1,2,3
II	20-30 mmHg	Moderate	Moderate to severe varicosities, moderate swelling, phlebitis, following vein ablation	3,4
III	30-40 mmHg	Firm	Severe varicosities, severe swelling, management of active ulceration, following DVT, post-surgery	4,5,6
IV	>40 mmHg	Extra firm	Lymphedema	NA

DVT: deep vein thrombosis; NA: not applicable.

\* Clinical-Etiologic-Anatomic-Physiologic classification of chronic venous disorders.

† OTC: Over-the-counter, no prescription needed.

# Venous Ulcers - Prevention

- The continued use of graduated compression hosiery after ulcer healing reduces recurrence, and patients should be offered the strongest compression (up to 40 mmHg) with which they can comply. In one study with 36 months follow-up, ulcers recurred in 100 percent of patients who were noncompliant versus 16 percent in those who were.

# Diabetic Ulcers

# Diabetic Ulcer

- Location over pressure points, plantar surface of foot, over metatarsal heads, heel
- Calloused border or even present under a callus
- Usually not painful, but can be when infection or mixed etiology (ie arterial)

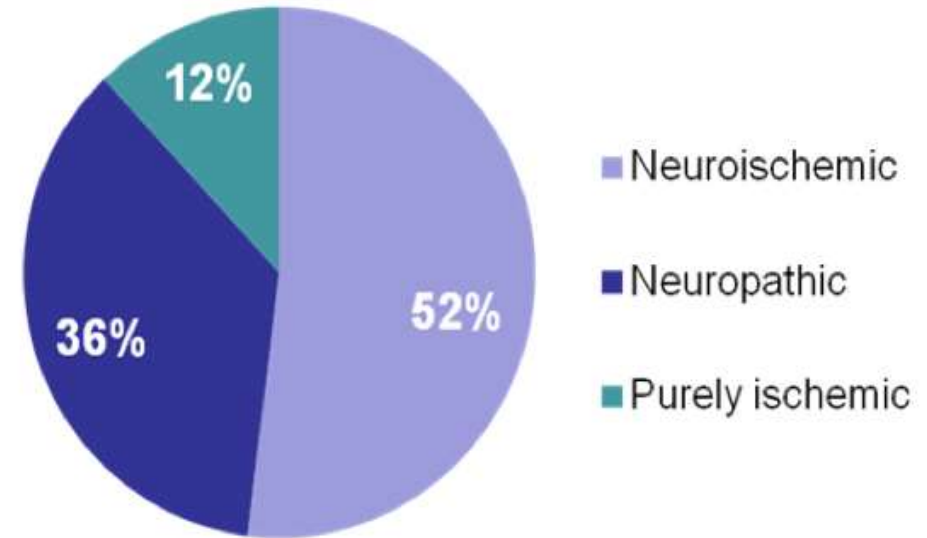
# Diabetic Foot Ulcers

- The lifetime risk of a foot ulcer in patients with diabetes (type 1 or 2) may be as high as 34 percent.
- Diabetic foot ulcers are a major cause of morbidity, accounting for at least two-thirds of all nontraumatic amputations performed in the United States
- Infected or ischemic diabetic foot ulcers account for approximately 25 percent of all hospital stays for patients with diabetes.
- Patients with diabetes with or without a diabetic foot ulcer have increased rates of depression, and expressing signs of depression is associated with an increased risk of diabetic foot ulcers



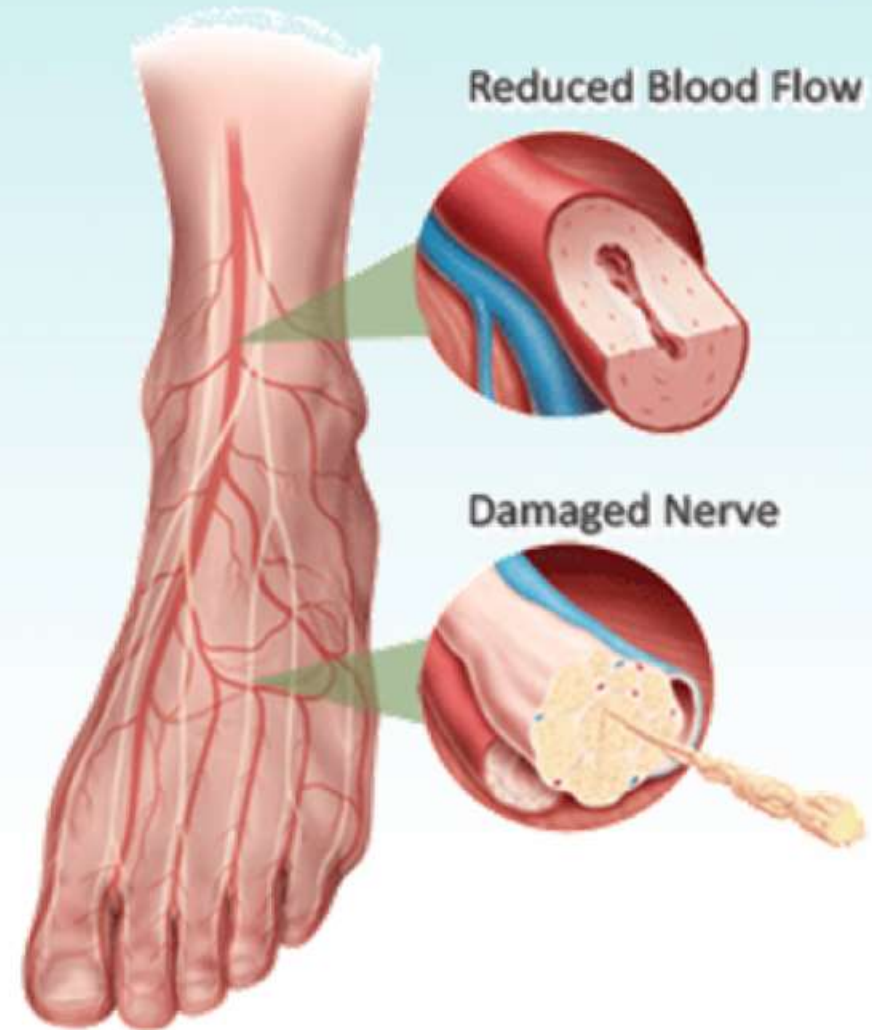
- Peripheral vascular disease and peripheral neuropathy are risk factors for diabetic foot ulcers (DFUs)<sup>1</sup>
- The pathogenesis of DFUs may be neuropathic, ischemic, or a combination of both (neuroischemic)<sup>1</sup>

### Pathogenesis of DFUs (N=298)<sup>1</sup>



1. Oyibo SO, et al. *Practical Diabetes Int.* 2002;19(1):10-12.

- In patients with diabetes, PAD can be compounded by peripheral neuropathy and insensitivity of feet to pain and trauma
- Impaired circulation and impaired sensitivity may lead to ulceration and infection



<b>Wagner score</b>	<b>Description</b>
Grade 0	No open ulceration, but with possible existence of bone deformation or hyperkeratosis
Grade 1	Superficial ulceration, but without penetration to deeper tissues
Grade 2	Deeper extension into tendons, bones, or joint capsule, which may be exposed
Grade 3	Presence of tendonitis, osteomyelitis, cellulitis, or deeper tissue abscess
Grade 4	Wet or dry gangrene of toe or dorsum of the foot, often with plantar infection
Grade 5	Extensive gangrene of the foot, with necrotic lesions and soft tissue infections indicating higher amputation

# Diabetic foot ulcer

Heel ulcer at presentation with infection and necrotic tissue at wound base



# Diabetic foot ulcer

After surgical debridement with excision of necrotic tissue



# Diabetic foot ulcer

Chronic ulcer present for >2 years



# Diabetic Foot Ulcer

Plantar foot ulcer due to neuropathy with periwound callus



# Diabetic Foot Ulcers - Prevention

**Preventive foot care** — In conjunction with the comprehensive foot exam, advice for prophylactic foot care should be given to all patients.

- Avoid smoking
- Avoid going barefoot, even at home, and especially on hot decks and hot sand
- Test water temperature before stepping into a bath
- Trim toenails to shape of the toe, and remove sharp edges with a nail file; do not cut cuticles. \*SEE PODIATRIST FOR FOOT CARE
- Wash in lukewarm water, dry thoroughly (including between the toes), and check feet daily
- Shoes should be snug, but not tight, and customized if feet are misshapen or have ulcers
- Socks should fit and be changed daily
- For the prevention of recurrent foot ulcers, customized footwear to reduce plantar pressure and daily foot skin temperature measurements with subsequent preventive action showed some benefit.
- The use of customized shoes reduced the development of a recurrent foot ulcer from 58 to 28 percent over one year of follow-up



# Arterial Ulcers

# Arterial Ulcers

- Common locations: over toe joints, malleoli, anterior shin, base of heel, pressure points
- Irregular margins
- Wound base often dry, can be necrotic
- Skin changes often include shiny skin, loss of hair, dependent rubor of leg and foot
- Painful

# Arterial Ulcers



# Arterial ulcer

Deep, Punched out appearance

May have eschar obscuring wound base



PAD can occur in any blood vessel, but it is more common in the legs

Approximately 8.5 million people in the United States have PAD, including 12–20% of individuals older than age 60.

Risk Factors: smoking, HTN, HLD, CAD, DM, obesity, age > 60, ethnicity.

Men and Women affected equally.

# Arterial Ulcers

The most common causes of arterial ulcers are:

- Restrictions to blood vessels due to peripheral vascular disease
- Chronic vascular insufficiency
- Vasculitis (inflammatory damage of blood vessels)
- Diabetes mellitus
- Renal failure
- High blood pressure
- Arteriosclerosis (hardening of the arteries)
- Atherosclerosis (thickening of the arteries, due to the buildup of fatty materials)
- Trauma
- Limited joint mobility
- Increased age

# Arterial Ulcers

Risk factors may contribute to the development of an arterial ulcer including the following comorbidities and conditions:

- Diabetes mellitus
- Foot deformity and callus formation resulting in focal areas of high pressure
- Poor footwear that inadequately protects against high pressure and shear
- Obesity
- Absence of protective sensation due to peripheral neuropathy
- Limited joint mobility

# Arterial Ulcer

fingertips





# Arterial Ulcers - Prevention

- Tobacco cessation
- Managing HTN, Hyperlipidemia
- Avoid cold
- Avoid trauma/injury
- Maintain skin moisture

# Pressure Ulcers

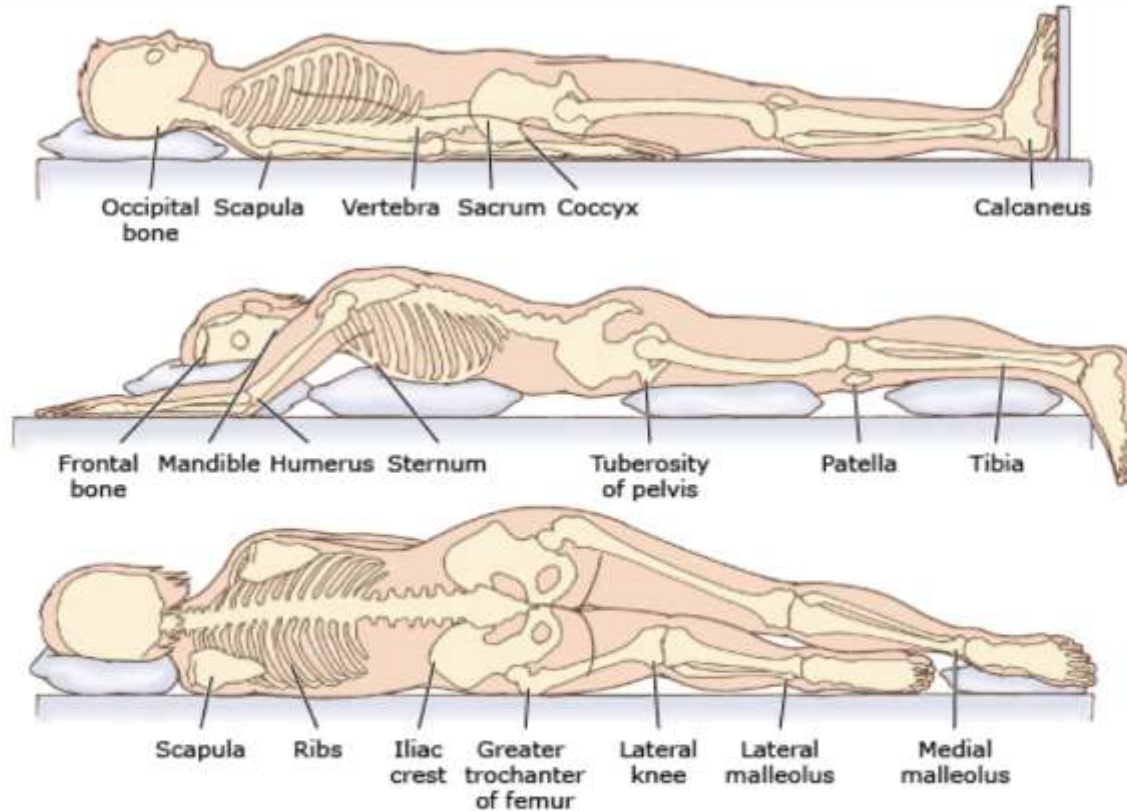
# Pressure Ulcers

- Pressure-induced skin and soft tissue injuries are localized areas of damage to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure or pressure in combination with shear (over sacrum, calcaneus, ischium).
- The superficial skin is less susceptible to pressure-induced damage than deeper tissues, and thus, the external appearance may underestimate the extent of damage.
- Lesions are typically related to immobility (ie, bed-bound or chair-bound individual) but can also result from poorly fitting casts or other medical equipment or devices.

# Pressure Ulcers

## Sites associated with pressure-induced injury

---



---

Common sites for development of pressure-induced skin and soft tissue injury.

*Reproduced with permission from: Taylor CR, Lillis C, LeMone P, Lynn P. Fundamentals of Nursing: The Art And Science Of Nursing Care, Sixth Edition. Philadelphia: Lippincott Williams & Wilkins, 2008. Copyright © 2008 Lippincott Williams & Wilkins.*

## Staging of pressure-induced skin and soft tissue injuries <sup>[1]</sup>

Stage	Description
1	Skin intact but with non-blanchable redness for >1 hour after relief of pressure.
2	Blister or other break in the dermis with partial thickness loss of dermis, with or without infection.
3	Full-thickness tissue loss. Subcutaneous fat may be visible; destruction extends into muscle with or without infection. Undermining and tunneling may be present.
4	Full-thickness skin loss with involvement of bone, tendon, or joint, with or without infection. Often includes undermining and tunneling.
Unstageable	Full-thickness tissue loss in which the base of the ulcer is covered by slough and/or eschar in the wound bed.
Deep tissue pressure injury	Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying tissue from pressure and/or shear.

### Reference:

1. National Pressure Injury Advisory Panel. NPIAP Pressure Injury Stages. Available at: <https://npiap.com/page/PressureInjuryStages> (Accessed on January 29, 2020).

# Pressure Ulcer

Buttock pressure ulcer with hypergranulation



# Pressure ulcer

Sacral ulcer with eschar



# Pressure Ulcer

Heel





# Pressure Ulcers - Prevention

- Pressure redistribution is the most important factor for prevention. Bed-bound patients should be repositioned at least every two hours to relieve tissue pressure ([Grade 2C](#)). Proper positioning and turning techniques should be used to minimize friction and shear forces.
- Use pressure-reducing products for patients at increased risk for developing pressure-induced skin and soft tissue injuries ([Grade 1A](#)). Ex: overlays, foam, gel supports, dynamic devices (depending upon patient risk factors and the availability of resources)
- Other measures:
  - improving mobility (physical therapy, decreased use of sedatives)
  - improving skin perfusion
  - providing proper skin care including minimizing excess moisture
  - correcting malnutrition
- Education of clinical staff, patients, and families

Surgical wounds

# Surgical Wound

Wound dehiscence of breast flap after mastectomy



# Surgical Wound

Moh's micrographic surgery for excision of basal cell carcinoma of the leg



# Surgical wound

Abdominal wound dehiscence after  
panniculectomy



# Surgical wound

Wound progression



# Surgical wound

After treatment with NPWT



# Trauma Wounds



# Trauma Wounds

- Tdap
- Clean wound
- Rule out underlying injury or foreign body
- Prevent/manage infection

# Trauma Wound

"Road rash"



Burns

# Burns

- TDaP
- Clean wound.
- Can leave blisters intact depending on size and location (differing opinions on this)
- Prevent/Manage infection
- Debridement (necrotic tissue, ruptured blisters)
- Pain management

# Burn

Toes with second degree burn from boiling water



# Burn

Progression



# References

- Cleveland Clinic. Lower Extremity (Leg and Foot) Ulcers. Cleveland Clinic. <http://my.clevelandclinic.org/heart/disorders/vascular/legfootulcer.aspx>.
- Gabriel A. Vascular Ulcers. Medscape Reference. <http://emedicine.medscape.com/article/1298345-overview>.
- London Health Sciences Centre. Venous Stasis & Arterial Ulcer Comparison. London Health Sciences Centre. [http://www.lhsc.on.ca/Health\\_Professionals/Wound\\_Care/venous.htm](http://www.lhsc.on.ca/Health_Professionals/Wound_Care/venous.htm).
- Takahashi P. Chronic Ischemic, Venous, and Neuropathic Ulcers in Long-Term Care. Annals of Long-Term Care. <http://www.annalsoflongtermcare.com/article/5980>.

# References

- **UpToDate: Medical management of lower extremity chronic venous disease. Authors:** [Barbara M Mathes, MD, FACP, FAAD, Lowell S Kabnick, MD, RPhS, FACS, FACPh, Patrick C Alguire, MD, FACP](#)
- **UpToDate: Prevention of pressure-induced skin and soft tissue injury. Author:** [Dan Berlowitz, MD, MPH](#)
- **UpToDate: Management of diabetic foot ulcers. Authors:** [David G Armstrong, DPM, MD, PhD, Richard J de Asla, MD](#)
- [The Vascular Society for Great Britain and Ireland](#)