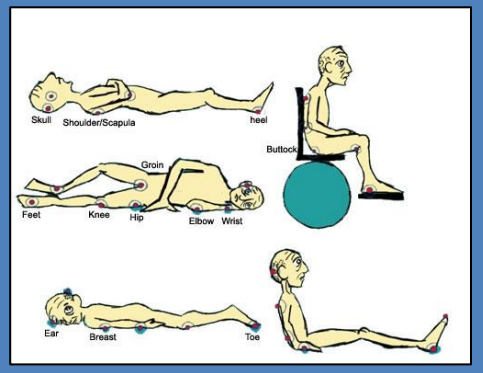
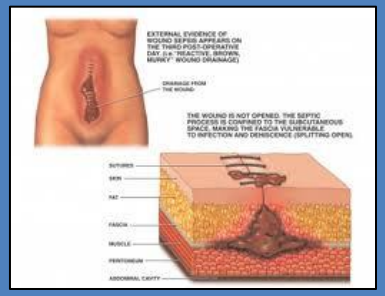
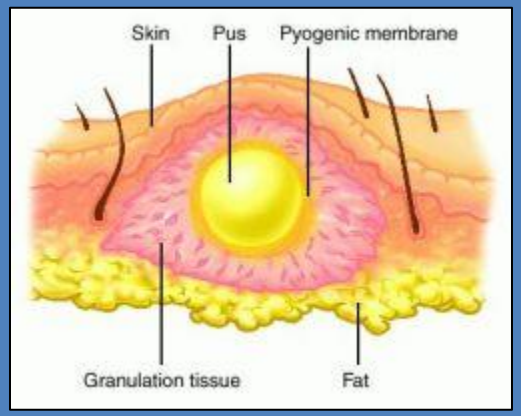


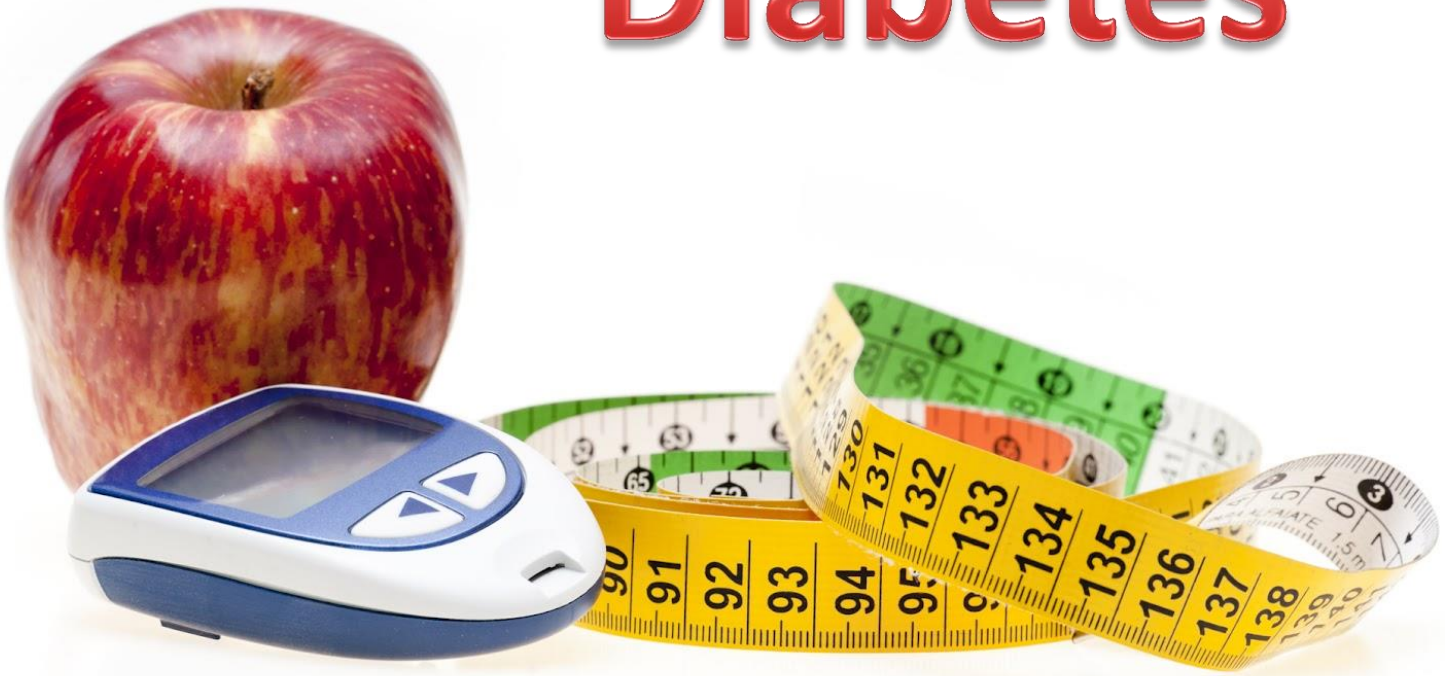
Common Diagnoses





Part II of Wound Care Module
Created by Michelle O'Neill

Diabetes[15,16]



DM: Statistics

- 25% of DFU's will become infected
- 8% will require hospitalization
- 4.3% of all diabetics will undergo an amputation
- 20% of all diabetics will die from a direct complication of diabetes

DM: A Practical Guide

- Identify the etiology of the wound and the barriers to wound healing at each visit
- Evaluate: presence of comorbidities that affect wound healing
  - ex: ESRD, cardiovascular dz, PVD, pulm dz
- Don’t overlook social history!
  - ex: smoking, alcohol use

DM: Evaluate

- Wound Age
- Wound Size
  - 50% decrease in wound size in a 4-wk period= reliable predictor of healing potential
  - 20% increase in wound size over 2 wks=reliable indicator of underlying infection

DM: Risk Assessment

- Any wound changes indicative of infection should be rapidly addressed
  - ±Erythema, edema, purulent drainage
  - INCREASE IN WOUND SIZE
- Depth of the wound should be assessed
  - Probe to bone test helps to identify osteomyelitis

DM: Anti-microbial Agents[19]

- Decrease bio-burden/ reduce infection
- The literature supports the use of systemic agents to eliminate bacteria
  - Literature does not support the use of topical agents containing silver or silver based wound dressings

DM: Tissue Perfusion[19]

- Regularly monitor pt's vascular status
  - i.e. ABI

- Indication of compromised perfusion or limb ischemia= Referral for arterial or transcutaneous oxygen studies!

DM: Proper Off-loading

- Must decrease force over time to decrease shear stress and rate of strain
  - -> Decelerate the foot into the ground and shorten the time the foot is on the ground
- Literature supports the use of an AFO, CROW walker, CAM walker, or a total contact cast

DM: Pt-Dependent Variables

- Higher hemoglobin A1c levels impede wound healing
- Nutrition= education topic!
- Monitor albumin and pre-albumin levels regularly
- Tobacco smoking/alcohol impede wound healing

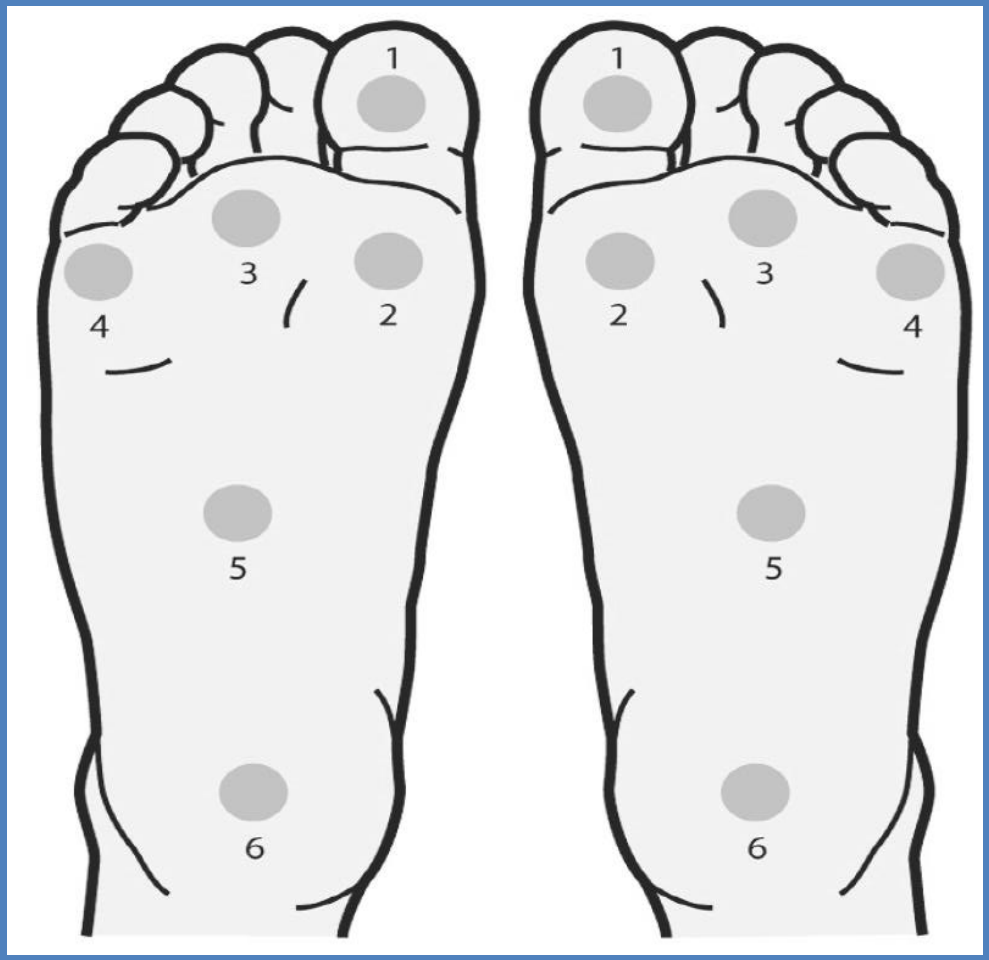
DM Pt Edu: Foot Checks

- Should be performed twice a day
- Use a mirror to see the bottom of the foot
- Look for redness, discoloration, and swelling
- Feel for warmth
- Keep a logbook of all findings, draw a picture of any suspicious findings
- Advise the patient to contact you if they find any abnormalities

Dermal Infrared Thermometer

- Use of an at-home digital thermometer proved to significantly reduce the incidence of DFU's among high-risk patients in several RCT's
  - 8.5% ulcer rate in thermometer group vs 30% in intense visual monitoring group
  - Another included 225 patients and showed a 62% ulcer reduction
- THUS, REDUCTION IN AMPUTATIONS!!!

Dermal Infrared Thermometer



DM Pt Edu: Nutrition

- **Protein:** To sustain healthy body function, need 1g/kg of body weight
  - In the presence of a wound, need 2g/kg of body weight
- In patients who are protein-deficient, supplementation of **arginine** and **glutamine** may be necessary (12.5-18.7g/L-arg; 0.57g/kg/day-glut)
  - Involved in protein synthesis and collagen deposition
  - Synthesis of fibroblasts, epithelial cells, and macrophages

DM Pt Edu: Nutrition[19]

- **Water:** At least 8 x 8oz glasses a day
  - Increases in hematocrit, hemoglobin, BUN:Creatinine ratio, chloride, albumin, urine specific gravity, and osmolality can be useful to assess hydration
  - Should be used in combination with intake and output records, daily weights, and physical exam

DM Pt Edu: Nutrition [19]

- **Vitamin C:** essential in all phases of wound healing
  - 1-2g daily
- **Vitamin A:** acts in the inflammatory and proliferative phases of healing
  - 25,000 IU daily
- **Vitamin E:** should be used with caution
  - can have alternate effects in types of wounds or in the presence of other nutrients
  - Depends on whether it is a water- or lipid-soluble preparation

DM Pt Edu: Nutrition

- **Zinc:** essential for DNA synthesis, cell division, and collagen and protein synthesis
  - 11mg daily; 15-30mg if deficient
- **Iron:** anemia will hinder wound healing
  - 18mg daily
- **Vitamin B12:** essential in red blood cell production
  - 6micrograms/daily

DM: Non-Responsive Wounds

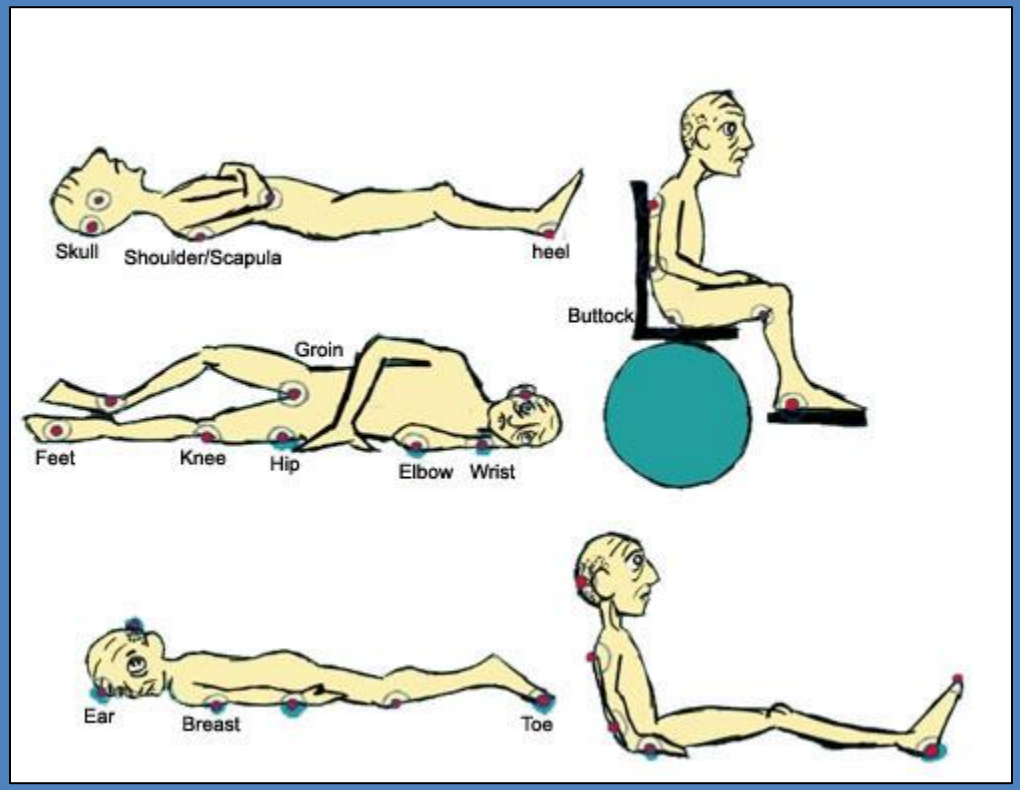
- Literature supports the use of a bioengineered skin substitute to stimulate healing
- But only after 50% wound area reduction after 4 weeks of conventional therapy

- Wound beds change often
  - Frequently re-assess and communicate with all patient care-givers

DM: Multi-Disciplinary Approach

- Wound care specialists
- Cardiologists
- Nephrologists
- Endocrinologists
- Ophthalmologists
- Infectious disease specialists
- Nutritionists
- Orthotists

Pressure Ulcers[17-23]



PrU: Statistics

- The average cost of pressure ulcer care is estimated at $43,180 per hospital stay
- The annual cost of treating hospital-acquired pressure ulcers is estimated at $11 billion
- As of Oct 1, 2008, CMS determined that hospital-acquired pressure ulcers are preventable and therefore no longer provides additional reimbursement to hospitals

PrU: Evidence

- N=310 med-surg and ICU patients
- 2010, CA community hospital
- Common sites: heel, coccyx, ear
- Most common primary diagnoses: respiratory, gastrointestinal, infection, and genitourinary
- Risk factors: sensory perception, moisture, activity, mobility, and nutrition

PrU: Evidence

Major contributing factors:

- Braden score of less than 18, serum albumin level of less than 3, fecal and/or urine incontinence, fragile skin, and bed bound

Less prominent contributing factors:

- poor circulation, diabetes, edema, obesity, multisystem failure, chair bound, contracted, and enteral feeding

PrU: 6 Prevention Strategies

1. Conduct a PrU admission assessment for all patients
   - Research suggests Braden scale
   - Educate staff and keep information about scale at Nurse's stations

2. Reassess risk for all patients daily
   - Including risk assessments every shift increased compliance to 100% in 2010 study
   - Include Braden score on visible patient information so at-risk patients can be readily identified

PrU: Braden Scale

- Risk assessment tool
- Valid and reliable
- 6 subscales scored 1-4 (one subscale is 1-3)
  - Total score 6-23

- Measures functional capabilities that contribute to:
  - Higher intensity and duration of pressure
  - Lower tissue tolerance for pressure

BRADEN SCALE – For Predicting Pressure Sore Risk

SEVERE RISK: Total score ≤ 9 **HIGH RISK**: Total score 10-12
MODERATE RISK: Total score 13-14 **MILD RISK**: Total score 15-18

RISK FACTOR	SCORE/DESCRIPTION				DATE OF ASSESS ➡ 1	2	3	4
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. COMPLETELY LIMITED** – Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, **OR** limited ability to feel pain over most of body surface.	**2. VERY LIMITED** – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED** – Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	**1. CONSTANTLY MOIST** – Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. OFTEN MOIST** – Skin is often but not always moist. Linen must be changed at least once a shift.	**3. OCCASIONALLY MOIST** – Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	**1. BEDFAST** – Confined to bed.	**2. CHAIRFAST** – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	**3. WALKS OCCASIONALLY** – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. WALKS FREQUENTLY** – Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position	**1. COMPLETELY IMMOBILE** – Does not make even slight changes in body or extremity position without assistance.	**2. VERY LIMITED** – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	**3. SLIGHTLY LIMITED** – Makes frequent though slight changes in body or extremity position independently.	**4. NO LIMITATIONS** – Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN: Total parenteral nutrition.	**1. VERY POOR** – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, **OR** is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE** – Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement **OR** receives less than optimum amount of liquid diet or tube feeding.	**3. ADEQUATE** – Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	**4. EXCELLENT** – Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICTION AND SHEAR	**1. PROBLEM** – Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. POTENTIAL PROBLEM** – Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	**3. NO APPARENT PROBLEM** – Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
TOTAL SCORE	**Total score of 12 or less represents HIGH RISK**							

PrU: 6 Prevention Strategies

3. Inspect skin every shift
   - Emphasize problem areas on documentation to improve communication
   - Document in a format that includes both pressure and non-pressure skin problems.

4. Manage Moisture
   - Check incontinent patients every hour
   - Ointment, powder, under-pad

PrU: 6 Prevention Strategies

5. Optimize nutrition and hydration
    - Perform a nutritional assessment on every patient upon admission
    - All patients with stage II PrU's or greater should receive a dietary consultation

6. Minimize pressure
    - Frequent repositioning
    - Foam padding is necessary to oxygen tubing for ear protection

PrU: Cost-effectiveness

Cost of wound care includes:

- The price of dressing
- The labor cost of having a healthcare professional change the dressing
- The indirect costs of ancillary supplies and services used in changing the dressing (gloves, biohazardous disposal, etc.)
- the cost of the duration of care (facility charges, travel costs for home care nurse, etc)

PrU: Cost-effectiveness

- Cost of semiocclusive dressing and ancillary supplies is $6.15 per dressing change
- Versus cost of wet-to-moist gauze $0.47

- Daily cost of care for the semiocclusive dressing was only $3.55
  - Required less frequent changes
- Versus wet-to-moist gauze $12.26

PrU: Cost-effectiveness

- Cost of semiocclusive dressing was over 3X higher than saline gauze
- The nursing time required for dressing changes was 1/8th that of saline gauze

- Total cost of semiocclusive dressing using national nursing wages at the time was $15.90
- Versus $25.31 for gauze dressing

PrU: Cost-effectiveness

- Based on evidence, advanced dressing results in more expedient healing
- If a wound is healed within 4 weeks of treatment with the advanced dressing
  - But only 50% healed in 4 weeks with gauze
- Gauze and saline costs over $115 per 1% reduction in wound size
- semiocclusive foam dressing costs approximately $13 for the same reduction

PrU: Cost-effectiveness

- Overwhelming results from research indicate that the **best quality care is less expensive**
  - vs. protocol that appears initially to be the most economical
  - Even though it is more costly upfront

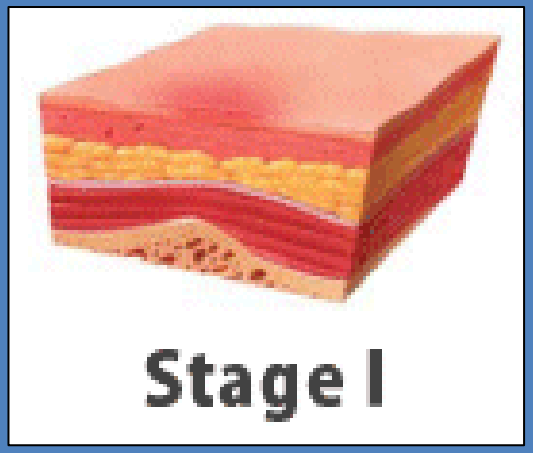
See copy provided

Dressing	Hydrocolloid	Transparent Film	Hydrogel	Alginate	Foam	Polymeric Membrane	Silver Impregnated
Stage I			Shallow, minimal exudate to dry wound bed, painful	Mod to heavy exudate, ±infection			Infected, heavily colonized, high-risk for infection
Stage II	If wound is clean		Shallow, minimal exudate to dry wound bed, painful	Mod to heavy exudate, ±infection	Exudative	Any	Infected, heavily colonized, high-risk for infection
Stage III				Mod to heavy exudate, ±infection	Shallow	Shallow	Infected, heavily colonized, high-risk for infection
Stage IV				Mod to heavy exudate, ±infection			Infected, heavily colonized, high-risk for infection
Periwound/Other	Protect areas at risk for friction or injury from tape	Protect areas at risk for friction or injury from tape; autolytic debridement			Painful; at risk for shear injury		
Contraindications	Area where it will roll or melt	As the tissue interface layer over mod to heavily draining wounds; as the cover dressing over enzymatic debriding agents, gels, or ointments			Small piece in large cavity		When infection is controlled; long term use
Notes	Might need filler dressing underneath for cavity wounds	Secondary dressing over alginate or other fillers	Amorphous hydrogel for non-infected ulcers that are granulating	If dressing is dry upon removal, irrigate; consider lengthening time between changes or using a different dressing			

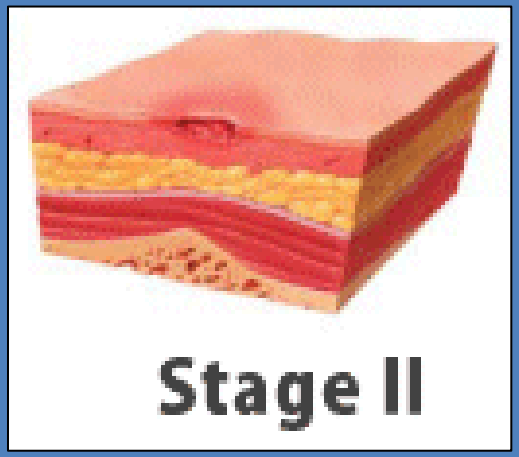
Dressing	Honey-Impregnated	Cadexomer Iodine	Gauze	Silicone	Collagen Matrix	Composite
Stage I		Mod to high exudate				
Stage II	Any	Mod to high exudate				
Stage III	Any	Mod to high exudate			Nonhealing	
Stage IV		Mod to high exudate			Nonhealing	
Periwound/Other			As cover dressing over moist tissue interface layer	Fragile		
Contraindications		Patients with iodine sensitivity or thyroid disease; large cavity ulcers that are changed daily	Clean, open ulcers			
Notes			When other forms of moisture-retentive dressings are not available, continually moist gauze is preferable to dry gauze. Use loosely woven gauze for highly exudative ulcers; use tightly woven gauze for minimally exudative ulcers. Associated with increased infection rates, retained dressing particles, and pain. Costly in professional time for frequent changes.	Great wound contact layer to prevent trauma from dressing removal		Combination of previously listed dressings

PrU: Staging

I) Intact skin with non-blanchable redness of a localized area usually over a bony prominence

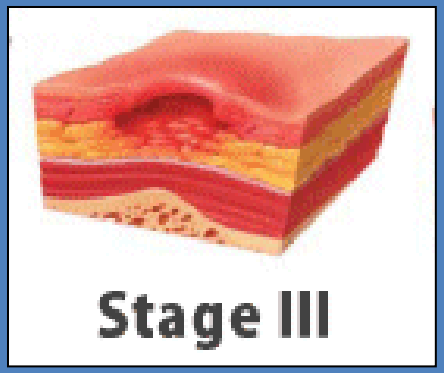


II) Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed without slough

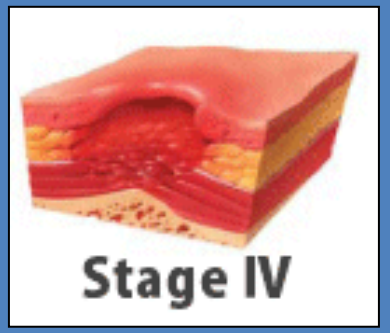


PrU: Staging

III) Full thickness tissue loss. Subcutaneous fat may be visible, but bone, tendon, or muscle are not exposed. May include undermining and tunneling.

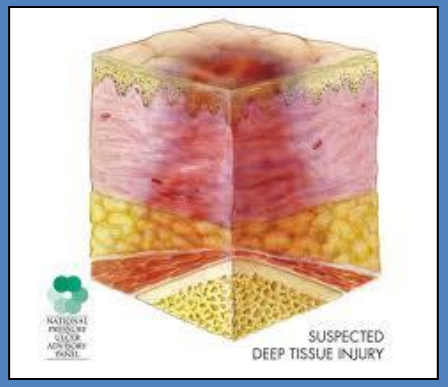


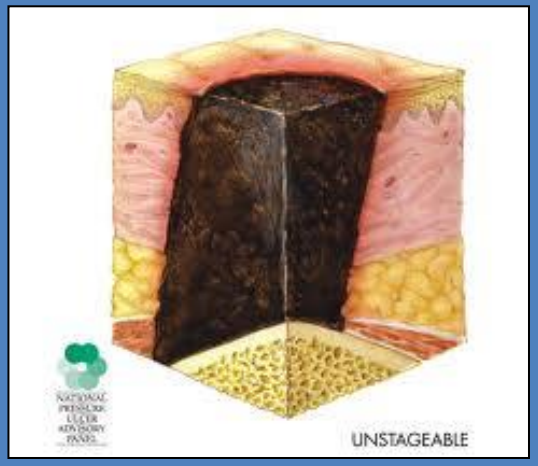
IV) Full thickness tissue loss with exposed bone, tendon, or muscle. Slough or eschar may be present; often includes undermining and tunneling.



PrU: Stages only in U.S.

- Unstageable: Full thickness tissue loss in which actual depth of the ulcer is completely obscured by slough and/or eschar in the wound bed





- Suspected Deep Tissue Injury: Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear

PrU: Positioning

- Goal: to reduce duration and magnitude of pressure over bony prominences
- FOR ALL AT-RISK PATIENTS
- Must consider condition of the patient and support surface

PrU: Repositioning Frequency

Patient Variables:

- Tissue tolerance
- Level of activity and mobility
- General medical condition
- Overall treatment objectives
- Assessments of skin condition

Support Surface Variables:

- Non-pressure-redistributing mattress=greater freq.
- Viscoelastic foam mattress=less freq.

PrU: Repositioning Technique

- Avoid shear and pressure forces
- Use transfer aids to reduce friction and shear
- Lift—don't drag!
- Avoid positioning onto tubes or drainage systems
- Avoid positioning on bony prominences with existing non-blanchable erythema
- Maintain patient dignity

PrU: Repositioning Technique

- Use 30^{o} tilted side-lying position
- Alternate right side, back, left side
- Alternate prone as well and patient tolerates and medical condition allows

- AVOID 90^{o} side-lying position
- AVOID semi-recumbent position
- AVOID head-of-bed elevation sitting/slouching
  - Places pressure and shear on sacrum and coccyx

PrU: Repositioning Seated

- Maintain full range of activities (i.e. footrest with heels offloaded impedes transfers)
- If feet do not touch the floor, use footstool or footrest
  - Height should position legs with slight hip flexion so that the thighs are slightly lower than horizontal to prevent the body from sliding forward
- Relieve pressure every 15 minutes

PrU Repositioning: Document

- Record repositioning regimes
- Frequency
- Position
- Evaluate outcome of repositioning regime

- Educate all care providers and significant others
- Consider appropriate equipment such as foam wedges and specialty mattresses

PrU: Support Surfaces

Select the surface based on:

- the individual's level of mobility in bed
- Comfort
- need for microclimate control
- Place/circumstances of care provision

PrU: Support Surface

- Must be compatible with the setting

In the home:

- Weight of the bed
- Structure of the home
- Width of the doors
- Availability of uninterrupted electrical power
- Ability to promote ventilation of heat from the motor

PrU: Support Surface

- Use higher-specification foam mattresses rather than standard hospital foam mattresses for all at-risk patients
- Use active support surfaces when high-risk patients cannot be repositioned manually
- Alternating-pressure active support overlays=replacement mattresses in terms of PrU incidence

PrU: Support Surface

Avoid use of:

- ✘ synthetic sheepskin pads
- ✘ Cutout, ring, or donut-type devices
- ✘ Water-filled gloves

(Natural sheepskin pads may assist in prevention)

Venous Leg Ulcers[10,24-25]

Venous Leg Ulcers

- Caused by sustained venous hypertension
  - Which results from chronic venous insufficiency
- In a properly functioning system, venous blood is circulated via the calf muscle pump
- Valves prevent reflux so pressure remains low
  - Valves are incompetent with venous insufficiency and pressure remains high

Venous Leg Ulcers

- 40-50% of venous ulcers are due to superficial venous insufficiency and/or perforating vein incompetence alone with a normal deep venous system

- Recurrent ulceration occurs in up to 70% of those at risk

VLU: Risk Factors

DIRECT

- Varicose veins
- Deep vein thrombosis
- Chronic venous insufficiency
- Poor calf muscle function
- Arterio-venous fistulae
- Obesity
- History of leg fracture

INDIRECT

- All risk factors leading to DVT inc. protein-C, protein-S, and anti-thrombin III deficiency
- Family history of varicose veins
- A history of minor trauma prior to the development of ulceration

VLU: Examination

- 95% of VLU's are around the malleoli
  - Ulcers above the mid-calf or on the foot are likely to have other causes
- VLU bed's are often covered with a fibrinous layer mixed with granulation tissue
- Edges are surrounded by an irregular, gently sloping edge
- Pitting edema is often present

VLU: Examination

- Hemosiderin staining occurs
  - Erythrosites leak into the skin
  - This results in hemosiderin deposits in macrophages
  - This stimulates melanin production
  - This pigments the skin brown

VLU: Examination

- In the long term, lipodermatosclerosis occurs
  - Dermis and subcutaneous tissue becomes indurated and fibrosed
  - Skin becomes atrophic, loses sweat glands and hair follicles, becomes variably pigmented
  - Severe cases leads to atrophie blanche-
    - White fibrotic areas with low blood flow
- Lipodermatosclerosis often precedes ulceration

A Common Symptom

VENOUS ECZEMA **VS.** **~~CELLULITIS~~**

- Red, warm, painful
- Tender to the touch
- Usually chronic
- Diffuse and poorly demarcated
- Increase in exudate
- Itchy, scaley
- Treated with topical steroids

- Red, warm, painful
- Tender to the touch
- Insidious (usually develops over 24-72hours)
- Usually well demarcated
- No increase in exudate
- Not itchy or scaley
- Treated with systemic antibiotics

VLU: Management

- Sharp debridement of necrotic tissue
- Consider a consult to a vascular specialist
  - Surgery is normally indicated to correct superficial venous disease
  - An attempt to prevent ulcers from recurring
  - Shave therapy (skin graft) or dermal substitute may also be used when other treatments have failed

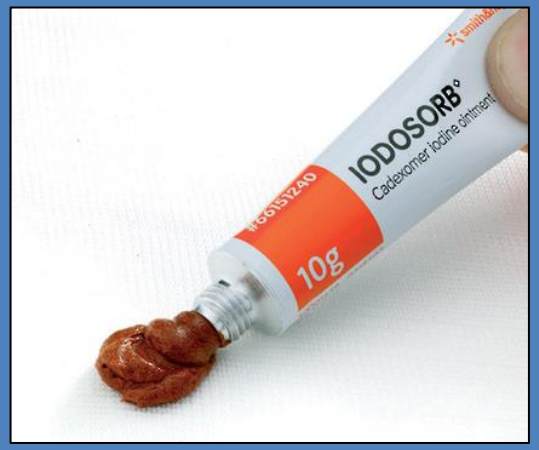
VLU: Treatment

- Graded compression
  - ~40mmHg at ankle; ~18mmHg below the knee
- Increases limb hydrostatic pressure which reduces superficial venous pressure
- Advise patients to remove compression if they notice numbness, tingling, pain, dusky toes
- Ex: Profore, Profore Lite, Coban 2, Coban 2 Lite, Kerlix and Coban

VLU: Primary Dressing

Cadexomer Iodine paste (Iodosorb)

- Decreases infection- antibacterial against *Pseudomonas* and *MRSA*
- Absorbs drainage
- Debriding agent- destroys biofilm
- More cost-efficient than silver



VLU: Primary Dressing

- 12 week, randomized, open, controlled, multicenter, multinational trial (12 weeks or until cessation of exudation)
- Cadexomer iodine paste vs. hydrocolloid dressing vs. paraffin gauze
- N=153 exudating VLU's (all wore short-stretch compression during entire study)

VLU: Primary Dressing

	Cadexomer Iodine	Hydrocolloid	Paraffin Gauze
Mean ulcer reduction at end-point	62%	41%	24%
Mean ulcer area reduction in pt's treated for 12 wks	66%	18%	51%
Ulcer area reduction per week	9%	8%	3%
Average cost per percentage ulcer reduction	$8.80	$32.50	$12.9
Dressing changes per week	2.7	2.8	3.3

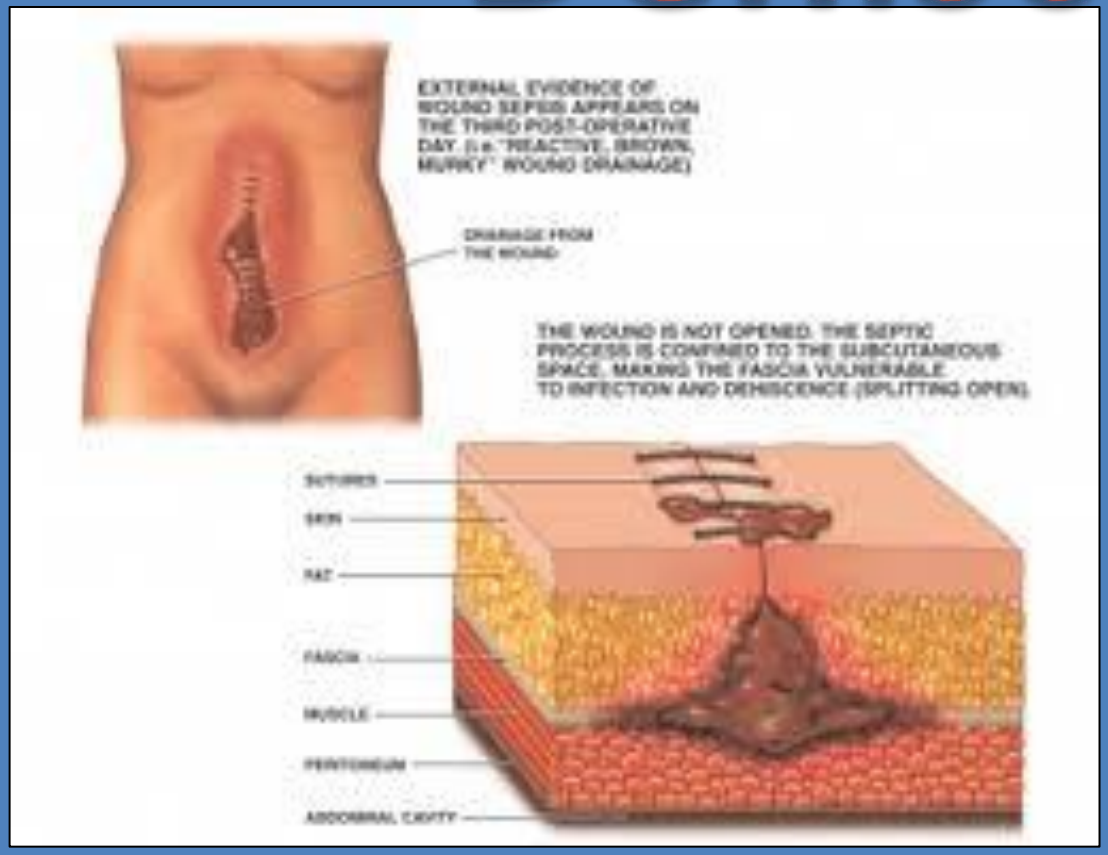
VLU: Treatment

- Consult MD for pharmacologic intervention for infection
  - Topical antibiotics are contraindicated secondary to the risk of increasing bacterial resistance
- Venous eczema should be treated with topical steroids and emmolients

VLU: Patient Education

- After the ulcer has healed, to prevent recurrence:
  - Compression stockings
  - Adequate skin care
  - Leg elevation
  - Calf exercises
  - Adopt/maintain a suitable diet
  - Consider joining support group

Dehiscence [26]



Dehiscence

- "premature unintentional reopening of a wound along the surgical suture line"
- Caused by delayed wound healing due to poor blood supply or mechanical stress
  - e.g.: nicotine abuse, DM, vascular dz
  - Infection
- Post-partum, post-amputation, post implantation of a port catheter system, etc.

Dehiscence

From surgical complications:

- ✘ Poor knotting/grabbing of stitches
- ✘ Broken suture
- ✘ Wound closure under tension
- ✘ Too early suture removal

Dehiscence

Local factors

- Hemostasis
- Tight suture
- Poor tissue vascularization
- Thin tissue
- Local inflammation
- Obesity

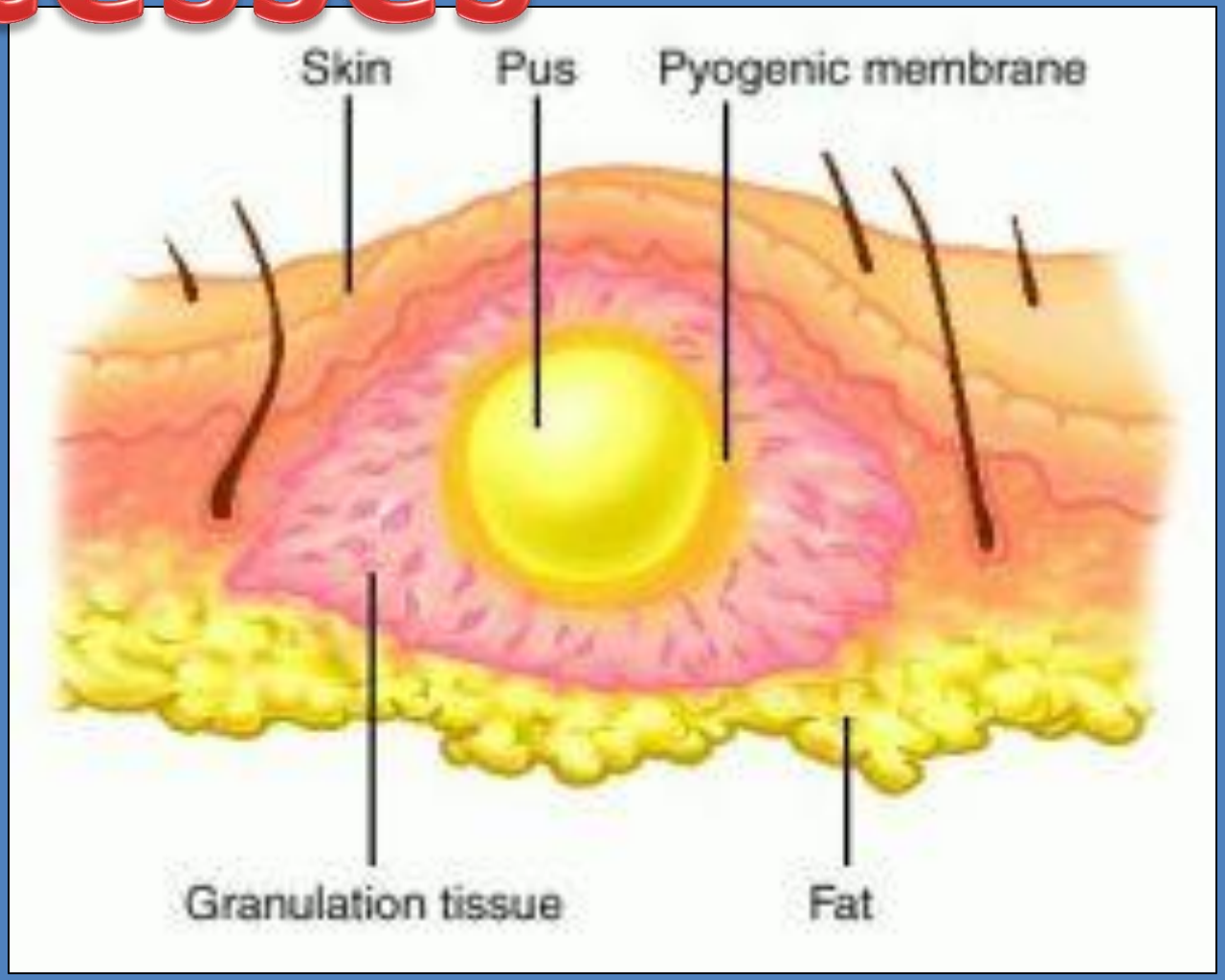
Systemic factors

- Malnutrition
- Physical stress
- Anemia
- Malignancy
- Uremia
- Hypertension
- Medication
- Nicotine abuse
- DM, Vascular dz

Dehiscence: Treatment

- Wound Vac to close the cavity wound

Abscesses 27-28



Abscess Formation

- "inflammatory lesions releasing purulent material"
- A standard response for many biological, chemical, or physical insults to host tissues
  - Ex: *S. aureus, Bacteroides fragilis, S. epidermidis*

Abscess Treatment

- Systemic antibiotic
- Incision and drainage
  - Local anaesthetic

- From this point, treat cavity wound
  - Usually packed with wet-dry-gauze

Questions???

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