Wound Care for the Vascular Surgery provider

Wound dehiscence, Surgical Site infection, Arterial vs Venous wounds, and Negative Pressure wound therapy

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Disclosure statement

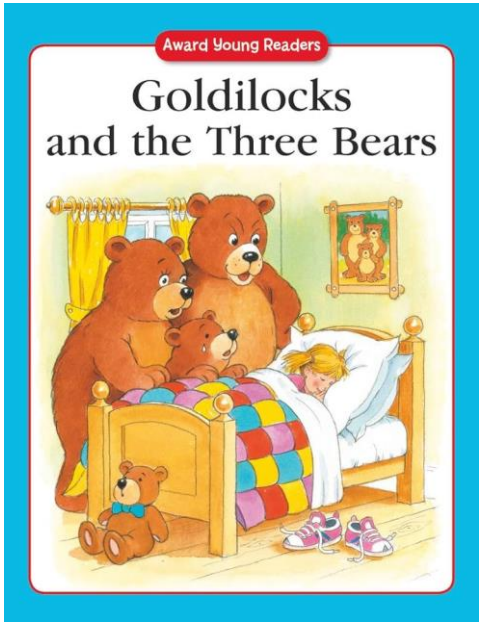
- I have no significant disclosures to communicate

Goals of Presentation

- Discuss characteristics of surgical dehiscence
- Identify characteristics of arterial vs venous wounds
- Discuss surgical site infection assessment and infection definition/criteria
- Discuss best practice for infection treatment of the surgical wound
- Discuss interventions and management for optimal wound care for all types of wounds
- Discuss the role of Negative Pressure wound therapy in wound healing

Wound management 101

- Many different brands that have many different products
- Perfusion optimization=Key
- Wound bed optimization
- Know what you are trying to achieve
  - Moisture balance
  - Local infection/bioburden
  - Acute vs chronic



Reference: 11,12

Dressing selection

Dressing Selection

Characteristics of Wound and Dressing Selection

Shallow Dry Wounds	Deep Dry Wounds
Goal: Donate, maintain moisture; protect the wound **Hydrogels**—Donate fluid **Hydrocolloid, thin foam**—Maintain moisture **Transparent film**—Maintain moisture	**Goal:** Donate moisture and fill for depth **Primary Dressing Selections:** Gel-soaked gauze filled or wicked into wound Hydrogel into wound base and moistened gauze packing **Secondary Dressing Selections:** Gauze and transparent film, waterproof, adhesive foam
Shallow Wet Wounds	**Deep Wet Wounds**
Goal: Maintain appropriate moisture balance, protect the wound "Filler" dressing usually not required as wound is shallow **Dressing selection may include:** Foam, hydrocolloid. Gauze wrap may be used to secure	**Goal:** Maintain appropriate moisture balance and fill for depth Absorptive filler, wick, or packing may be needed and secondary dressing **Dressing selection may include:** Alginate or hydrofiber with secondary (foam, polymer or copolymer dressing to secure) Contact dressing may help to protect the wound base and protect wound bed from trauma with dressing changes

Antimicrobial dressings: Used for management of critically colonized or infected wounds; broad spectrum with multiple modes of action to reduce bacteria. Indicated to be used for short periods, generally ~2 weeks.

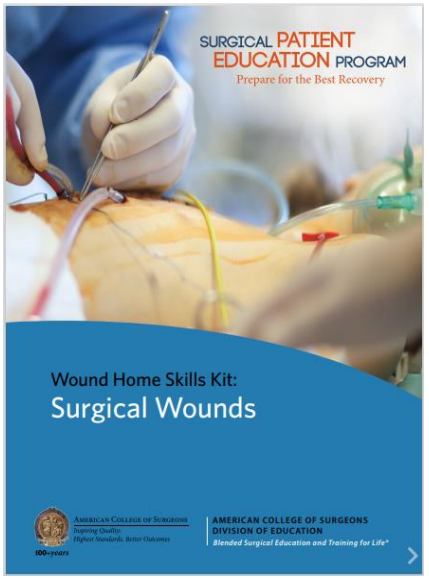
Wound Dressing Selection Guide

Product Category	Alginate	Collagen	Contact layer	Foam	Hydrocolloid	Hydrogel	Gentian violet/methylene blue	Silver dressing
Indication for Use	•Partial to full thickness wounds •Moderate to heavy exudate	•Partial to full thickness wounds •Stagnant, non-healing wounds •Non-infected, necrotic free wounds	•Ideal for surface wounds or lining deep cavity wounds •Clean, necrotic free wounds	•Partial to full thickness wounds •Moderate to heavy exudate	•Partial to full thickness wounds, without depth •Minimal to moderate exudate •Semiocclusive dressing	•Partial to full thickness wounds •Dry to minimal exudate	•Antimicrobial •Use indicated for short period of time, ~ 2 weeks •Partial and full thickness wounds	•Antimicrobial •Partial to full thickness wounds with critical colonization or infection, use indicated ~ 2 weeks
Instructions for Use	•Change every 1-3 days •Secondary dressing is required •Use rope type in tunnels	•Apply daily to once weekly, dependent upon exudate and product type •Secondary dressing is required	•Change at least weekly •Secondary dressing is required	•Change every 3-4 days •Can be used as primary or secondary dressing •Do not use on dry wounds	•Change every 3-5 days •Primary or secondary dressing •Not for use on infected wounds	•Gel formulary, change daily •Secondary dressing required	•Change frequency dependent on exudate amount, typically every 1-3 days •Dressing turns white as product is depleted •Secondary dressing required	•Change frequency depends on form used and exudate; typically every 1-7 days •Primary or secondary dressing

Surgical site dehiscence

Definition

- Definition
- Contributing factors
  - Smoking
  - Poor nutrition
  - Uncontrolled chronic disease
  - Infection
  - Tension/pressure/friction
  - Medication use



Management of dehiscence

- Primary vs secondary healing
- Know anatomy and extent of surgery performed
- Wound bed quality and presentation
- Infection prevention, appropriate dressing selection
- Optimize contributing factors

Reference: 3

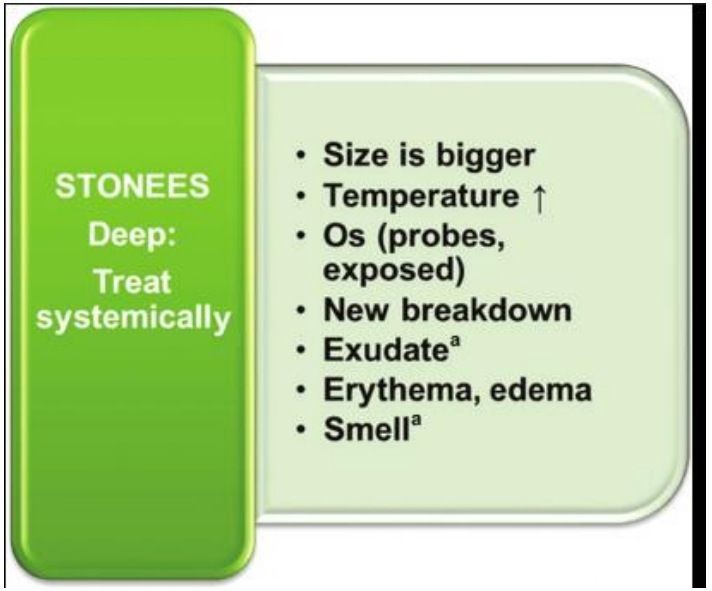
Surgical site infection

Infection Criteria

NERDS criteria

Sensitivity is 73% and specificity is 80.5% when three criteria are present

STONEES criteria



Sensitivity is 90% and specificity is 69.4% when three criteria are present.

Lab assessment: CRP, CBC, ESR

Reference: 2, 5, 11, 12

Topical wound care

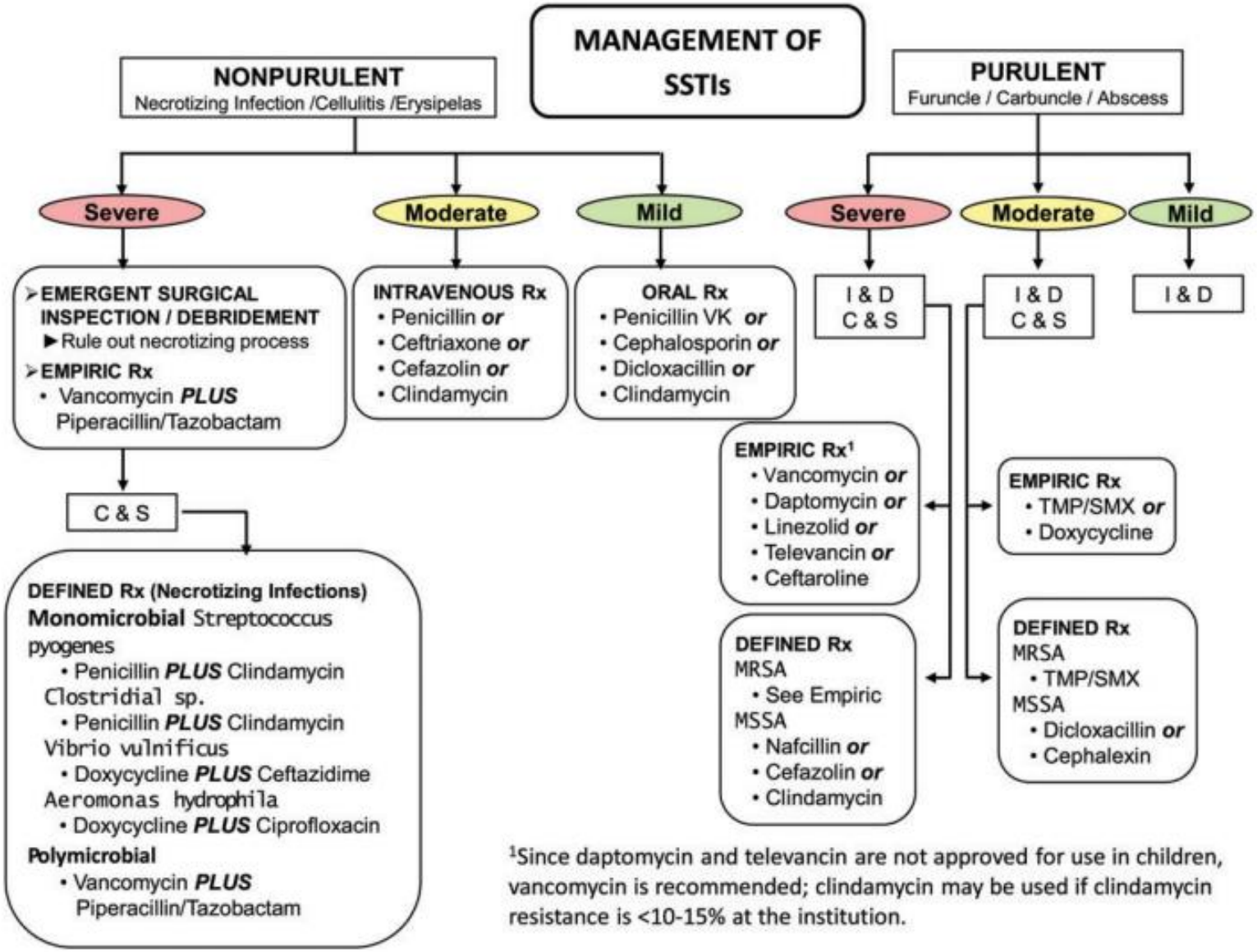
- Topical antimicrobial use limits
- Wound bed presentation
- Culture technique
- Clean vs sterile dressing changes
- Classification
  - Superficial incisional
  - Deep incisional
  - organ/space

Reference: 4, 6, 11, 12

Pharmacological interventions

- Single or polymicrobial coverage
- Environmental factors
- Surgical site location
- Duration of therapy
- Adjunctive modalities
- Most common pathogens:
  - Uncomplicated, non purulent infection
    - B-hemolytic strep (strep pyogenes)
    - MSSA
  - MRSA
  - Complicated, purulent infections
    - Gram positive, gram negative aerobes, anaerobes

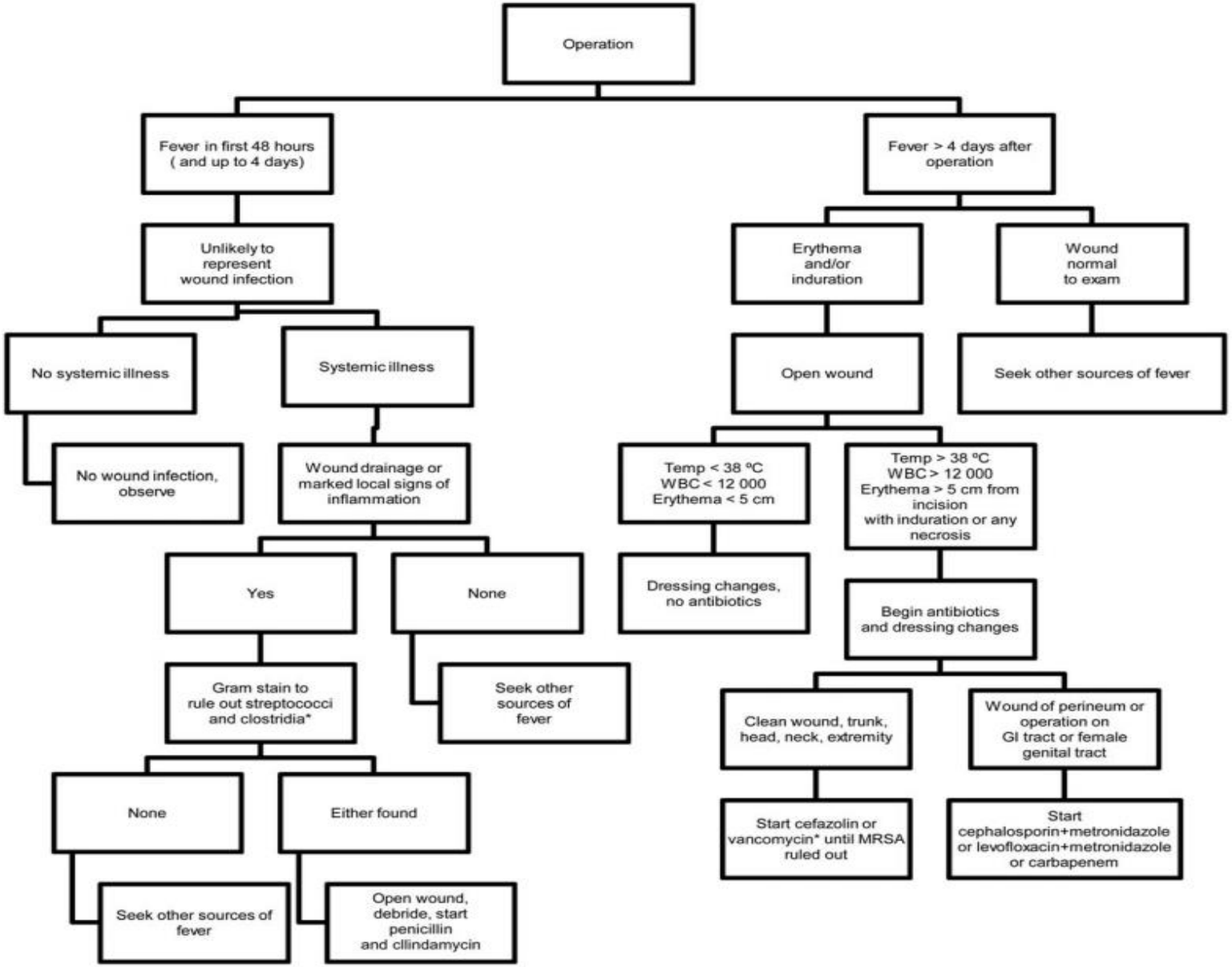
Reference: 5, 14



[1]Since daptomycin and televancin are not approved for use in children, vancomycin is recommended; clindamycin may be used if clindamycin resistance is <10-15% at the institution.

Reference: 14

Wound Infection Algorithm



Reference: 14

MSSA SSTI	Nafcillin or oxacillin	1-2 g every 4 h IV	100–150 mg/kg/d in 4 divided doses	Parental drug of choice; inactive against MRSA
	Cefazolin	1 g every 8 h IV	50 mg/kg/d in 3 divided doses	For penicillin-allergic patients except those with immediate hypersensitivity reactions. More convenient than nafcillin with less bone marrow suppression
	Clindamycin	600 mg every 8 h IV or 300–450 mg qid po	25–40 mg/kg/d in 3 divided doses IV or 25–30 mg/kg/d in 3 divided doses po	Bacteriostatic; potential of cross-resistance and emergence of resistance in erythromycin-resistant strains; inducible resistance in MRSA
	Dicloxacillin	500 mg qid po	25–50 mg/kg/d in 4 divided doses po	Oral agent of choice for methicillin-susceptible strains in adults. Not used much in pediatrics
	Cephalexin	500 mg qid po	25–50 mg/kg/d 4 divided doses po	For penicillin-allergic patients except those with immediate hypersensitivity reactions. The availability of a suspension and requirement for less frequent dosing
	Doxycycline, minocycline	100 mg bid po	Not recommended for age <8 y[d]	Bacteriostatic; limited recent clinical experience
	Trimethoprim-sulfamethoxazole	1–2 double-strength tablets bid po	8–12 mg/kg (based on trimethoprim component) in either 4 divided doses IV or 2 divided doses po	Bactericidal; efficacy poorly documented
MRSA SSTI	Vancomycin	30 mg/kg/d in 2 divided doses IV	40 mg/kg/d in 4 divided doses IV	For penicillin allergic patients; parenteral drug of choice for treatment of infections caused by MRSA
	Linezolid	600 mg every 12 h IV or 600 mg bid po	10 mg/kg every 12 h IV or po for children <12 y	Bacteriostatic; limited clinical experience; no cross-resistance with other antibiotic classes; expensive
	Clindamycin	600 mg every 8 h IV or 300–450 mg qid po	25–40 mg/kg/d in 3 divided doses IV or 30–40 mg/kg/d in 3 divided doses po	Bacteriostatic; potential of cross-resistance and emergence of resistance in erythromycin-resistant strains; inducible resistance in MRSA. Important option for children
	Daptomycin	4 mg/kg every 24 h IV	N/A	Bactericidal; possible myopathy
	Ceftaroline	600 mg bid IV	N/A	Bactericidal
	Doxycycline, minocycline	100 mg bid po	Not recommended for age <8 y[d]	Bacteriostatic; limited recent clinical experience
	Trimethoprim-sulfamethoxazole	1–2 double-strength tablets bid po	8–12 mg/kg/d (based on trimethoprim component) in either 4 divided doses IV or 2 divided doses po	Bactericidal; limited published efficacy data

Disease Entity	Antibiotic	Dosage, Adults	Dosage, Children[a]	Comment
Non-purulent SSTI (cellulitis)	Adult dosage	Pediatric dosage	antimicrobial agents for patients with severe penicillin hypersensitivity	N/A
Streptococcal skin infections	Penicillin 2–4 million units every 4–6 h IV Clindamycin 600–900 mg every 8 h IV Nafcillin 1–2 g every 4–6 h IV Cefazolin 1 g every 8 h IV Penicillin VK 250–500 mg every 6 h po Cephalexin 500 mg every 6 h po	Penicillin 60–100 000 units/kg/dose every 6 h 10–13 mg/kg dose every 8 h IV 50 mg/kg/dose every 6 h 33 mg/kg/dose every 8 h IV	Clindamycin, vancomycin, linezolid, daptomycin, or telavancin. Clindamycin resistance is <1% but may be increasing in Asia	N/A

Arterial vs Venous wounds

Which is which?

Arterial wound characteristics

Wound base: pale with minimal granulation tissue, necrosis is common

Usually deeper

Thicker edges, well defined edges

Minimal drainage

More likely to become infected

Edema less likely

Surrounding tissue characteristics may include pallor, dependent rubor, shiny/taut/thin/fragile skin, hair loss, atrophy of SQ tissue, cool to touch

Venous wound characteristics

Wound Base: Ruddy red with variable slough coverage

Usually shallow in nature

Size is variable, can be fairly large

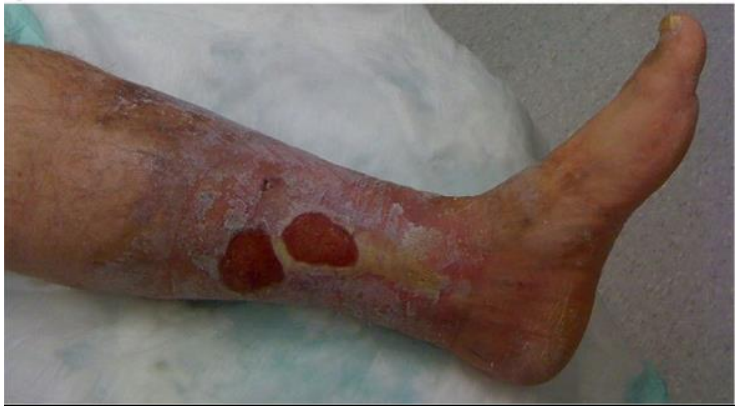
Moderate to heavy exudate

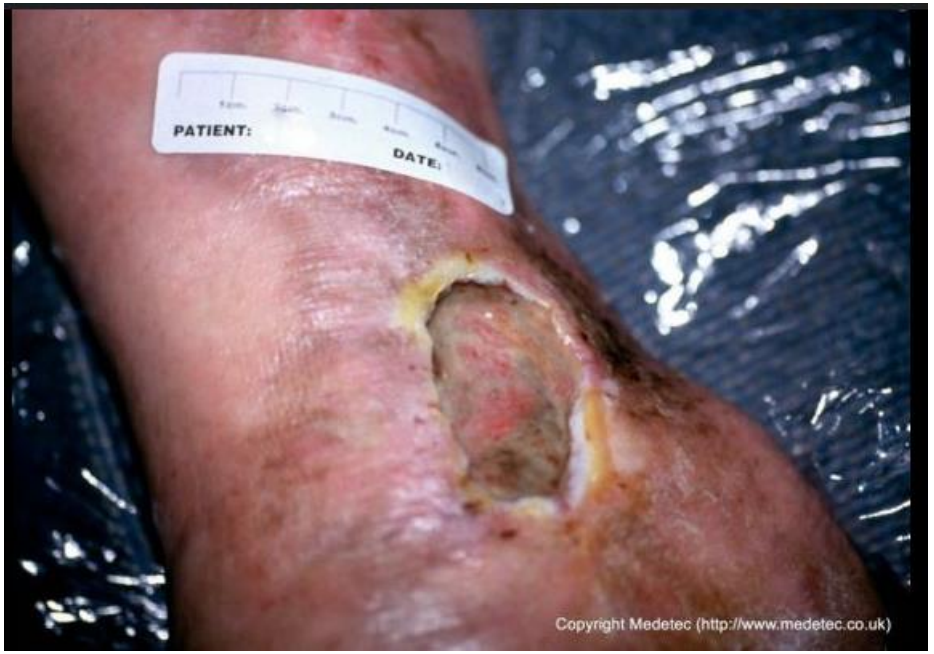
Less likely to become infected

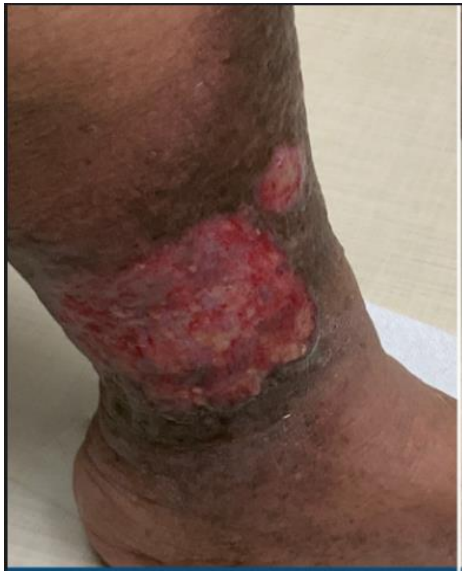
Edema present

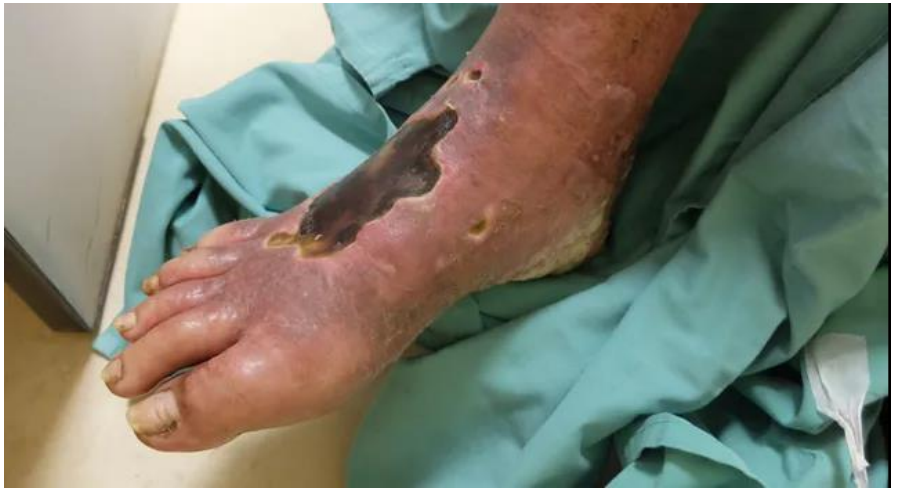
Surrounding wound tissue characteristics may include hemosiderin staining, atrophie blanche, maceration, built up drainage, itching, warm to touch

Examples









Non-invasive imaging testing

Ankle Brachial Index (ABI)

Definition and Calculation Values:

- Elevated: > 1.30.
- Normal: 0.9-1.00 (1.1/1.2)
- LEAD: ≤ 0.90.
- Borderline perfusion: ≤ 0.60–0.80.
- Severe ischemia: ≤ 0.50.
- CLTI: ≤ 0.40.

Consider TBI evaluation

- Normal: >0.75
- >50mmhg in diabetic should allow healing of digit amputation
- <30mmhg in any patient signifies poor ability to heal

Arterial duplex

Measures arterial amplitude

Triphasic, Biphasic, Monophasic

Velocities

Venous duplex (reflux)

Assess for reflux

Best done in standing position

Screen for DVT additionally

Criteria for reflux:

- Superficial system: >0.5 secs
- Deep system: >1 secs

Reference: 1, 5, 8

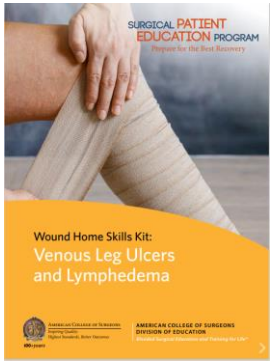
Topical wound management

Arterial ulcers

- TIME principle
- Donate moisture to wound bed
- Eschar management
- Avoid compression therapy
- Dedicated walking program
- Improve perfusion
- Pain control
- Localized infection management and prevention

Venous ulcers

- Drainage management
- Necrotic tissue/slough management
- Compression therapy
- Leg elevation + walking
- Pain control
- Systemic infection management and prevention



Reference: 2, 9, 15

Negative Pressure wound therapy (NPWT)

Negative Pressure Therapy 101

Mechanism of action

Applies pressure to wound bed to allow for angiogenesis at capillary level

Drainage management and moisture balance

Occlusive dressing

Pain management

Criteria for placement

Clean wound bed

Actively treating underlying infection

Depth to wound

Contraindications for placement

Untreated infection

Heavy necrotic tissue/slough burden

Inappropriate offloading of pressure

Exposed structures such as blood vessels, organs

Malignancies

Known, untreated ischemia

Types of NPWT

Incisional (pre-made vs independently constructed)

Open belly

Standard (Black, white, Silver, Blue foams)

Solution Instillation abilities

Inpatient vs home units

Disposable vs battery operated units

Management of NPWT

- Standard of care
- Appropriate type of foam dressing placement
- Appropriate suction disc application
- Education to provide to patients/caregivers/HH/facilities
  - When to remove dressing
  - Malfunction info
  - Application techniques to ensure best outcomes

In conclusion

- Goldie locks principle
- Know what type of wound you are working with
- Know anatomy
- End goal
- Rally the troops

References

1. Aboyans, V., MD, Criqui, M., MD, Abraham, P., MD, Allison, M., MD, Creager, M., MD, Diehm, C., MD, Fowkes, G., PhD, Hiatt, W., MD, Jonsson, B., MD, Lacroix, P., MD, Marin, B., MD, McDermott, M., MD, Norgren, L., MD, Pande, R., MD, Preux, P. M., MD, Stoffers, J., MD, & Treat-Jacobson, D., RN (2012). Measurements and Interpretation of the Ankle-Brachial Index: A Scientific Statement from the American Heart Association. *Circulation*, *126*(24), 2890-2909. https://doi.org/10.1161/CIR.0b013e318276fbcb

2. Bowers S, Franco E. Chronic Wounds: Evaluation and Management. Am Fam Physician. 2020 Feb 1;101(3):159-166. PMID: 32003952.

3. Calcido, R. (2017). Healing by Intention. *Advances in Skin and Wound Care*, *30*(6), 246-247. https://doi.org/10.1097/01.ASW.0000516787.46060.b2

4. Campbell, J., MD, Stone, P., MD, & AbuRahma, A., MD (2013). *Vascular/Endovascular Surgery combat manual*. W.L. Gore and Associates, Inc.

5. Duane, T., Huston, J., Collom, M., Beyer, A., Parli, S., Buckman, S., Shapiro, M., McDonald, A., Diaz, J., Tessier, J., & Sanders, J. (2021). Surgical Infection Society 2020 Updated Guidelines on the Management of Complicated Skin and Soft Tissue Infections. *Surgical Infections*, *22*(4), 383-399. https://doi.org/10.1089/sur.2020.436

6. Eberhardt, R. T., & Eberhardt, R. T. (2014). *Chronic Venous Insufficiency* (pp. 333-346). American Heart Association. https://doi.org/10.1161/CIRCULATIONAHA.113.006898

7. Gestring, M., MD (2023, November 17). *Negative pressure wound therapy*. Www.Uptodate.com. Retrieved August 21, 2024, from https://www.uptodate.com/contents/negative-pressure-wound-therapy#references

8. Kent, Dea J.; Scardillo, Jody N.; Dale, Barbara; Pike, Caitlin. Does the Use of Clean or Sterile Dressing Technique Affect the Incidence of Wound Infection?. Journal of Wound, Ostomy and Continence Nursing 45(3):p 265-269, May/June 2018. | DOI: 10.1097/WON.0000000000000425

9. O'donnell, T., MD, Marson, W., MD, Ennis, W., DO, Dalsing, M., MD, Kistner, R., MD, Lurie, F., MD, Henke, P., MD, Gloviczki, M., MD, Eklof, B., MD, Stoughton, J., MD, Raju, S., MD, Shortell, C., MD, Raffetto, J., MD, Partsch, H., MD, Pounds, L., MD, Cummings, M., MD, Gillespie, D., MD, McLafferty, R., MD, Hassan Murad, M., MD, . . . Gloviczki, P., MD (2014). Management of venous leg ulcers: Clinica practice guidelines of the Society for Vascular Surgery and the American Venous Forum. *Journal of Vascular Surgery*, *60*(2S), 3S-59S. https://doi.org/http://dx.doi.org/10.1016/j.jvs.2014.04.049

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10. Rosen RD, Manna B. Wound Dehiscence. [Updated 2023 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK551712/

11. Sibbald, Ronald & Ovington, Liza & Ayello, Elizabeth & Goodman, Laurie & Elliott, James. (2014). Wound Bed Preparation 2014 Update: Management of Critical Colonization with a Gentian Violet and Methylene Blue Absorbent Antibacterial Dressing and Elevated Levels of Matrix Metalloproteases with an Ovine Collagen Extracellular Matrix Dressing. Advances in skin & wound care. 27. 1-6. 10.1097/01.ASW.0000443269.63406.f9.

12. Sibbald RG, Elliott JA, Persaud-Jaimangal R, Goodman L, Armstrong DG, Harley C, Coelho S, Xi N, Evans R, Mayer DO, Zhao X, Heil J, Kotru B, Delmore B, LeBlanc K, Ayello EA, Smart H, Tariq G, Alavi A, Somayaji R. Wound Bed Preparation 2021. Adv Skin Wound Care. 2021 Apr 1;34(4):183-195. doi: 10.1097/01.ASW.0000733724.87630.d6. PMID: 33739948; PMCID: PMC7982138.

13. Stallard, Yvonne. When and How to Perform Cultures on Chronic Wounds?. Journal of Wound, Ostomy and Continence Nursing 45(2):p 179-186, March/April 2018. | DOI: 10.1097/WON.0000000000000414

14 Stevens, D. L., Bisno, A. L., Chambers, H. F., Dellinger, E. P., Goldstein, E. J., Gorbach, S. L., Hirschmann, J. V., Kaplan, S. L., Montoya, J. G., & Wade, J. C. (2014). Clinical Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by IDSA. Clinical Infectious Diseases, 59(2), e10-e52. https://doi.org/10.1093/cid/ciu296

15. Wound, Ostomy, and Continence Nurses Society. (2024). Lower-Extremity wounds due to venous disease, arterial disease, or diabetes mellitus and/or neuropathic disease: Clinical resource guide. Mt. Laurel, NJ: Author

Questions?

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Thank you