Intersection of Infectious Diseases and MOUD

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Literature Review

"Increasing rates of OUD have resulted in an emergent epidemic of infectious complications of infection drug use (IDU) that include outbreaks of human immunodeficiency virus (HIV) and hepatitis C virus (HCV) , as well as increasing hospitalizations and deaths from skin and soft tissue infections, osteomyelitis, septic arthritis, bacteremia, central nervous system infections, and infective endocarditis" (Serota, et al., 2019, p.968)

Workup Consideration

- Reminder to consider the whole person
  - Not just focus on the MOUD need
- Consider ROS responses
- Consider PE findings
  - Remember to take off the socks and shoes
- Mental Status Exam findings?
- Screening tools: GAD7/ PHQ2→9/ CAGE-AID/Others?
- Key questions: risk taking? Other risks?
  - 5 Ps of a sexual history- include STI screening, Pregnancy screening, ID screening
    - PEP or PrEP eligible
    - Birth control
    - Empiric STI treatment
- Labs & follow-up

STI Treatment

- STI 2021 Guidelines https://www.cdc.gov/std/treatment-guidelines/screening-recommendations.htm
- Pocket Guide to Treatmwnt https://www.cdc.gov/std/treatment-guidelines/pocket-guide.pdf
  - Consider wall chart treatment guide
- Diagnoses of/ Picture Guide https://www.cdc.gov/std/training/clinicalslides/slides-dl.htm
- Expedited Partner Therapy https://www.cdc.gov/std/ept/default.htm
  - CDC has concluded that EPT is a useful option to facilitate partner management, particularly for treatment of male partners of women with chlamydial infection or gonorrhea. (note legal status by state)
- Duty to warn

Hepatitis

- Patient with prior history of Ab + or
- Unknown status: AB + reflex to HCV RNA/ VL & Genotrype*
- Hep A/B**/ C
  - Hep B lab interpretation: https://www.cdc.gov/hepatitis/hbv/pdfs/serologicchartv8.pdf
  - If need further Hep B evaluation consider:
    - HBV DNA
    - Hep B e antigen
    - Hep B e antibody
    - HDV
- Additional Labs:
  - AFP, non maternal (tumor marker)
  - INR/PT
  - CBC with Diff
  - CMP (includes ALT/AST,Alk Phos, Bili, BUN, Cr etc.)
- Assessing Liver disease severity: Liver-directed physical exam (normal in most patients)
  - Serum fibrosis marker panels or
  - Transient elastography (Fibroscan)
  - Liver imaging (eg, ultrasound or CT scan)
  - Consider Child Pugh scoring https://www.mdcalc.com/child-pugh-score-cirrhosis-mortality

Pangenomic Treatments & Follow up

- Mavyret (glecaprevir/pibrentasvir) 100/40mg tabs 8 weeks or 12 weeks * (3 tabs PO QD)
  - Without or compensated Cirrhosis

Rx insert package: https://www.rxabbvie.com/pdf/mavyret_pi.pdf

- Epclusa (sofosbuvir/velpatasvir) 400/100 mg tabs 12 weeks (1 tab PO QD)
  - Without cirrhosis/ compensated cirrhosis
  - Decompensated cirrhosis

Rx insert package: https://www.gilead.com/~/media/Files/pdfs/medicines/liver-disease/epclusa/epclusa_pi.pdf

- Note Hep B reactivation risk with these meds / black boxed warnings
- Liverpool DDI resource: https://www.hep-druginteractions.org/
- Labs: wks 4,8,12/ q6 -1 year labs and US
- Incomplete adherence/ retreatment https://www.hcvguidelines.org/evaluate/monitoring#incomplete-adherence

PrEP/ PEP

https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2021.pdf

- Clinicians should document a negative HIV test result within the week before initiating (or reinitiating) PrEP medications, ideally with an antigen/antibody test conducted by a laboratory. The required HIV testing before initiation can be accomplished by (1) drawing blood (serum) and sending the specimen to a laboratory for an antigen/antibody test or (2) performing a rapid, point-of-care, FDA-approved, fingerstick antigen/antibody blood test (see figure 4a).
- Clinicians should suspect acute HIV infection in persons who report having engaged in exposure-prone behaviors in the 4 weeks prior to evaluation for PrEP (e.g., a condom broke during sex with an HIV-infected partner, relapse to injection drug use with shared injection equipment).

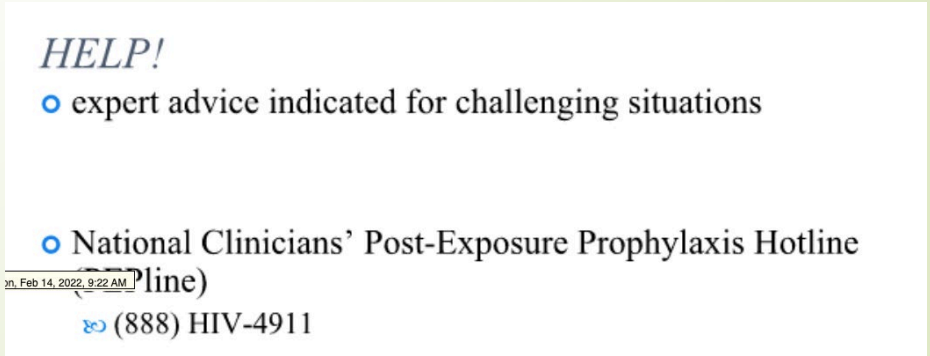
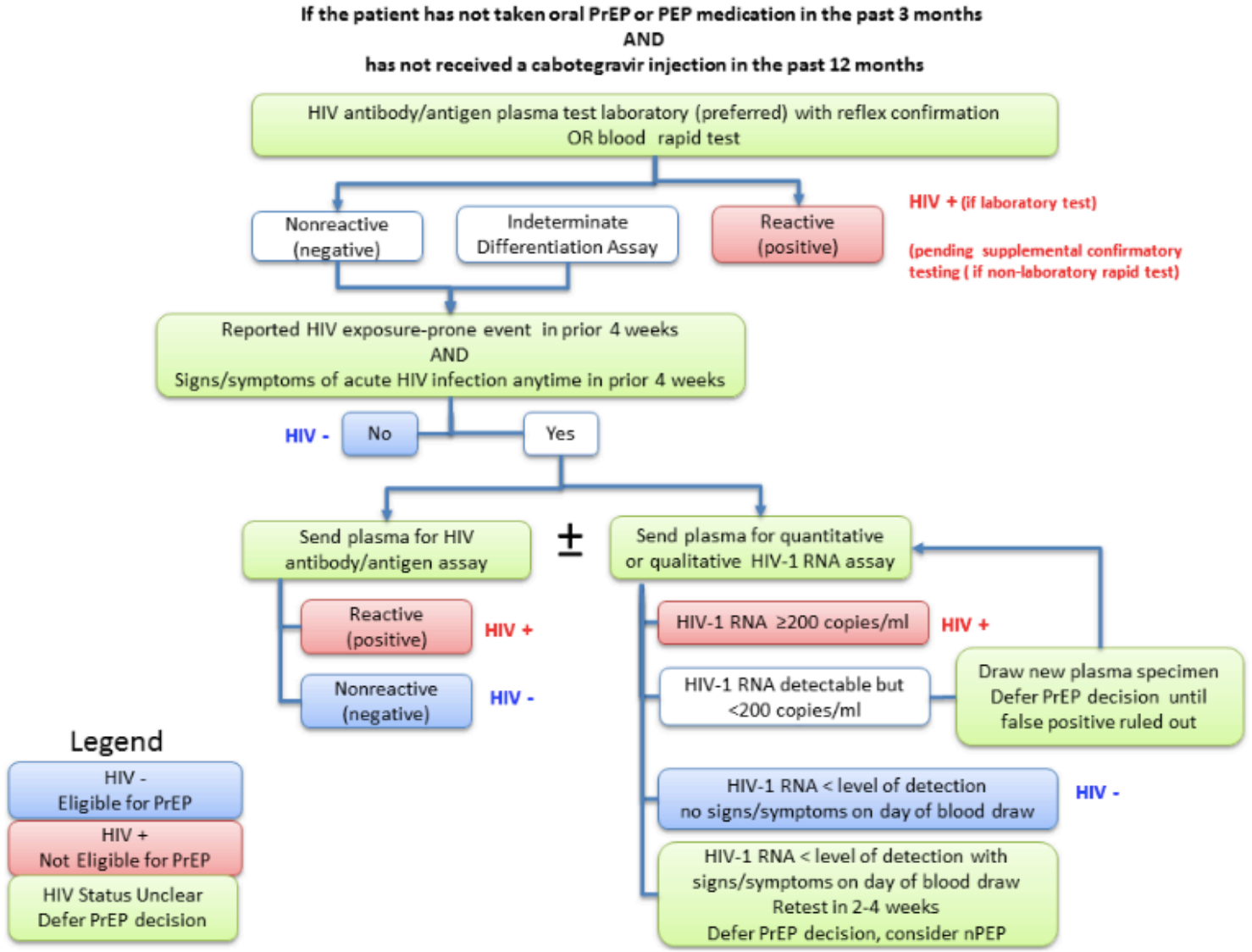


Figure 4a Clinician Determination of HIV Status for PrEP Provision to Persons without Recent Antiretroviral Prophylaxis Use



Acute HIV S/Sx

Table 2: Clinical Signs and Symptoms of Acute (Primary) HIV Infection[71]

Features	Overall (n = 375) %	Sex		Route of transmission	
		Male (n = 355) %	Female (n = 23) %	Sexual (n = 324) %	Injection Drug Use (n = 34) %
Fever	75	74	83	77	50
Fatigue	68	67	78	71	50
Myalgia	49	50	26	52	29
Skin rash	48	48	48	51	21
Headache	45	45	44	47	30
Pharyngitis	40	40	48	43	18
Cervical adenopathy	39	39	39	41	27
Arthralgia	30	30	26	28	26
Night sweats	28	28	22	30	27
Diarrhea	27	27	21	28	23

Other Lab/Testing

- CBC with Diff
- CMP
- Creatine clearance
- Lipids
- Hep A/B/C
- Syphilis
- STI screening:
  - G/C (urine and swabs) ALL SITES used

PrEP Medications

Table 3: Recommended Oral PrEP Medications

Generic Name	Trade Name	Dose	Frequency	Most Common Side Effects[109,110]
F/TDF	Truvada	200 mg/300 mg	Once a day	Headache, abdominal pain, weight loss
F/TAF	Descovy	200 mg/25 mg	Once a day	Diarrhea

Cabotegravir 30 mg 1 tab PO
Cabotegravir 600 mg injectable

PrEP follow-up

Table 5 Timing of Oral PrEP-associated Laboratory Tests

Test	Screening/Baseline Visit	Q 3 months	Q 6 months	Q 12 months	When stopping PrEP
HIV Test	X*	X			X*
eCrCl	X		If age ≥50 or eCrCL <90 ml/min at PrEP initiation	If age <50 and eCrCl ≥90 ml/min at PrEP initiation	X
Syphilis	X	MSM /TGW	X		MSM/TGW
Gonorrhea	X	MSM /TGW	X		MSM /TGW
Chlamydia	X	MSM /TGW	X		MSM /TGW
Lipid panel (F/TAF)	X			X	
Hep B serology	X				
Hep C serology	MSM, TGW, and PWID only			MSM,TGW, and PWID only	

* Assess for acute HIV infection (see Figure 4)

PrEP follow-up

Table 7 Timing of CAB PrEP-associated Laboratory Tests

Test	Initiation Visit	1 month visit	Q2 months	Q4 months	Q6 months	Q12 months	When Stopping CAB
HIV*	X	X	X	X	X	X	X
Syphilis	X			MSM^/TGW~ only	Heterosexually active women and men only	X	MSM/TGW only
Gonorrhea	X			MSM/TGW only	Heterosexually active women and men only	X	MSM/TGW only
Chlamydia	X			MSM/TGW only	MSM/TGW only	Heterosexually active women and men only	MSM/TGW only

* HIV-1 RNA assay

X all PrEP patients

^ men who have sex with men

~ persons assigned male sex at birth whose gender identification is female

nPEP

EXPOSURE

Activity	Transmission risk per act
Sharing needles with an infected person	0.67%
Receptive anal intercourse	0.5%
Percutaneous needle stick	0.3%
Receptive vaginal intercourse	0.1%
Insertive anal intercourse	0.065%
Insertive vaginal intercourse	0.05%
Receptive oral intercourse (with a man)	0.01%
Insertive oral intercourse (male insertion)	0.005%

ORDER THE FOLLOWING LABORATORY TESTS:

- HIV Ag/Ab test (rapid test, not an oral test)
- Complete blood count
- Basic metabolic profile
- Hepatitis B core antibody, surface antigen, surface antibody
- Hepatitis C antibody
- Pregnancy test
- Urine or genital sample for NAA (PCR) testing for gonorrhea and Chlamydia
- Syphilis serology testing

OFFER TREATMENT IF APPROPRIATE

- 28-day course of nPEP
  - start as soon as possible (first dose in ED – ideally within 2 hours of exposure)

	Adults and adolescents ≥ 13 yo	
	Normal renal function (CrCL ≥ 60 ml/min)	Renal dysfunction (CrCl ≤ 59 ml/min)
Preferred	(Tenofovir DF 300 mg + emtricitabine 200 mg QD) plus either raltegravir 400 mg BID or dolutegravir 50 mg QD	(Zidovudine* + lamivudine*) plus either raltegravir 400 mg BID or dolutegravir 50 mg QD
Alternative	(Tenofovir DF 300 mg + emtricitabine 200 mg QD) plus darunavir 800 mg QD + ritonavir 100 mg QD	(Zidovudine* + lamivudine*) plus darunavir 800 mg QD + ritonavir 100 mg QD

*dose adjusted according to degree of renal dysfunction

OFFER TREATMENT IF APPROPRIATE

- Starter pack of 3-7 day supply or entire 28-day course should be available onsite
  - Giving entire 28-day supply has been associated with better adherence than starter packs but is not always practical
- Considerations
  - HIV status of source- resistance? Consult expert
  - Renal dysfunction: may need to adjust dose of tenofovir/emtricitabine and use individual components
  - Drug interactions
- If sexual assault, prophylaxis for STIs and HBV should be provided

Empiric tx G/C, test syphilis, HBV vaccine or Immunoglobulin, check HPV vaccine series

oPEP

OPEP REGIMENS: 3 DRUGS FOR EVERYONE!

Truvada (Emtricitabine + Tenofovir) + Raltegravir

- Alternatives (1 from left, 2 from right column)
  - Raltegravir
  - Darunavir/ritonavir
  - Etravirine
  - Rilpivirine
  - Atazanavir
  - Lopinavir/ritonavir
  - Tenofovir + emtricitabine
  - Tenofovir + lamivudine
  - Zidovudine + lamivudine
  - Zidovudine + emtricitabine
- OR: Stribild (elvitegravir, cobicistat, tenofovir DF, emtricitabine)

PEP follow up; transition to PrEP?

RECOMMENDED FOLLOW-UP

- HIV testing at baseline and at 6 weeks, 12 weeks, and 6 months after exposure
  - If 4th generation combination HIV p24 antigen–HIV antibody test, HIV testing could be performed at baseline, 6 weeks & 4 months after exposure
- CBC, renal and hepatic function tests (at BL and 2 weeks post-exposure)
- HIV testing results should preferably be given to the exposed healthcare provider at face-to-face appointments
- Extended follow-up (eg, for 12 months) if infected with HCV after exposure to HIV/HCV + source

HIV

The following laboratory tests performed during initial patient visits can be used to stage HIV disease and to assist in the selection of ARV drug regimens:

- HIV antibody testing (if prior documentation is not available or if HIV RNA is below the assay's limit of detection) **(AI)**;
- CD4 T lymphocyte cell count (CD4 count) **(AI)**;
- Plasma HIV RNA (viral load) **(AI)**;
- Complete blood count, chemistry profile, transaminase levels, blood urea nitrogen (BUN), and creatinine, urinalysis, ar serologies for hepatitis A, B, and C viruses **(AIII)**;
- Fasting blood glucose and serum lipids **(AIII)**; and
- Genotypic resistance testing **(AII)**. For patients who have HIV RNA levels <500 to 1,000 copies/mL, viral amplification for resistance testing may not always be successful **(BII)**.

In addition, other tests (including screening tests for sexually transmitted infections and tests for determining the risk of opportunistic infections and need for prophylaxis) should be performed as recommended in HIV primary care and opportunistic infections guidelines.[1,2]

Panel's Recommendations

- Antiretroviral therapy (ART) is recommended for all persons with HIV to reduce morbidity and mortality **(AI)** and to prevent the transmission of HIV to others **(AI)**.
- The Panel on Antiretroviral Guidelines for Adults and Adolescents recommends initiating ART immediately (or as soon as possible) after HIV diagnosis in order to increase the uptake of ART and linkage to care, decrease the time to viral suppression for individual patients, and improve the rate of virologic suppression among persons with HIV **(AII)**.
- When initiating ART, it is important to educate patients regarding the benefits of ART and to deploy strategies to optimize care engagement and treatment adherence **(AIII)**.

Rating of Recommendations: *A = Strong; B = Moderate; C = Optional*
Rating of Evidence: *I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion*

After initiation of effective ART, viral load reduction to below limits of assay detection usually occurs within the first 12 to 24 weeks of therapy. Predictors of virologic success include the following:

- Low baseline viremia;
- High potency of the ARV regimen;
- Tolerability of the regimen;
- Convenience of the regimen; and
- Excellent adherence to the regimen.

https://www.hiv.uw.edu/page/treatment/drugs

ART in treatment Naïve v. Treatment experienced

- https://clinicalinfo.hiv.gov/en/guidelines/hiv-clinical-guidelines-adult-and-adolescent-arv/table-7-antiretroviral-regimen?view=full
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Virologic Response Definitions

The following definitions are used in this section to describe the different levels of virologic response to ART.

Virologic Suppression: A confirmed HIV RNA level below the LLOD of available assays.

Virologic Failure: The inability to achieve or maintain suppression of viral replication to HIV RNA level <200 copies/mL.

Incomplete Virologic Response: Two consecutive plasma HIV RNA levels ≥200 copies/mL after 24 weeks on an ARV regimen in a patient who has not yet had documented virologic suppression on this regimen. A patient's baseline HIV RNA level may affect the time course of response, and some regimens may take longer than others to suppress HIV RNA levels.

Virologic Rebound: After virologic suppression, confirmed HIV RNA level(s) ≥200 copies/mL.

Virologic Blip: After virologic suppression, an isolated detectable HIV RNA level that is followed by a return to virologic suppression.

Low-Level Viremia: Confirmed detectable HIV RNA level <200 copies/mL.

Wound Types: Acute & Chronic

Acute Wounds

- Surgical incisions
- Trauma
  - Skin tears
  - Lacerations
  - Crush injuries
  - Burns

Chronic Wounds

- Venous ulcers
- Arterial ulcers
- Diabetic foot ulcers
- Pressure ulcers
- Non-healing surgical wounds
  - Persistently draining (>72 hrs)
  - Copious drainage

Features of Chronic Wound Infection

Often do not see “the usual” (rubor, calor)

Signs/symptoms of chronic wound infections;

- Increased pain
- Delayed healing (no improvement in 2 weeks)
- Discoloration of granulation tissue (pale, dusky)
- Friable granulation tissues, bleeds easily
- Foul odor
- Wound breakdown (increased size, loss of epithelium, bone exposure)
- Pocketing at base or in recessed areas

Common Questions

What do I pack an abscess s/p I & D with?

Managing other skin conditions PLUS the wound.

Harm Reduction approaches, and what does harm reduction have to do with wound care?

What do I do with the patient that wants to/ is leaving AMA?

What wound care product(s) survive the streets?

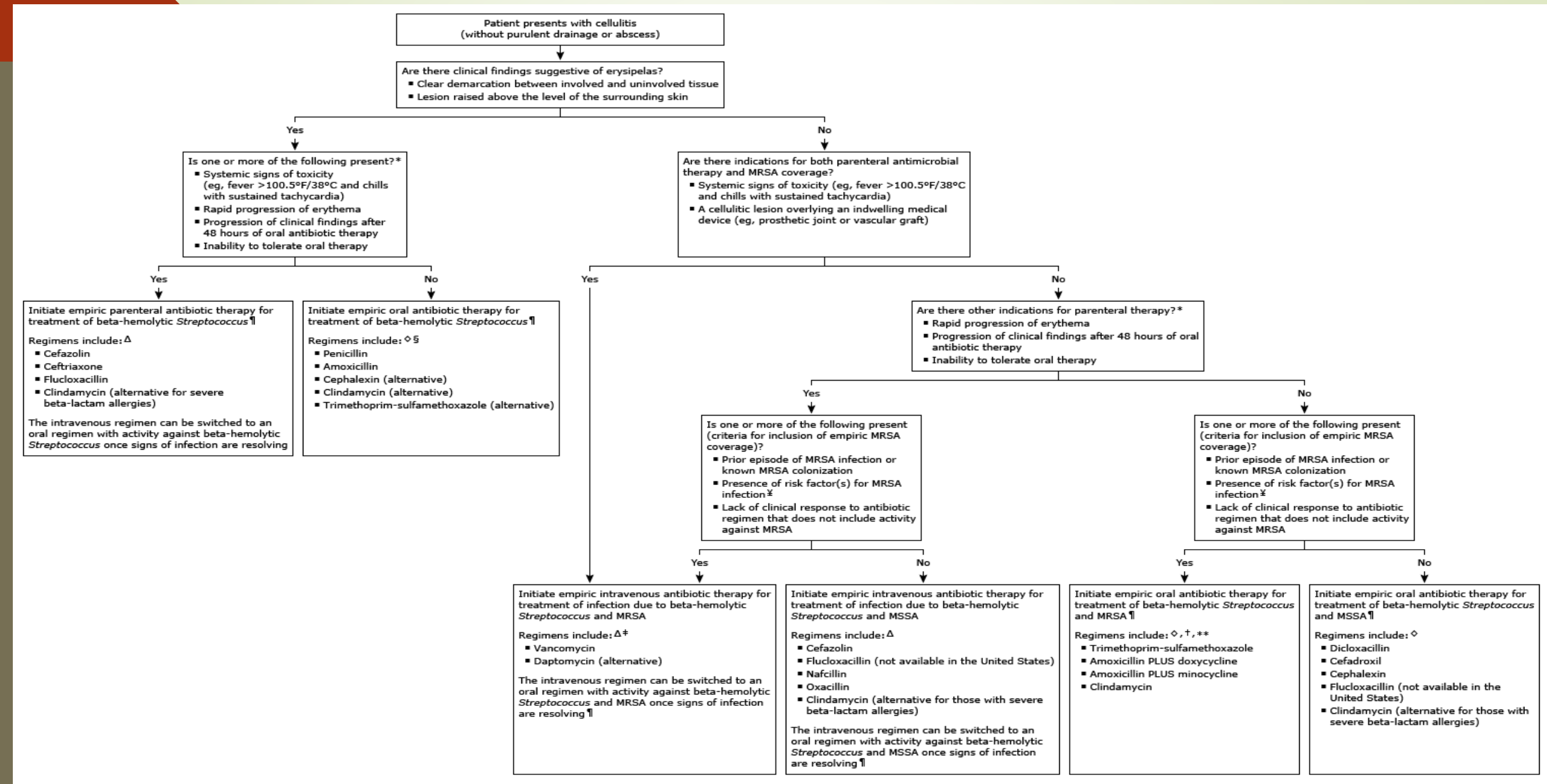
Should I compress a patient without an ABI?

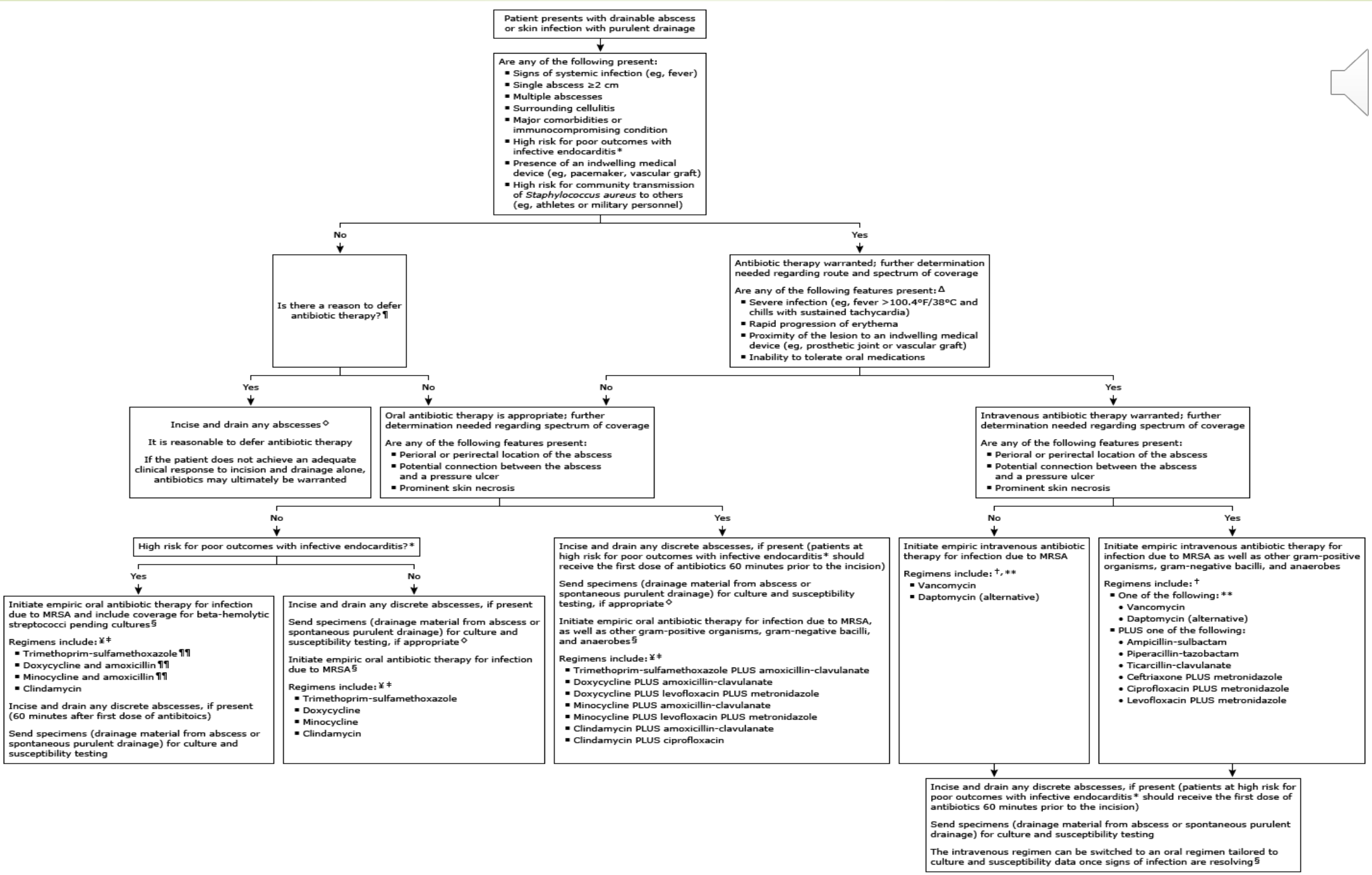
What about antibiotics?

The "Outpatient" patient that should be "Inpatient"

- Patient often leave against medical advice (AMA) because:
  - They do not understand their illness
  - They are "drug sick"
  - Concerned about belonging or animal being left unattended
  - MH/BH complications
- Concerns with-
  - Wounds that are severe (incl. recent amputations) , require IV ABX, or Surgical debridement
  - Patient discharged and placed back on the street (inappropriate setting)
  - SMI- inability to follow up
- Outpatient management:
  - Increase visits?
  - Culture/ Labs?
  - PO antibiotics – broad spectrum
  - Engage SW/ CM/ Insurance coordinator (1147/1157/ frequent admission- recurring admission)

Managing Cellulitis & Abscesses




Patient presents with drainable abscess or skin infection with purulent drainage
Are any of the following present:
Signs of systemic infection (eg, fever)
Single abscess ≥2 cm
Multiple abscesses
Surrounding cellulitis
Major comorbidities or immunocompromising condition
High risk for poor outcomes with infective endocarditis*
Presence of an indwelling medical device (eg, pacemaker, vascular graft)
High risk for community transmission of Staphylococcus aureus to others (eg, athletes or military personnel)
No
Yes
Is there a reason to defer antibiotic therapy?¶
Antibiotic therapy warranted; further determination needed regarding route and spectrum of coverage
Are any of the following features present:Δ
Severe infection (eg, fever >100.4°F/38°C and chills with sustained tachycardia)
Rapid progression of erythema
Proximity of the lesion to an indwelling medical device (eg, prosthetic joint or vascular graft)
Inability to tolerate oral medications
Yes
No
No
Yes
Incise and drain any abscesses◇
It is reasonable to defer antibiotic therapy
If the patient does not achieve an adequate clinical response to incision and drainage alone, antibiotics may ultimately be warranted
Oral antibiotic therapy is appropriate; further determination needed regarding spectrum of coverage
Are any of the following features present:
Perioral or perirectal location of the abscess
Potential connection between the abscess and a pressure ulcer
Prominent skin necrosis
Intravenous antibiotic therapy warranted; further determination needed regarding spectrum of coverage
Are any of the following features present:
Perioral or perirectal location of the abscess
Potential connection between the abscess and a pressure ulcer
Prominent skin necrosis
No
Yes
No
Yes
High risk for poor outcomes with infective endocarditis?*
Incise and drain any discrete abscesses, if present (patients at high risk for poor outcomes with infective endocarditis* should receive the first dose of antibiotics 60 minutes prior to the incision)
Send specimens (drainage material from abscess or spontaneous purulent drainage) for culture and susceptibility testing, if appropriate◇
Initiate empiric oral antibiotic therapy for infection due to MRSA, as well as other gram-positive organisms, gram-negative bacilli, and anaerobes§
Regimens include:¥‡
Trimethoprim-sulfamethoxazole PLUS amoxicillin-clavulanate
Doxycycline PLUS amoxicillin-clavulanate
Doxycycline PLUS levofloxacin PLUS metronidazole
Minocycline PLUS amoxicillin-clavulanate
Minocycline PLUS levofloxacin PLUS metronidazole
Clindamycin PLUS amoxicillin-clavulanate
Clindamycin PLUS ciprofloxacin
Initiate empiric intravenous antibiotic therapy for infection due to MRSA
Regimens include:†,**
Vancomycin
Daptomycin (alternative)
Initiate empiric intravenous antibiotic therapy for infection due to MRSA as well as other gram-positive organisms, gram-negative bacilli, and anaerobes
Regimens include:†
One of the following:**
Vancomycin
Daptomycin (alternative)
PLUS one of the following:
Ampicillin-sulbactam
Piperacillin-tazobactam
Ticarcillin-clavulanate
Ceftriaxone PLUS metronidazole
Ciprofloxacin PLUS metronidazole
Levofloxacin PLUS metronidazole
Yes
No
Initiate empiric oral antibiotic therapy for infection due to MRSA and include coverage for beta-hemolytic streptococci pending cultures§
Regimens include:¥‡
Trimethoprim-sulfamethoxazole¶¶
Doxycycline and amoxicillin¶¶
Minocycline and amoxicillin¶¶
Clindamycin
Incise and drain any discrete abscesses, if present (60 minutes after first dose of antibitoics)
Send specimens (drainage material from abscess or spontaneous purulent drainage) for culture and susceptibility testing
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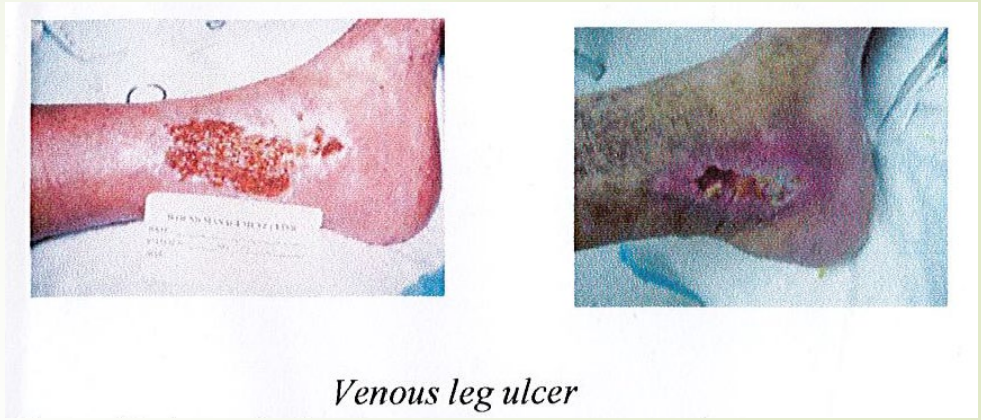
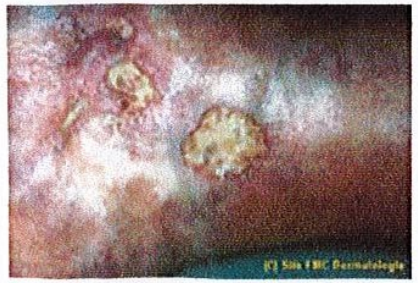
Initiate empiric oral antibiotic therapy for infection due to MRSA§
Regimens include:¥‡
Trimethoprim-sulfamethoxazole
Doxycycline
Minocycline
Clindamycin
Incise and drain any discrete abscesses, if present (patients at high risk for poor outcomes with infective endocarditis* should receive the first dose of antibiotics 60 minutes prior to the incision)
Send specimens (drainage material from abscess or spontaneous purulent drainage) for culture and susceptibility testing
The intravenous regimen can be switched to an oral regimen tailored to culture and susceptibility data once signs of infection are resolving§

Venous Ulcers

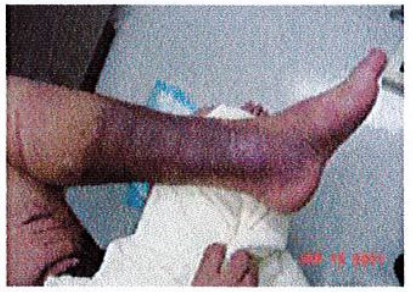
Mechanism	Venous valve failure -> congestion, HTN
Location	Ankle to mid-calf; often medial malleolus
Wound margin, bed & size	Irregular shape Usually shallow bed, viable or necrotic Usually large
Exudate, edema & wound staining	Exudate varies (none, heavy, weeping) Generalized edema Often hyperpigmented
ABI & pulses	ABI >0.8. Pulses normal (or undetectable due to edema)
Pain	Often w/ dependent position (edema)



Venous leg ulcer



Atrophy blanche



hemocidirin staining

Managing Chronic Venous Insufficiency/ Venous Ulcers & Compression

SORT: KEY RECOMMENDATIONS FOR PRACTICE

CLINICAL RECOMMENDATION	*EVIDENCE RATING*	*REFERENCES*
Compression therapy has been proven beneficial for venous ulcer treatment and is the standard of care.	A	2, 7, 10, 22–26, 45
Leg elevation minimizes edema in patients with venous insufficiency and is recommended as adjunctive therapy for venous ulcers. The recommended regimen is 30 minutes, three or four times per day.	C	27
Dressings are beneficial for venous ulcer healing, but no dressing has been shown to be superior.	A	28, 29

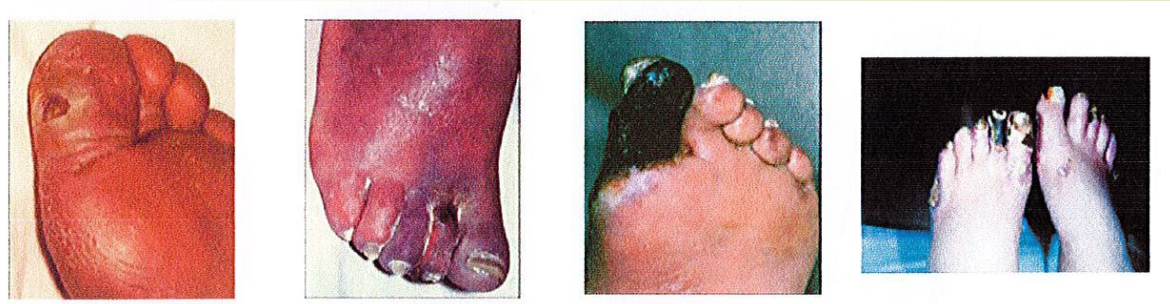
SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	Comments
Arterial pulse examination and measurement of ankle-brachial index are recommended for all patients with suspected venous ulcers.[1]	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.[1]	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.[1,5]	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.[1,28]	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.[1,18]	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.[1,19,39]	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.[21]	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.

Arterial Ulcers

Mechanism	Arterial occlusion, ischemia
Location	Distal extremity (anywhere)
Wound margin, bed & size	Well-defined margin Pale, little granulation. Necrosis common Starts small; increases in size
Exudate, edema & wound staining	Minimal to no exudate +/- local edema Usually no statining
ABI & pulses	ABI <0.8 (<0.5 → BAD!). Dec pulses
Pain	At rest, night or w/ limb elevation



Arterial ulcers

Diabetic Foot Ulcers

Mechanism	Autonomic / sensory / motor nerve damage Arterial perfusion deficit
Location	Usually foot, can be anywhere
Wound margin, bed & size	Well-defined margin, calloused edge Pale, little granulation. Necrosis common. Usually small
Exudate, edema & wound staining	Minimal to no exudate +/- localized edema Usually no staining
ABI & pulses	ABI and pulses unreliable (calcification)
Pain	Variable (absent or severe; neuropathy)

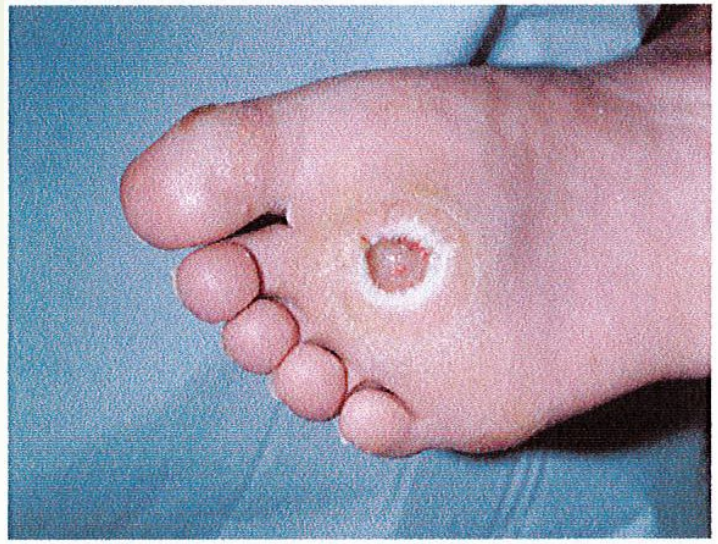


Figure 2: **Neuropathic ulcer in typical position under second metatarsal head and surrounded by callus**

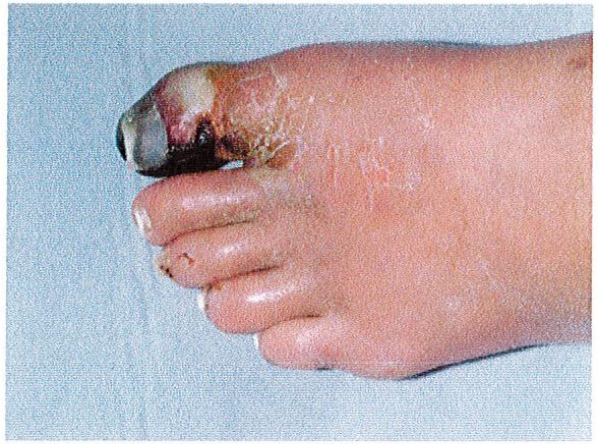
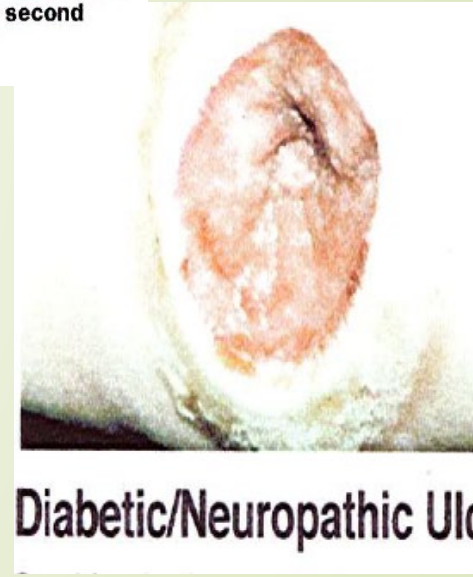


Figure 3: **Digital gangrene**



Diabetic/Neuropathic Ul

Type	Arterial ("ischemic")	Neuropathic / Diabetic	Venous
Mechanism	Arterial occlusive disease causes ischemia	Damage to autonomic, sensory, or motor nerves; arterial perfusion deficit	Venous valve failure, causes venous congestion and hypertension
Location	Distal extremity (anywhere)	Usually **foot**, but can be anywhere	Ankle to mid-calf, often medial malleolus, can be circumferential
Wound margin, bed, and size	Well-defined margin. Pale, little granulation, necrosis is common. Starts **small, then increases** in size.	Well-defined margin with **calloused edge.** Pale, little granulation tissue, necrosis is common. Usually **small size**.	**Irregular shaped.** Usually shallow, can have viable or necrotic tissue. Usually **large size**.
Exudate, edema & limb staining	Minimal to no exudate. +/- localized edema. Usually no staining.	Minimal to no exudate. +/- localized edema. Usually no staining.	Exudate varies (none, heavy, generalized weeping). Generalized **edema**. Usually **hyperpigmented**.
ABI and pulses	**ABI <0.8** (<0.5 bad!). Reduced / no pulses.	ABI and pulses not reliable (calcification).	**ABI >0.8**. Pulses usually normal, or undetectable due to edema.
Pain	**At rest, at night, or when limb is elevated**	**Variable**: absent or severe (neuropathy)	Often in **dependent position** (edema)

Supports or Impedances for wound healing

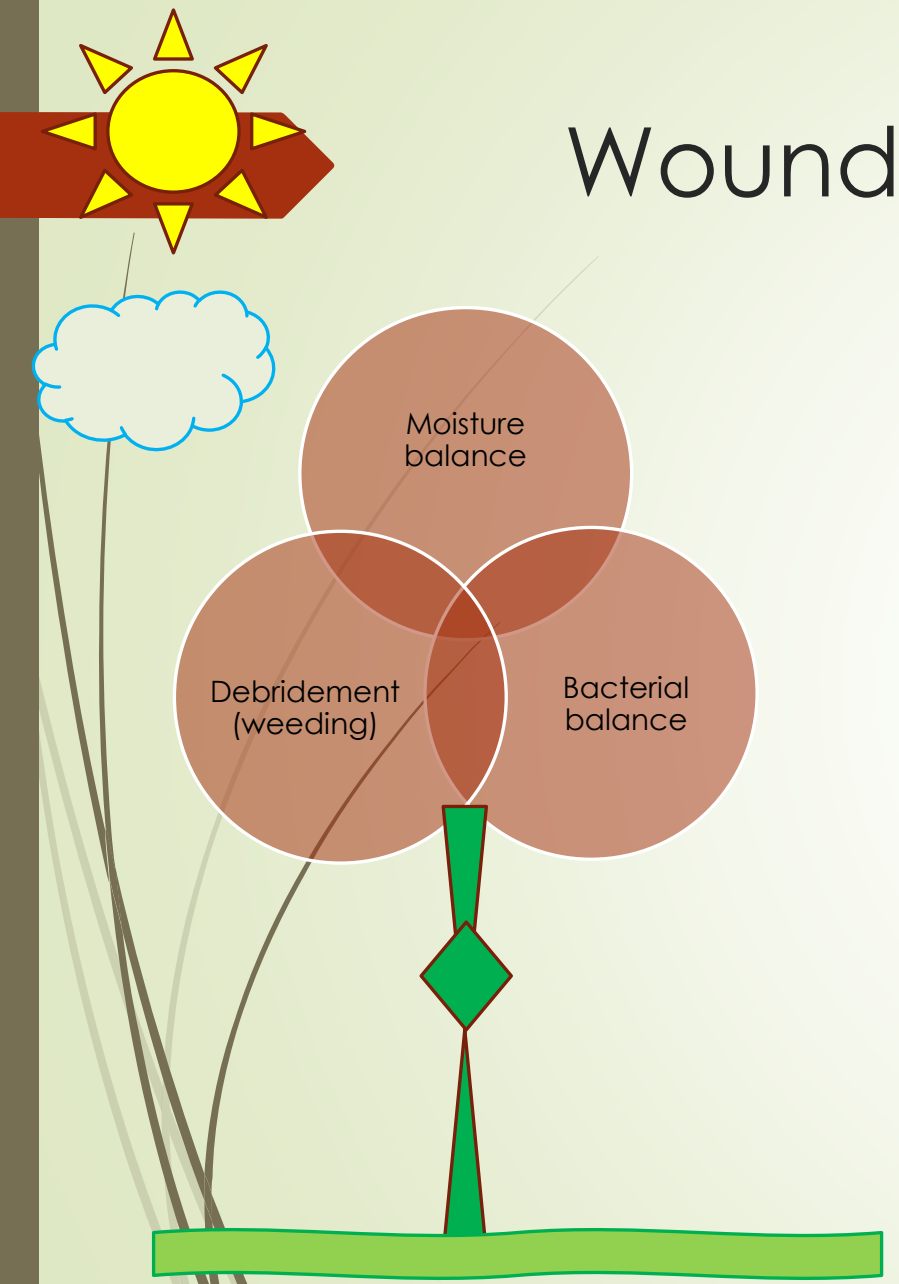
Factors that may delay wound healing

- Nutrition / Macronutrients
  - Adequate protein, fluid intake, amino acids
  - Glucose control
- Vitamins (especially A, C, and D)/ Minerals (especially zinc, copper, iron, selenium)
- Continued trauma to the site (IVDU)
- Optimization of wound bed / moisture

Factors that may delay wound healing

- Tissue necrosis, devitalization
- Infection / inflammation
- Moisture imbalance
- Edges (stalling in advancement of edges / closure)

Wound Beds: They're like a garden



- Moisture balance:
  - Choose the right dressing (see separate slide)
- Bacterial balance:
  - Cleanse wound with dressing changes
    - Tap water (if clean), sterile saline, acetic acid solution (pseudomonas), commercial wound cleanser (surfactant)
  - Treat infections if needed
- Debridement
  - Scrubbing (pre-treat with 4% topical lidocaine)
  - Sharps debridement
  - Surgical debridement
  - Enzymatic (i.e. collagenase)
  - Autolysis (phagocytes, leukocytes, need moisture balance)

To Culture or Not to Culture?

- Culture if:
  - Suspected infection in debrided ulcer
  - No progress in 2 weeks after debridement
- How to culture
  - Wound tissue biopsy (curette)
  - Validated quantitative swab technique
    - Levine method superior to Z-method
  - Obtain both aerobic and anaerobic Cxs
  - Consider fungal if no response to Abx

- Levine Method for Wound Swab
  - 1) Thoroughly cleanse with NS, blot dry with sterile gauze
  - 2) If wound is very dry, pre-moisten swab (NS)
  - 3) Don't swab pus / exudate / eschar / necrosis!
  - 4) Rotate swab tip in 1cm square area of clean granulation tissue. Apply gentle pressure 5 seconds to release exudate
  - 5) Insert swab into culture medium

Product Selection- What survives the streets? What is worth the $

Factors to consider:

- Houseless v. marginally housed
  - Living in a shelter?
  - Couch surfing?
  - Living in a park?
  - Living on the sidewalk?
  - Living under a bridge- in the water?
  - Living in the tree line along the roadway/ highway?
  - Living in a car?
- Ability to access water?
- Ability to stay dry?
- Ability to store extra dry dressings/ supplies/ medications?
- Using a wheelchair?
- Using other assistive devices? (crutches, cane, etc.)
- Insurance?
  - Cost of dressing/ product/ medication
- How frequently need to change the dressing

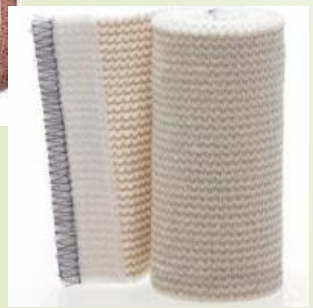
Alginates (Calcium/ Silver)

Xeroform

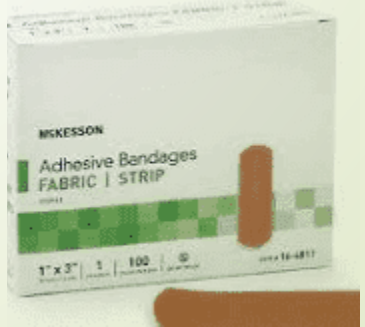
Wrapping it up

Consider Zinc barrier cream for the periwound

Select an appropriate wound care product for the wound bed



Consider non-stick pads, ABD pads to cover the site, consider gauze roll (open weave v closed weave) as a wrap; consider the final dressing layer- ability to compress? Self-adherent Cohesive bandage (Coban) v. Elastic wrap (ACE); 4 –layer?, just needs a Band-Aid*? Which tape- transpore v. retention



Normal Wound Healing Process

Coagulation

Days 0 - 3

Cellular: Vasoconstriction, platelet plug / aggregation

Facilitated by cytokines (thromboxane, serotonin, adrenaline, coagulation cascade)

Inflammation

Days 1 – 3

Cellular: Leukocytes (PMNs, monocytes, macrophages, lymphocytes)

Facilitated by growth factors (PDGF, VEGF, TGF-alpha / beta, TNF-alpha, MMPs, IL-1, IL-6

Proliferation

Days 4 – weeks

Cellular: Fibroblasts, ECM deposition, reepithelialization, angiogenesis

Facilitated by collagen (type 1 & 3), VEGF, PDGF

Remodeling

Weeks – months (sometimes years)

Cellular: wound maturation

Facilitated by collagen (type 3 → type 1), cross-linkage of collagen to increase tensile strength

Other Special Considerations

- Pregnancy
- Incarcerated setting: jails/ prisons
- ED setting

Final Thought

"…when addiction care is available, it is often fragmented and not well integrated with ID care. Addiction medicine care among patients with IDU-associated infections can be cost-effective and is associated with improved infection and addiction outcomes [19, 20]. Referral to addiction treatment is associated with decreased mortality in patients with IDU and infective endocarditis [21]. Additionally, patients with HIV who receive medications for their SUDs have improved viral suppression and increased retention in HIV care [22–24]. Among patients with HCV, the provision of MOUDs facilitates successful cures and is feasible in primary care and in methadone maintenance programs [25]. There is a need for physicians and health-care systems able to provide integrated care to patients with IDU-associated infectious diseases." (Serota, et al., 2019, p.968)

Case Study

- 42 y.o NH Male on Buprenorphine/ Naloxone 8/2 mg BID (2 years) for history of IVDU- Heroin/ Opioid use
- Foot pain – presented to urgent care after 3 days in pain to left great foot worsening.
  - Dx: Gout
  - No clear PE documented; however noted that medications were reconciled and reviewed rx: Allopurinol and Oxycodone
- Roll up the pant leg- severe cellulitis with necrotic tissue
- Prescribed Oxycodone for pain management of Gout; also noting and D/C Buprenorphine
- Lessons learned:
  - patients still using/ should check legs- toe space for injection marks. Consider Buprenorphine for both pain management and for OUD
  - Actually complete a full PE- roll up pant les; take off socks and shoes
  - Need for a culture with IVDU related severe wounds? Patient had a rare bacterial growth ; often seen more with IVDU
    - Referral to ID for IV ABX management (debate about PO versus IV ABX; and newer one time dose(Dalvance) versus prolonged IV Vancomycin
  - Wound care: required aggressive debridement and consideration for a wound VAC
  - Requires SUD management/ pain management –consider increasing Buprenorphine dosage?

References

- Collins, L. & Seraj, S. (2010). Diagnosis and treatment of venous ulcers. *Am Fam Physician,* 81(8) 989-996. https://www.aafp.org/afp/2010/0415/p989.html
- Marston W et al. Wound healing society 2015 update on guidelines for venous ulcers. *Wound Rep Reg.* 2016,24: 136-144.
- Millan, S.B., Gan, R., & Townsend, P. E. (2019). Venous ulcers: diagnosis and treatment. *Am Fam Physician,* 100 (5) 298-305. *https://www.aafp.org/afp/2019/0901/p298.html*
- Serota, D., Barocas, J., & Spring, S. (2020). Infectious complications of addiction: a call for a new subspeciality within infectious diseases. *Clinical Infectious Diseases,* 70(5), 968-972. https://doi.org/10.1093/cid/ciz804
- Spelman, D. & Baddour, L.M. (2021, October 29). Cellulitis and skin abscess in adults: treatment. *Up to Date. https://www.uptodate.com/contents/cellulitis-and-skin-abscess-in-adults-treatment*