Infectious Disease Test Review

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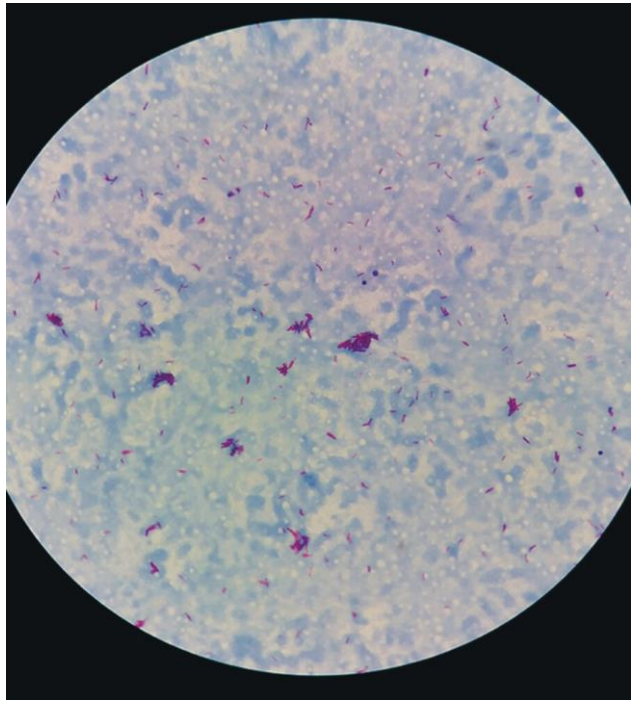

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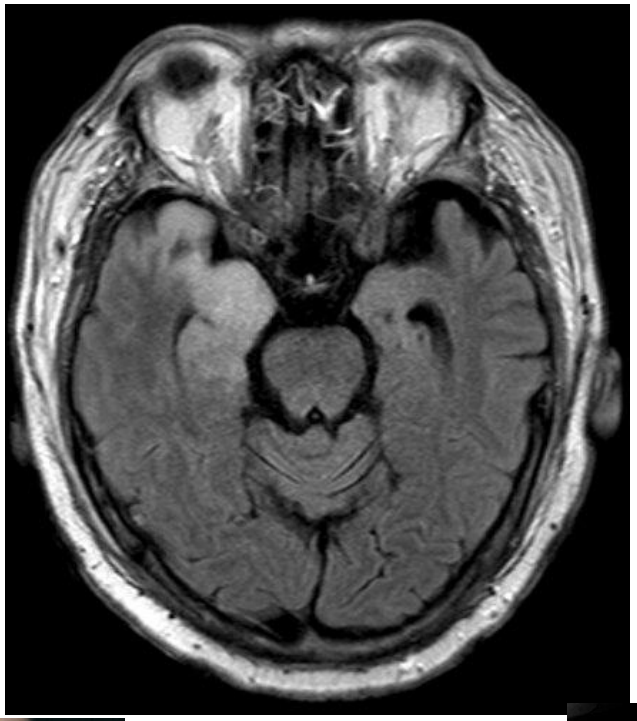

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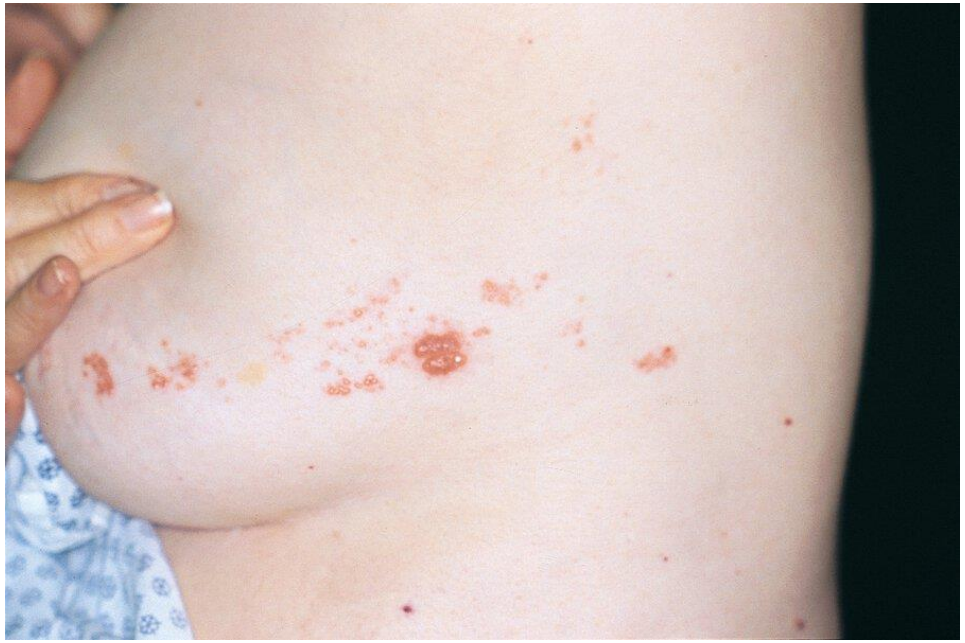

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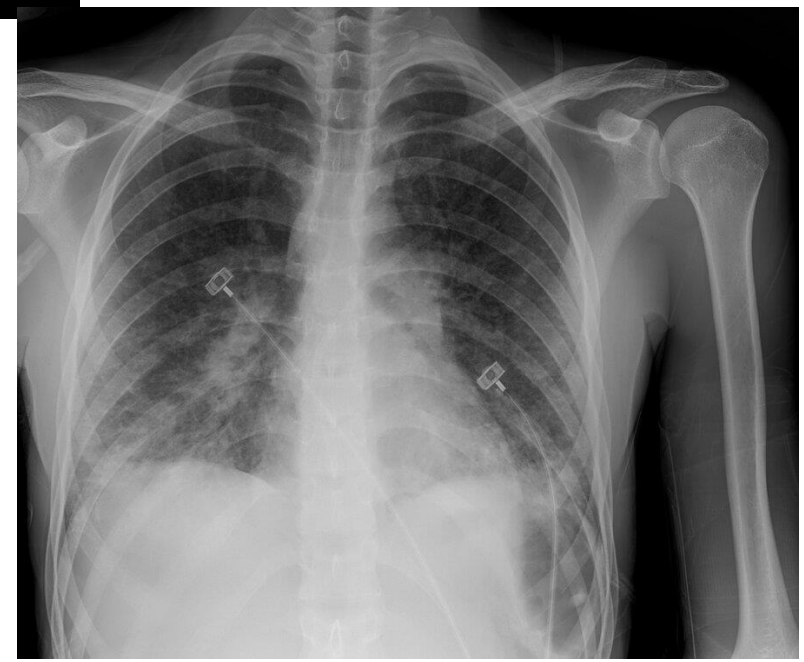


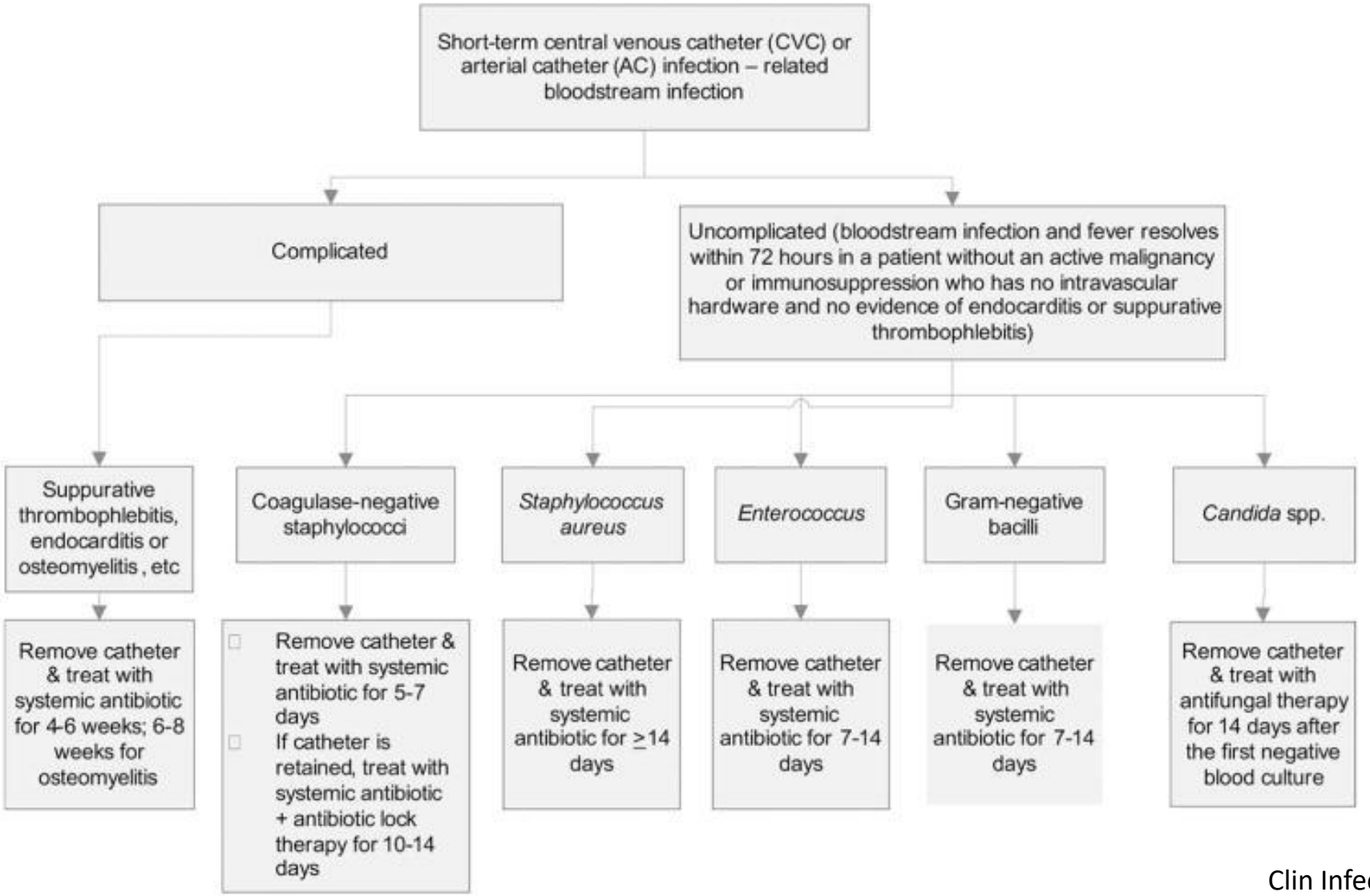
1. Which of the following is the most appropriate management?

- D; remove PICC, switch to IV cefepime, peripherally administered

- 63 y/o F receiving IV penicillin via PICC for group B strep osteo of right great toe
- Fevers, chills; T 38.8 ˚C; TTP at right brachial insertion site
- WBC count of 17,400/µL
- 2 sets of blood cultures with GNRs

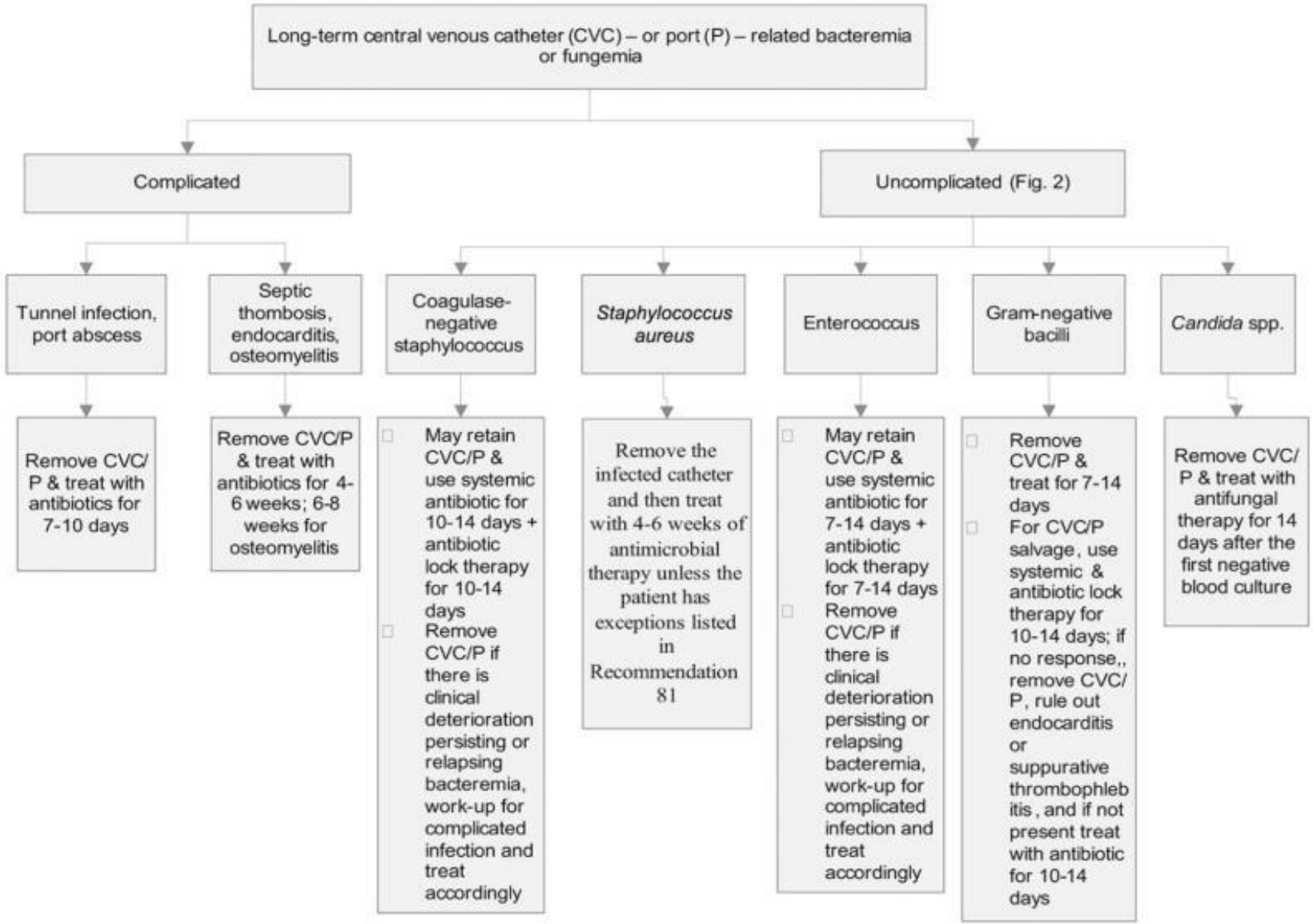
- **Treat central line associated blood stream infection**

Treat central line associated blood stream infection



Clin Infect Dis. 2009;49(1):1

Treat central line associated blood stream infection



Catheter management

- Removal recommended:
  - Sepsis
  - Hemodynamic instability
  - Concomitant endocarditis or evidence of metastatic infection
  - Presence of suppurative thrombophlebitis
  - Presence of a propagating clot
  - Persistent bacteremia after 72 hours of appropriate antimicrobial therapy
  - Subcutaneously tunneled central venous catheter tunnel tract infection or subcutaneous port reservoir infection
- **Always remove the line:**
  - ***S. aureus***
  - ***Pseudomonas aeruginosa***
  - ***Drug-resistant GNRs***
  - ***Candida species***

- Consider catheter salvage therapy:
  - CoNS
  - Drug-susceptible Enterobacteriaceae (eg, *E. coli*, *Klebsiella* species, *Enterobacter* species)
- Antibiotic lock therapy in addition to systemic antibiotics
- Guidewire exchange = last resort!

2. Which of the following is the most appropriate treatment?

- C; levofloxacin

- 24 y/o M w/ TBI after MVA 6 months previously; dependent on others for care and receives nutrition through PEG tube
- Episode of emesis 3 days ago and TF material was suctioned from oropharynx
- T 38.4 ˚C; sputum gram stain shows moderate PMNs but no bacteria; CXR with RLL consolidation
- Anaphylaxis with PCN

- **Treat community acquired PNA following aspiration**

Management of aspiration PNA

- 5-15% of community-acquired pneumonias
- Aspiration PNA is the leading cause of death in patients with gastrostomy tubes
- Common organisms to CAP
  - *Streptococcus pneumoniae*, *Haemophilus influenzae*, and gram-negatives

Conditions that predispose to aspiration

Altered consciousness
Alcoholism, seizures, head trauma, general anesthesia, drug overdose
Dysphagia
Esophageal disorders including stricture, neoplasm, diverticula, tracheoesophageal fistula, incompetent cardiac sphincter, achalasia, oropharyngeal obstruction, xerostomia
Neurologic disorder
Cerebrovascular accident, multiple sclerosis, Parkinson disease, myasthenia gravis, pseudobulbar palsy, amyotrophic lateral sclerosis
Mechanical disruption of the usual defense barriers
Nasogastric tube, endotracheal intubation, tracheostomy, upper gastrointestinal endoscopy, bronchoscopy
Other
Protracted vomiting, gastric outlet obstruction, large-volume nasogastric tube feedings, pharyngeal anesthesia, general debility, recumbent position, ascites, gastroparesis, ileus, glottic insufficiency (eg, vocal cord paralysis)

Graphic 56501 Version 5.0

Things We Do for No Reason™: Routine Coverage of Anaerobes in Aspiration Pneumonia

Amar Vedamurthy, MD, MS, MRCP (UK), FACP[1]*, Iniya Rajendran, MD, MPH[2], Farrin Manian, MD, MPH, FACP, FIDSA, FSHEA[1]

- When to consider anaerobic coverage:
  - Empyema
  - Lung abscess
  - Post-obstructive PNA

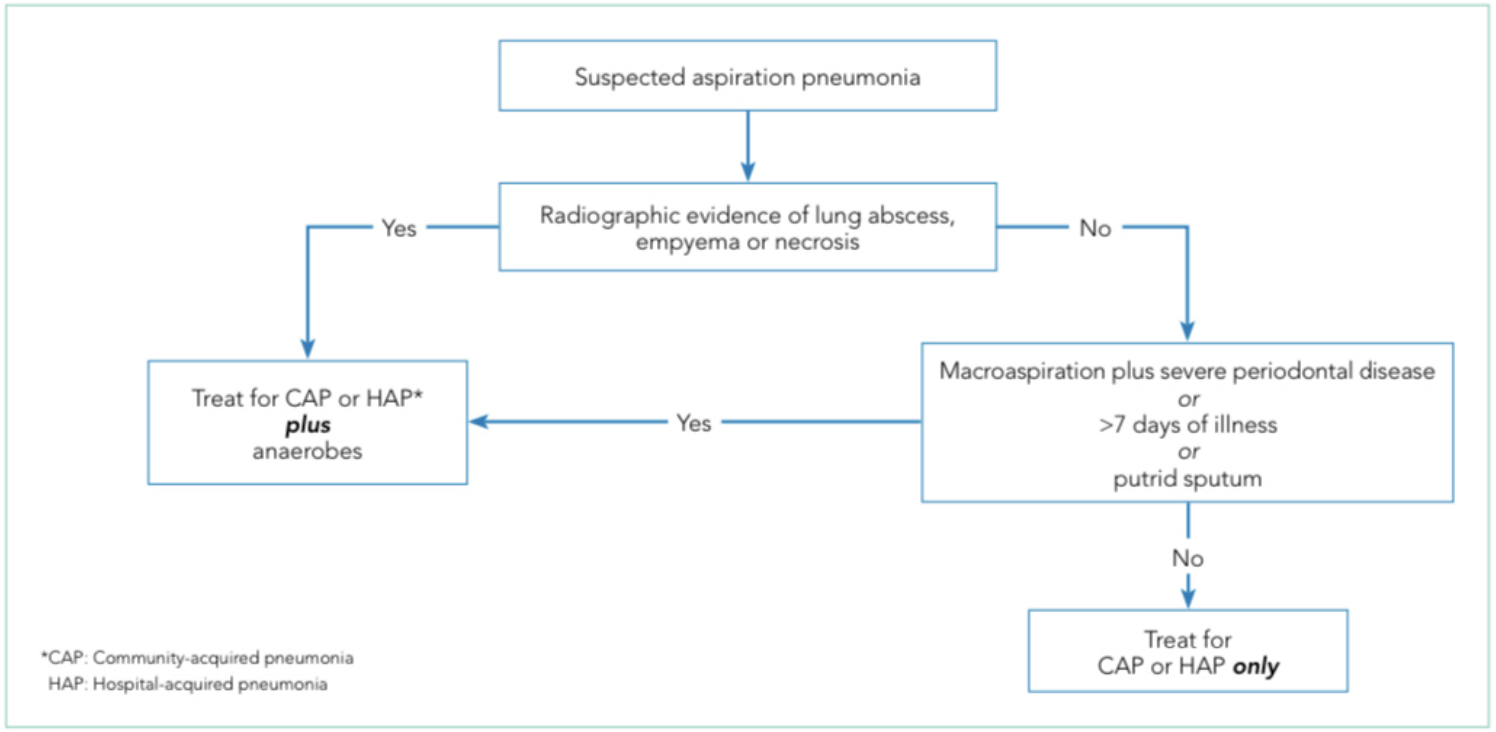


FIG. Algorithm for Antibiotic Selection in Suspected Aspiration Pneumonia. Antibiotic selection for suspected aspiration pneumonia is based on clinical findings plus risk factors and radiographic findings.

Aspiration pneumonia

- Other answers:
  - A. Aztreonam + metronidazole does not cover pneumococcus or other gram-positive organisms
  - B. Ceftriaxone + azithromycin would be an appropriate alternative, but should be avoided given history of immediate hypersensitivity reaction to β-lactam antibiotics
  - D. Residence in a SNF is not an independent risk factor for *Pseudomonas* pneumonia, so an antipseudomonal agent such as meropenem is not indicated
  - E. Moxifloxacin monotherapy would be an appropriate choice, but adding clindamycin increases the risk of *Clostridioides difficile* colitis with minimal therapeutic benefit

3. Which of the following is the most appropriate treatment?

- A; benzathine penicillin, IM (single dose)

- 26 y/o F w/ multiple sexual partners; hx of STIs including treatment for latent syphilis 1 year ago
- T 37.9 ˚C; maculopapular rash on trunk and extremities, some lesions on left palm
- RPR 1:128, RPR 3 months ago was 1:2

- **Treat secondary syphilis**

Clinical manifestations and screening

TABLE 1

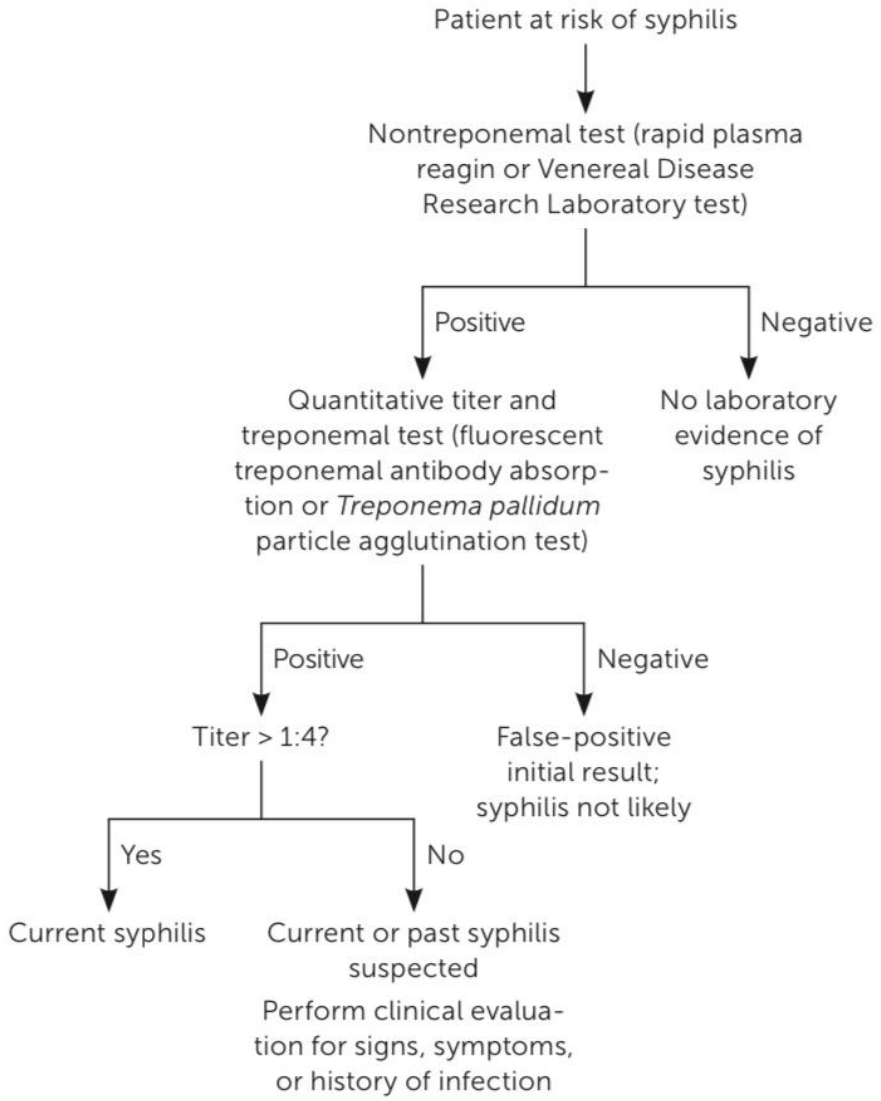
Stages, Time Course, and Manifestations of Syphilis

Stage	Duration	Manifestations	
		Common	Uncommon
Primary	10 to 90 days	Chancre	Local lymphadenopathy
Secondary	1 to 3 months	Arthralgias, condylomata lata, fatigue, generalized lymphadenopathy, headache, hepatosplenomegaly, maculopapular/papulosquamous exanthema, myalgias, nephrotic syndrome, pharyngitis	Annular syphilis, iritis, pustular syphilis, pyrexia, syphilitic alopecia, ulceronodular syphilis
Early latent	After primary and secondary stages, up to 1 year of no symptoms	None	Secondary symptoms can recur
Late latent	More than 1 year of no symptoms	None	None
Tertiary	Months to years	Late neurosyphilis*	Cardiovascular or gummatous syphilis

*—Neurosyphilis, particularly ocular manifestations, may occur at any stage of infection.

Adapted with permission from Mattei PL, Beachkofsky TM, Gilson RT, et al. Syphilis: a reemerging infection. Am Fam Physician. *2012;86(5):434.*

FIGURE 4



Traditional screening algorithm for syphilis.

Am Fam Physician. 2020 Jul 15; 102(2):91-98.

Treatment based on stage

TABLE 3

Treatment Regimens for Syphilis

Syphilis type	Treatment
Primary and secondary	Penicillin G benzathine, 2.4 million units IM 1 time *In people allergic to penicillin:* Doxycycline, 100 mg orally 2 times per day for 14 days (preferred) *or* Tetracycline, 500 mg orally 4 times per day for 14 days *or* Ceftriaxone (Rocephin), 1 to 2 g IM or IV per day for 10 to 14 days* *or* Azithromycin (Zithromax), single 2-g oral dose has been effective in some populations†
Early latent	Penicillin G benzathine, 2.4 million units IM 1 time
Late latent or latent of unknown duration	Penicillin G benzathine, 2.4 million units IM at 1-week intervals for 3 weeks
Tertiary	Penicillin G benzathine, 2.4 million units IM at 1-week intervals for 3 weeks
Ocular or neurosyphilis	Aqueous crystalline penicillin G, 18 to 24 million units IV per day, given as 3 to 4 million units every 4 hours or as continuous infusion, for 10 to 14 days *Alternative if compliance is ensured:* Penicillin G procaine, 2.4 million units IM 1 time per day for 10 to 14 days *plus* Probenecid, 500 mg orally 4 times per day for 10 to 14 days

4. Which of the following is the most appropriate management?

- A; antiretroviral therapy initiation now

- 35 y/o M w/ new diagnosis of HIV
- HIV-1/2 antigen/antibody combination immunoassay is positive with HIV-1 quantitative RNA 25,640 copies/mL and CD4 count is 540/µL

- **Manage newly diagnosed HIV infection**

Manage newly diagnosed HIV infection

- HIV treatment guidelines recommend immediate ART initiation (either the same day as or within 2 weeks of diagnosis) if no medical contraindications
- Contraindications:
  - Concomitant opportunistic infection in which immediate ART may be harmful
  - Structural barriers (staffing and linkage to care service availability)
- Immune reconstitution inflammatory syndrome (IRIS)
  - Paradoxical worsening of pre-existing infectious processes following ART initiation
  - Increased severity if ↑ VL and ↓ CD4 count
  - Consider delay in ART initiation in setting of cryptococcal meningitis and TB meningitis; otherwise within 2 weeks

HIV diagnosis

Figure 1. Progression of HIV Viremia and Immune Response after Initial Infection.

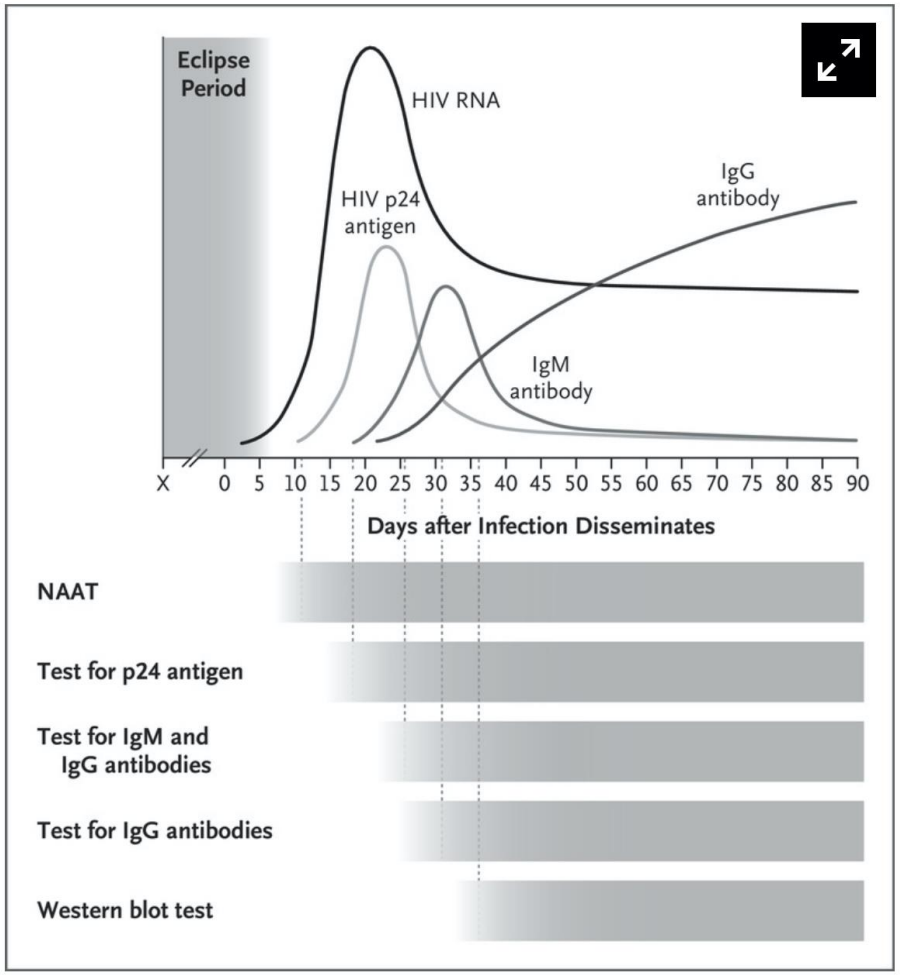
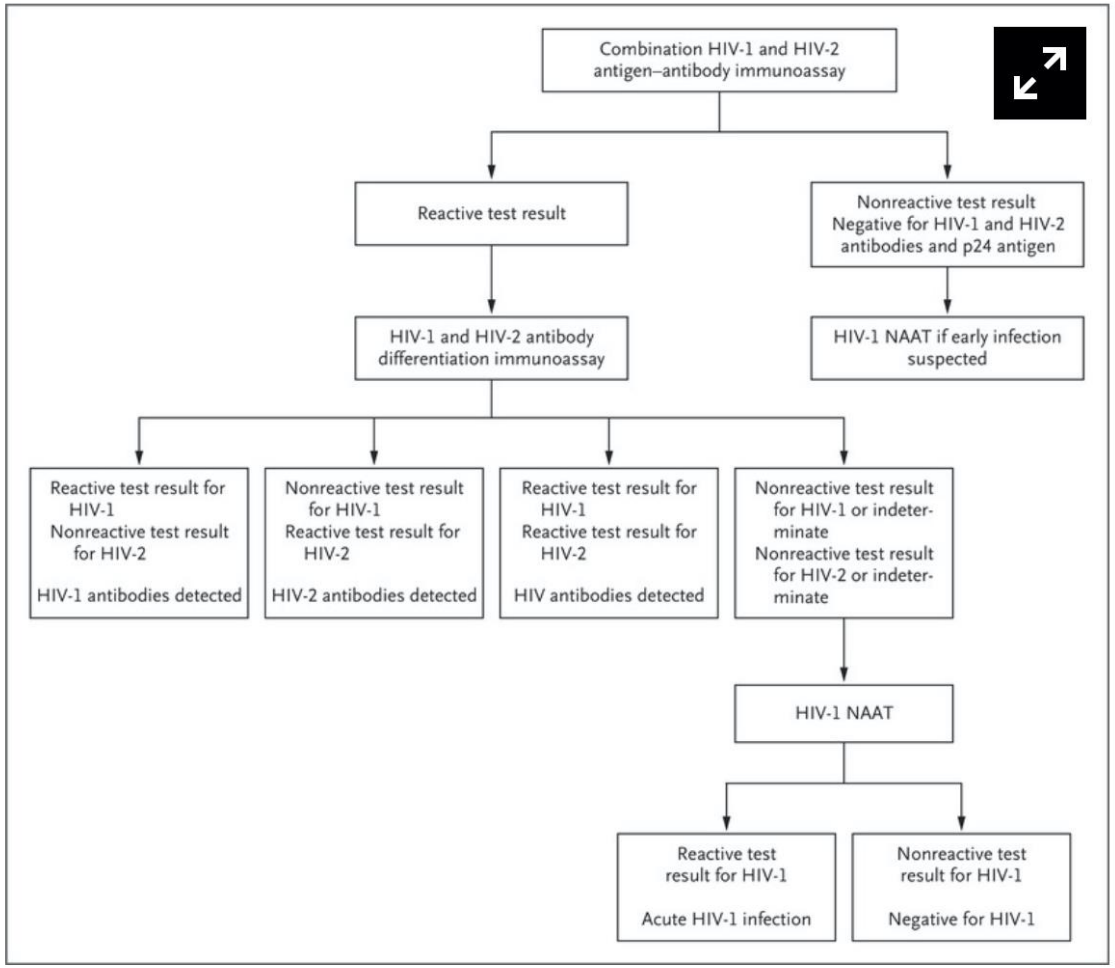


Figure 2. Recommended Laboratory Testing to Detect HIV in Serum or Plasma Specimens.



5. Which of the following is the most appropriate initial treatment?

- C; isoniazid, rifampin, pyrazinamide, and ethambutol

- 24 y/o F who works in a state prison w/ 6 weeks of weight loss, fever, night sweats, productive cough, malaise and fatigue
- T 38.6 ˚C; bronchial breath sounds over posterior upper lung lobes
- CXR shows small cavity with b/l upper lobe infiltrates and hilar LAD
- Sputum AFB stain positive

- **Treat pulmonary tuberculosis infection**

Treat pulmonary tuberculosis infection

Table 2. Drug Regimens for Microbiologically Confirmed Pulmonary Tuberculosis Caused by Drug-Susceptible Organisms

	Intensive Phase		Continuation Phase				
Regimen	Drug[a]	Interval and Dose[b] (Minimum Duration)	Drugs	Interval and Dose[b,c] (Minimum Duration)	Range of Total Doses	Comments[c,d]	Regimen Effectiveness
1	INH RIF PZA EMB	7 d/wk for 56 doses (8 wk), or 5 d/wk for 40 doses (8 wk)	INH RIF	7 d/wk for 126 doses (18 wk), or 5 d/wk for 90 doses (18 wk)	182–130	This is the preferred regimen for patients with newly diagnosed pulmonary tuberculosis.	Greater
2	INH RIF PZA EMB	7 d/wk for 56 doses (8 wk), or 5 d/wk for 40 doses (8 wk)	INH RIF	3 times weekly for 54 doses (18 wk)	110–94	Preferred alternative regimen in situations in which more frequent DOT during continuation phase is difficult to achieve.	
3	INH RIF PZA EMB	3 times weekly for 24 doses (8 wk)	INH RIF	3 times weekly for 54 doses (18 wk)	78	Use regimen with caution in patients with HIV and/or cavitary disease. Missed doses can lead to treatment failure, relapse, and acquired drug resistance.	
4	INH RIF PZA EMB	7 d/wk for 14 doses then twice weekly for 12 doses[e]	INH RIF	Twice weekly for 36 doses (18 wk)	62	Do not use twice-weekly regimens in HIV-infected patients or patients with smear-positive and/or cavitary disease. If doses are missed, then therapy is equivalent to once weekly, which is inferior.	Lesser

Abbreviations: DOT, directly observed therapy; EMB, ethambutol; HIV, human immunodeficiency virus; INH, isoniazid; PZA, pyrazinamide; RIF, rifampin.

[a] Other combinations may be appropriate in certain circumstances; additional details are provided in the section "Recommended Treatment Regimens."

[b] When DOT is used, drugs may be given 5 days per week and the necessary number of doses adjusted accordingly. Although there are no studies that compare 5 with 7 daily doses, extensive experience indicates this would be an effective practice. DOT should be used when drugs are administered <7 days per week.

[c] Based on expert opinion, patients with cavitation on initial chest radiograph and positive cultures at completion of 2 months of therapy should receive a 7-month (31-week) continuation phase.

[d] Pyridoxine (vitamin B6), 25–50 mg/day, is given with INH to all persons at risk of neuropathy (eg, pregnant women; breastfeeding infants; persons with HIV; patients with diabetes, alcoholism, malnutrition, or chronic renal failure; or patients with advanced age). For patients with peripheral neuropathy, experts recommend increasing pyridoxine dose to 100 mg/day.

[e] See [426]. Alternatively, some US tuberculosis control programs have administered intensive-phase regimens 5 days per week for 15 doses (3 weeks), then twice weekly for 12 doses.

- INH
  - Iron-accumulation
  - Hepatitis
  - Neuritis (B6)
- Rifampin
  - Red-orange discoloration of secretions
- Pyrazinamide
  - Hepatitis
- Ethambutol
  - ↓ visual acuity

Treat pulmonary tuberculosis infection

- Other answers:
  - A. Clarithromycin and ethambutol is the preferred regimen for *Mycobacterium avium* complex, not *Mycobacterium tuberculosis*
  - *B. I*soniazid alone is not indicated for active tuberculosis, only for treatment of latent tuberculosis; could promote the development of isoniazid resistance
  - D. Isoniazid resistance ranges from 4.7% to 14.4% in the US and global resistance rates are higher; the regimen of rifampin, ethambutol, pyrazinamide, and levofloxacin is a safe and reasonable option for patients with proven isoniazid resistance

6. Which of the following infections is most likely present in this patient?

- A; cytomegalovirus

- 68 y/o M w/ hx of kidney transplant 9 months ago presents w/ 2 weeks of fever and malaise
- Donor CMV +/Recipient CMV -
- Treated with 6 months of valganciclovir post-transplant
- T 38.1, normal PE
- New leukopenia and thrombocytopenia; AST 80 U/L, ALT 92 U/L

- **Diagnose CMV infection in a patient who has undergone solid organ transplantation**

CMV following kidney transplant

- Risk factors:
  - D+/R-
    - Highest risk, without prophy CMV infection occurs in 69% and disease in 56%
  - R+
    - Similar risk of CMV infection, but lower risk of disease; 67% and 20%, respectively
  - D-/R-
    - Lowest risk; < 5% of patients
  - Immunosuppression, including lymphocyte-depleting agents (ATG), mycophenolate, high dose steroids, belatacept
  - Lymphopenia pre- or post- transplant
- Implications
  - Increase risk of graft loss and mortality with CMV
- Main side effect of valganciclovir is leukopenia, which can warrant cessation of therapy

TABLE 1 Consensus definitions of cytomegalovirus infection and disease

	Proven or definite	Probable
CMV syndrome	Not defined	Detection of CMV in the blood by viral isolation, rapid culture, antigenemia, or QNAT Plus, at least two of the following: 1. Fever ≥38°C for at least 2 d 2. New or increased malaise or fatigue 3. Leukopenia or neutropenia on 2 separate measurements 4. 5% atypical lymphocytes 5. Thrombocytopenia 6. Hepatic aminotransferases increase to two times ULN (except non-liver transplant recipients)
Gastrointestinal CMV disease	Presence of upper and/or lower GI symptoms plus macroscopic mucosal lesions plus CMV documented in tissue by histopathology, virus isolation, rapid culture, immunohistochemistry, or DNA hybridization techniques	Presence of upper and/or lower GI symptoms and CMV documented in tissue but without macroscopic mucosal lesions CMV documented in blood by NAT or antigenemia alone is not sufficient for diagnosis of CMV GI disease
CMV pneumonia	Clinical symptoms and/or signs of pneumonia such as new infiltrates on imaging, hypoxia, tachypnea, and/or dyspnea combined with CMV documented in lung tissue by virus isolation, rapid culture, histopathology, immunohistochemistry, or DNA hybridization techniques	Clinical symptoms and/or signs of pneumonia such as new infiltrates on imaging, hypoxia, tachypnea, and/or dyspnea combined with detection of CMV by viral isolation and rapid culture of BALF, or quantitation of CMV DNA in BALF
CMV hepatitis	Abnormal liver tests plus CMV documented in liver tissue by histopathology, immunohistochemistry, virus isolation, rapid culture, or DNA hybridization techniques plus the absence of other documented cause of hepatitis	Not defined
CMV retinitis	Typical ophthalmological signs as assessed by an ophthalmologist experienced with the diagnosis of CMV retinitis If the presentation is atypical or an experienced ophthalmologist is not available, the diagnosis should be supported by CMV documented in vitreous fluid by NAT	Not defined
CMV encephalitis	CNS symptoms plus detection of CMV in CNS tissue by virus isolation, rapid culture, immunohistochemical analysis, in situ hybridization, or quantitative NAT	CNS symptoms plus detection of CMV in CSF without visible contamination of blood ("bloody tap") plus abnormal imaging results

Cytomegalovirus in solid organ transplant recipients—Guidelines of the American Society of Transplantation Infectious Diseases Community of Practice

TABLE 4 Recommendations for cytomegalovirus prevention in solid organ transplant recipients

Organ	Risk category	Recommendation/Options (see Table 3 for dose and text for special pediatric issues)	Level of evidence
Kidney	D+/R−	Antiviral prophylaxis Drugs: valganciclovir (preferred), intravenous ganciclovir, or valacyclovir Duration: 6 mo	Strong, high
		Preemptive therapy (if logistic support is available) Weekly CMV QNAT (or pp65 antigenemia) for 12 wk after kidney transplantation, and if a positive CMV threshold is reached, treat with (a) valganciclovir 900 mg[b] p.o. BID (preferred), or (b) IV ganciclovir 5 mg/kg IV every 12 h until negative test	Strong, high
	R+	Antiviral prophylaxis Drugs: valganciclovir (preferred), intravenous ganciclovir, or valacyclovir Duration: 3 mo	Strong, high
		Preemptive therapy (if logistic support is available) Weekly CMV QNAT (or pp65 antigenemia) for 12 wk after kidney transplantation, and if a positive CMV threshold is reached, treat with (a) valganciclovir 900 mg[b] po BID (preferred), or (b) IV ganciclovir 5 mg/kg IV every 12 h until negative test	Strong, high

7. Which of the following is the most appropriate management of the central venous catheter?

- D; replace the femoral catheter with a subclavian catheter

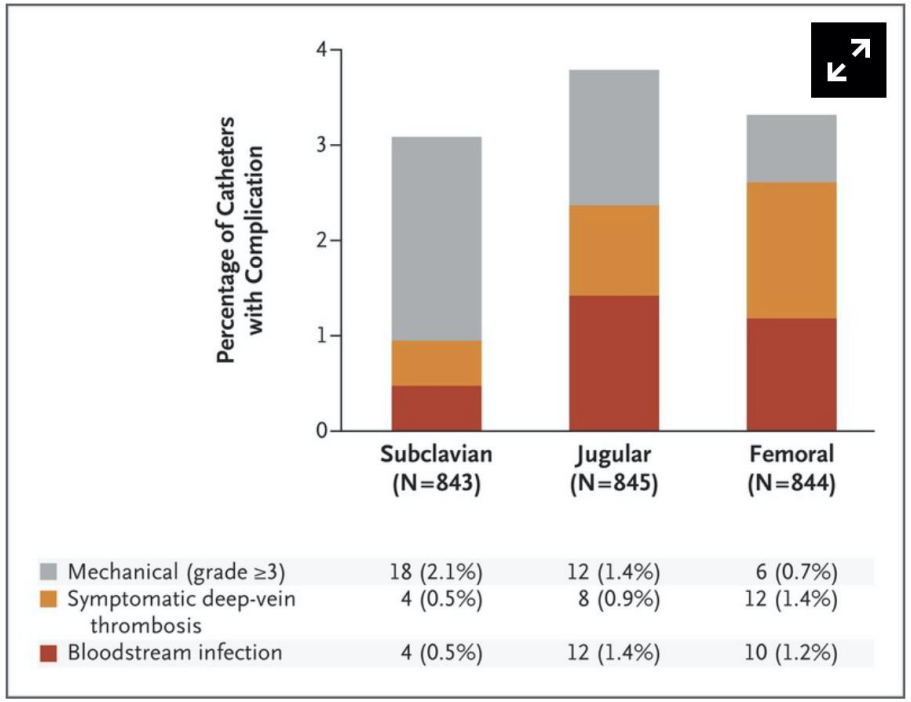
- 28 y/o M underwent CVC placement in femoral vein emergently after presenting in hemorrhagic shock following an MVA
- T 37.6 ˚C; left femoral vein access site intact

- **Prevent central venous catheter-associated bloodstream infection**

CVC-infection prevention

- Hand hygiene
  - Hands are decontaminated immediately before and after each episode of patient contact using the correct hand hygiene technique
- Use of full barrier precautions/personal protective equipment
- Chlorhexidine skin antisepsis
- Optimal catheter type selection
- Optimal catheter site selection
- Dressing
- Daily review of line necessity, with prompt removal of unnecessary CVCs

Figure 2.



Complications in the Three-Choice Comparison, According to Insertion-Site Group.

NEJM, 2015

8. Which of the following is the most appropriate management?

- A; disk space aspiration/biopsy

- 78 y/o M w/ hx of BPH presenting with 4 weeks of worsening low back pain
- T 37.9 ˚C; TTP over lower lumbar spine
- WBC count 15,600/µL
- MRI shows L3-L4 discitis with osteomyelitis; blood cultures are negative

- **Evaluate vertebral osteomyelitis with needle biopsy**

Vertebral osteomyelitis evaluation

IDSA GUIDELINE

2015 Infectious Diseases Society of America (IDSA) Clinical Practice Guidelines for the Diagnosis and Treatment of Native Vertebral Osteomyelitis in Adults[a]

III. When Should an Image-Guided Aspiration Biopsy or Additional Workup Be Performed in Patients With NVO?

Recommendations

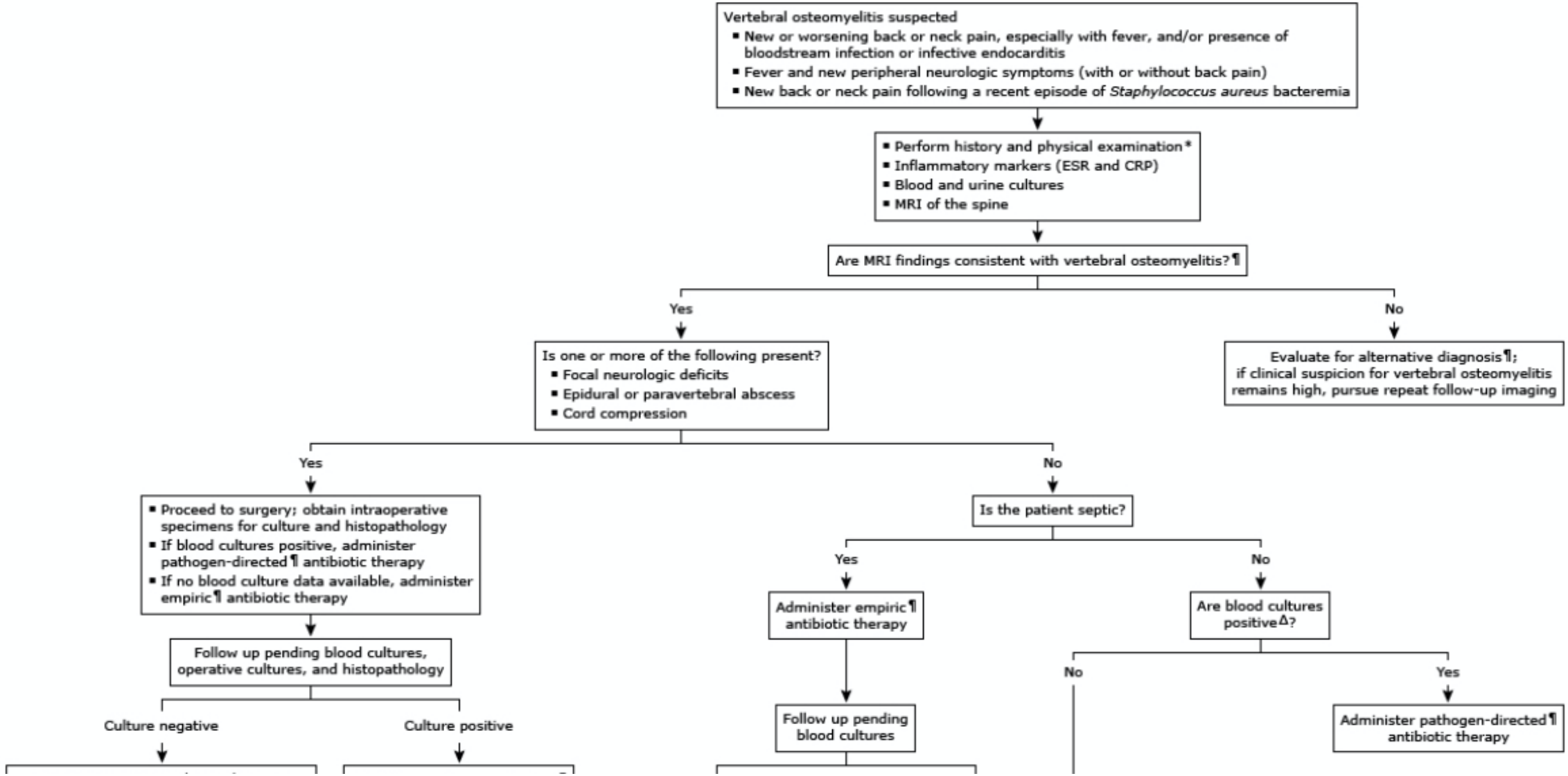
14. We recommend an image-guided aspiration biopsy in all patients with suspected NVO (based on clinical, laboratory, and imaging studies) when a microbiologic diagnosis for a known associated organism (*S. aureus*, *Staphylococcus lugdunensis*, and *Brucella* species) has not been established by blood cultures or serologic tests (strong, low).

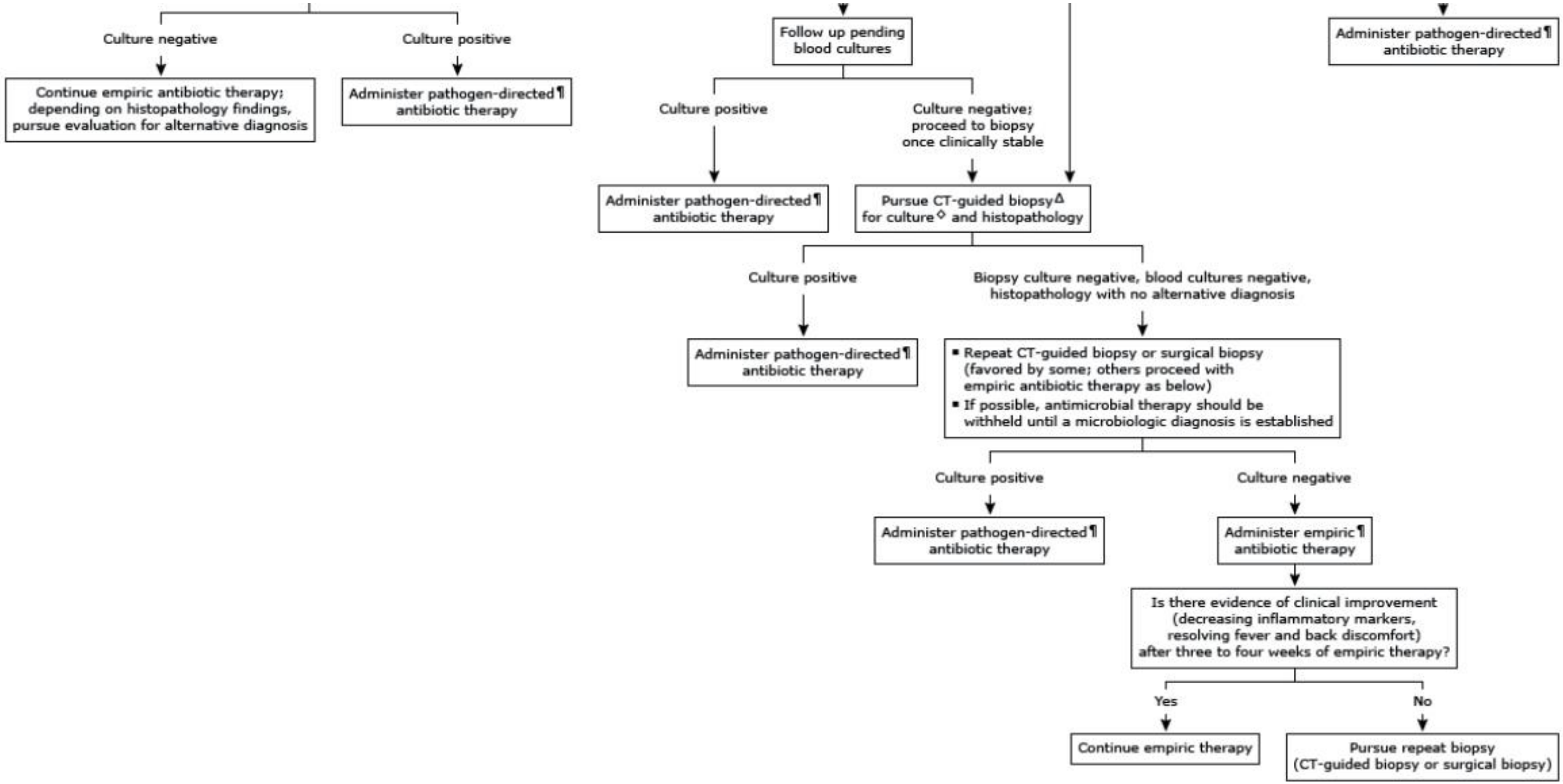
VIII. When Should Empiric Antimicrobial Therapy Be Started in Patients With NVO?

Recommendations

24. In patients with normal and stable neurologic examination and stable hemodynamics, we suggest holding empiric antimicrobial therapy until a microbiologic diagnosis is established (weak, low).
25. In patients with hemodynamic instability, sepsis, septic shock, or severe or progressive neurologic symptoms, we suggest the initiation of empiric antimicrobial therapy in conjunction with an attempt at establishing a microbiologic diagnosis (weak, low).

Clinical approach to vertebral osteomyelitis in adults




Culture negative
Culture positive
Continue empiric antibiotic therapy; depending on histopathology findings, pursue evaluation for alternative diagnosis
Administer pathogen-directed¶ antibiotic therapy
Follow up pending blood cultures
Culture positive
Culture negative; proceed to biopsy once clinically stable
Administer pathogen-directed¶ antibiotic therapy
Pursue CT-guided biopsyΔ for cultureᵒ and histopathology
Culture positive
Biopsy culture negative, blood cultures negative, histopathology with no alternative diagnosis
Administer pathogen-directed¶ antibiotic therapy
Repeat CT-guided biopsy or surgical biopsy (favored by some; others proceed with empiric antibiotic therapy as below)
If possible, antimicrobial therapy should be withheld until a microbiologic diagnosis is established
Culture positive
Culture negative
Administer pathogen-directed¶ antibiotic therapy
Administer empiric¶ antibiotic therapy
Is there evidence of clinical improvement (decreasing inflammatory markers, resolving fever and back discomfort) after three to four weeks of empiric therapy?
Yes
No
Continue empiric therapy
Pursue repeat biopsy (CT-guided biopsy or surgical biopsy)
Administer pathogen-directed¶ antibiotic therapy

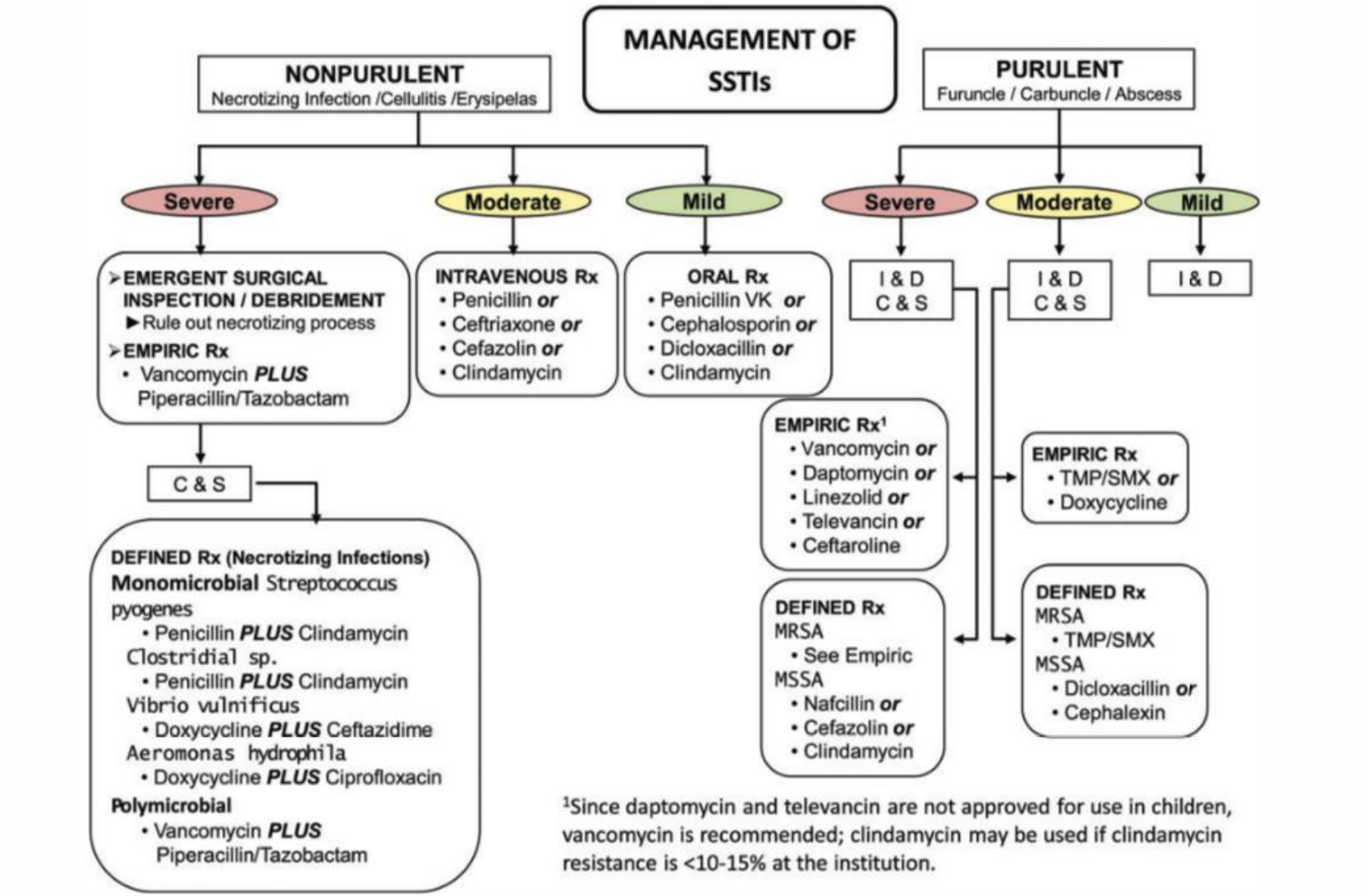
9. Which of the following is the most appropriate antibiotic therapy?

- A; cefazolin

- 42 y/o M w/ 2 days of LLE cellulitis
- T 38.8 ˚C, HR 105/min
- 4 x 5 cm area of erythema LLE which is non-purulent
- WBC count 15,000/µL

- **Treat a patient with moderate non-purulent cellulitis**

Non-purulent SSTI management



IDSA, 2014

10. Which of the following transmission-based precautions should be initiated?

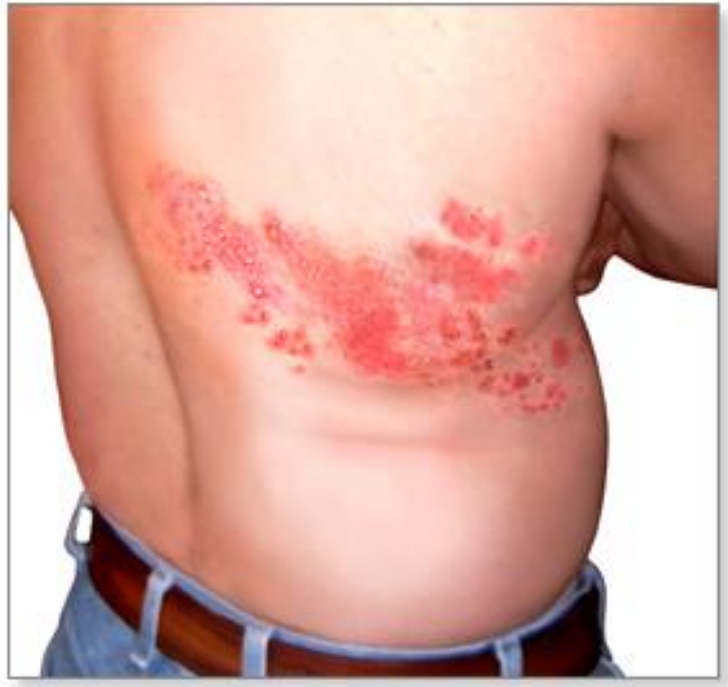
- B; airborne and contact precautions

- 62 y/o F w/ herpes zoster infection
- Receiving chemotherapy for breast CA with doxorubicin, cyclophosphamide, and paclitaxel

- **Prevent transmission of varicella-zoster virus**

Herpes zoster prevention

- Definitions of dissemination:
  - Immunocompetent: >2 dermatomes or vesicular lesions that cross the midline
  - Immunocompromised: any dermatomal involvement
- Dissemination includes risk of VZV to the respiratory tract - airborne
- Vesicular lesions are contagious until dry and crusted over - contact



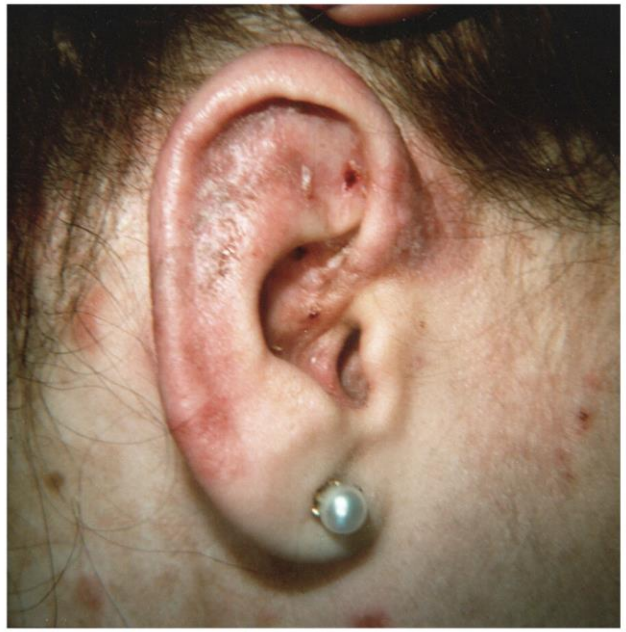
Shingles

A.D.A.M.

Herpes zoster

- Treatment
  - Acyclovir: 800 mg 5 x's daily x 7 days
  - Valacyclovir: 1,000 mg TID x 7 days
  - Famciclovir: 500 mg TID x 7 days
  - Speed recovery and decrease severity and duration of neuropathic pain if started within 72 hours of onset
- Immunocompromised patients with disseminated zoster should be hospitalized for IV acyclovir

- Complications
  - Post-herpetic neuralgia
  - Herpes zoster opthalmicus – visual loss
  - Ramsay hunt syndrome
  - Hepatitis
  - Pneumonia
  - CNS infections



11. Which of the following is the most appropriate management?

- A; obtain influenza polymerase chain reaction test; start oseltamivir

- 45 y/o M w/ fever, HA, myalgia, cough, and runny nose x 1 day
- Vaccinated for influenza 3 months prior
- Takes MTX, etanercept and low-dose prednisone for RA
- T 39.1 ˚C
- COVID-19 testing is negative

- **Manage a patient with influenza**

Clinical Infectious Diseases
IDSA GUIDELINE

Clinical Practice Guidelines by the Infectious Diseases Society of America: 2018 Update on Diagnosis, Treatment, Chemoprophylaxis, and Institutional Outbreak Management of Seasonal Influenza[a]

Table 6. Influenza Diagnostic Tests for Respiratory Specimens

Testing Category	Method	Influenza Viruses Detected	Distinguishes Influenza A Virus Subtypes	Time to Results	Performance
Rapid molecular assay	Nucleic acid amplification	Influenza A or B viral RNA	No	15–30 minutes	High sensitivity; high specificity
Rapid influenza diagnostic test	Antigen detection	Influenza A or B virus antigens	No	10–15 minutes	Low to moderate sensitivity (higher with analyzer device); high specificity;
Direct and indirect immunofluorescence assays	Antigen detection	Influenza A or B virus antigens	No	1–4 hours	Moderate sensitivity; high specificity
Molecular assays (including RT-PCR)	Nucleic acid amplification	Influenza A or B viral RNA	Yes, if subtype primers are used	1–8 hours	High sensitivity; high specificity
Multiplex molecular assays	Nucleic acid amplification	Influenza A or B viral RNA, other viral or bacterial targets (RNA or DNA)	Yes, if subtype primers are used	1–2 hours	High sensitivity; high specificity
Rapid cell culture (shell vial and cell mixtures)	Virus isolation	Influenza A or B virus	Yes	1–3 days	High sensitivity; high specificity
Viral culture (tissue cell culture)	Virus isolation	Influenza A or B virus	Yes	3–10 days	High sensitivity; high specificity

Negative results may not rule out influenza. Respiratory tract specimens should be collected as close to illness onset as possible for testing. Clinicians should consult the manufacturer's package insert for the specific test for the approved respiratory specimen(s). Most US Food and Drug Administration (FDA)–cleared influenza diagnostic tests are approved for upper respiratory tract specimens but not for sputum or lower respiratory tract specimens. Specificities are generally high (>90%) for all tests compared to RT-PCR. FDA-cleared rapid influenza diagnostic tests are Clinical Laboratory Improvement Amendments (CLIA)–waived; most FDA-cleared rapid influenza molecular assays are CLIA-waived, depending on the specimen.

Abbreviation: RT-PCR, reverse-transcription polymerase chain reaction.

Indications for treatment

- Patients hospitalized with influenza, regardless of illness duration prior to hospitalization
- Outpatients with severe or progressive illness, regardless of illness duration
- Outpatients who are at high risk of influenza complications

- High risk:
  - ≥65 years of age
  - Pregnant or w/in 2 weeks postpartum
  - Residents of long-term care facilities
  - Native Americans including Alaska Natives
  - BMI >40
  - Individuals with immunocompromising condition, chronic lung disease, chronic heart disease, chronic kidney disease
  - Those receiving glucocorticoids or other immunosuppressive medications

- Consider treatment:
  - Outpatients with illness onset ≤48 hours before presentation in order to reduce the duration of illness
  - Symptomatic outpatients who are household contacts of persons at high risk for influenza complications, particularly those who are severely immunocompromised
  - Symptomatic health care providers who routinely care for patients at high risk for influenza complications, particularly those who are severely immunocompromised

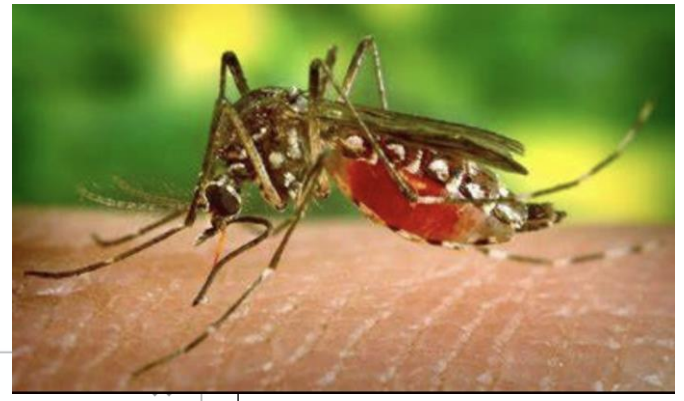
12. Which of the following is the most likely diagnosis?

- B; dengue virus infection

- 38 y/o M w/ 3 days of fevers up to 39.4 ˚C, headaches, myalgia, arthralgia, back pain, nausea
- Symptoms began 5 days after returning from Ecuador
- Petechial lesions on RUE where BP was taken
- WBC count 2,850/µL, hematocrit 41%, platelet count 82,000/µL, AST 176 U/L, ALT 192 U/L, Cr 1.4 mg/dL

- **Diagnose dengue virus infection**

Dengue fever



- Febrile illness, frontal HA, retro-orbital pain, myalgia, severe lumbosacral pain
- + tourniquet test
- Fever abates then returns, “saddleback pattern”
- Leukopenia, thrombocytopenia, elevated aminotransferase levels

Table 45.

Important Clinical Distinguishing Features of Arbovirus Infection

Clinical Finding	Dengue	Chikungunya	Zika
Fever	+++	+++	++
Myalgia	++	+	+
Arthralgia	+	+++	++
Headache	++	++	+
Conjunctivitis	–	–	++
Rash	+	++	+++
Bleeding	++	–	–
Shock	+	–	–

+++ = always; ++ = common; + = rare; – = almost never

13. Which of the following is the most appropriate empiric therapy?

- B; vancomycin, ampicillin, ceftriaxone, and dexamethasone

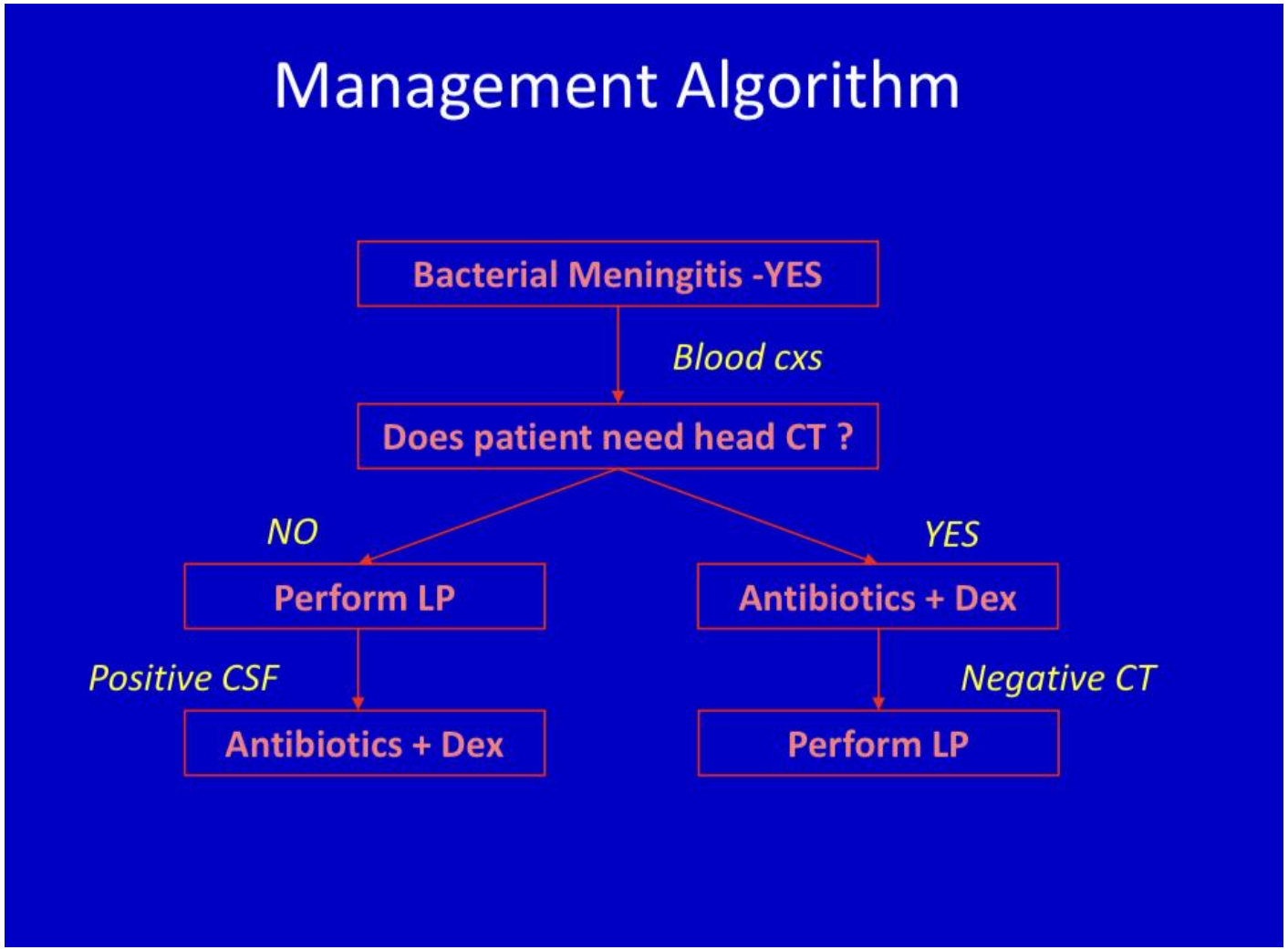
- 74 y/o M w/ HA, fever, stiff neck, and altered mental status
- T 39.1 ˚C, HR 124/min, GCS 12
- CSF studies: leukocyte count of 2354/µL with 90% neutrophils, glucose level of 17 mg/dL, and protein level of 295 mg/dL
- CT head without intracranial lesions though shows pansinusitis

- **Treat bacterial meningitis empirically**

Bacterial meningitis

- Bacterial pathogens
  - *Strep pneumo*, GPC in pairs, most common cause
  - *Neisseria meningitidis*, GNC in pairs, resp droplet isolation, students, communal living
  - *H. influenza*, GNR
  - *Listeria monocytogenes*, GPR, neonates, IC, age >50
- Treatment
  - Dexamethasone first (classic presentation or CSF criteria)
  - Vanco + ceftriaxone (+ ampicillin)

Bacterial meningitis key points



- Who needs a head CT:
  - Immunocompromised
  - hx CNS disease
  - New seizure
  - Papilledema
  - ALOC
  - Focal neuro deficit

14. Which of the following is the most appropriate intravenous treatment?

- C; discontinue antibiotics and continue acyclovir

- 78 y/o M w/ fever, confusion and altered speech
- T 39.5 ˚C; difficult to rouse, disoriented and cannot follow commands; non-focal neuro exam
- Started IV vancomycin, ampicillin, ceftriaxone, and acyclovir
- CSF studies: leukocyte count of 60/µL with 88% lymphocytes, glucose level of 42 mg/dL, and protein level of 113 mg/dL with negative gram strain and cultures as well as multiplex PCR for viruses and bacteria
- MR brain with unilateral temporal load enhancement

- **Treat herpes simplex virus encephalitis**

HSV encephalitis

- HSV-1
  - Fever, seizures, AMS, focal neuro deficits
  - Lymphocytic pleocytosis, elevated protein level, nml glucose level
  - Imaging findings of temporal lobe enhancement
    - MR brain abnormal 90%, 60% unilateral
  - Repeat PCR within 1 week
  - Treat with IV acyclovir for 14-21 days
- Start empiric therapy immediately if suspected; outcomes best if treatment within 24 hours
- Mortality 70% -> 15% with treatment
- HSV meningitis – HSV-2
  - Recurrent
  - Immunocompromised – IV/PO acyclovir
  - Immunocompetent – treatment controversial
  - Primary genital HSV treatment ↓ risk of meningitis

15. Which of the following is the most appropriate next step in the management of this patient?

- B; perform lumbar puncture

- 32 y/o HIV + M w/ 2 weeks of HA and fever, not yet on ART
- T 38.1 ˚C
- Lethargic, white plaques on palate and buccal mucosa
- Serum cryptococcal positive 1:256, HIV viral load 95,640 copies/mL, CD4 count 42/µL
- Non-con head CT negative
- IV liposomal amphotericin-B and flucytosine started

- **Manage cryptococcal meningitis in a patient with AIDS**

Cryptococcal meningitis

- Treatment:
  - Induction therapy with liposomal amphotericin B + flucytosine
  - 2 weeks and then transition to consolidation therapy with fluconazole for minimum 8 weeks
  - Maintenance therapy long-term
- Management of increased ICP
  - Measure ICP at the time of initial LP; usually following brain imaging to r/o space-occupying lesion
  - Goal to reduce the OP to < 20 cm CSF
  - If CSF pressures extremely high, > 50 cm CSF, reduce by half, daily LPs
  - Consideration for lumbar or ventricular drains

Cryptococcal meningitis

- Other answers:
  - A. Oral candidiasis will be managed by ampho, so addition of fluconazole not needed; fluconazole is fungistatic and inferior to initial treatment with ampho + flucytosine
  - C. and D. With recent HIV diagnosis + cryptococcal meningitis, early ART assoc. with increased mortality

16. Which of the following is the most likely diagnosis?

- C; legionella pneumonia

- 22 y/o M w/ 3 days of cough, fever, and diarrhea
- Hot tub and 3 other members of wrestling team with flu-like illness
- T 38.8 ˚C, RR 24/min
- Serum Na level 128 mEq/L
- COVID-19 and legionella urinary antigen are negative
- Improvement after 48 hours of ceftriaxone and azithromycin

- **Diagnose legionella pneumonia**

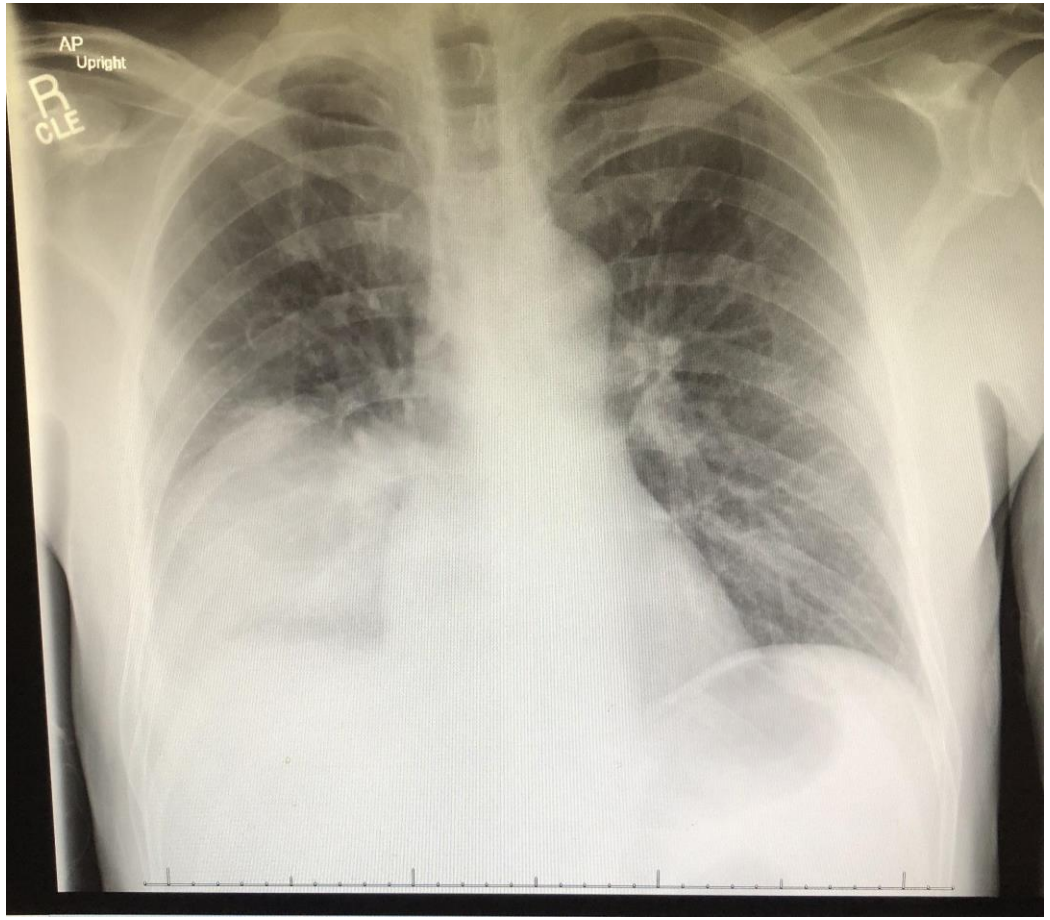
Legionella PNA/Legionnaires' disease

- Clinical features:
  - Fever, cough, shortness of breath
  - GI symptoms – N, V, diarrhea
  - Hyponatremia
  - Elevated hepatic transaminases
  - CRP >100 mg/L
  - Failure to respond to treatment with beta-lactam monotherapy
- Contamination of water supplies in large facilities
- 1 to 10% of CAP

- Whom to test:
  - Moderate to severe CAP
  - Any patient with CAP or nosocomial PNA with known or possible exposure
  - Immunocompromised patients
- How to test:
  - PCR on lower respiratory tract sample (sputum or BAL)
  - Culture
  - Urine antigen test - only detects serogroup 1

Legionella PNA/Legionnaires' disease

- Treatment:
  - Levofloxacin and azithromycin are preferred agents; doxycycline, though some species R to tetracyclines
  - At least 5 days, afebrile for 48 hours prior to stopping, and may need 7-10 days in pts with severe PNA, comorbidities, slow to respond
  - Treat immunocompromised patients for 14 days



17. C; isoniazid and rifampin, daily for 3 months

- 48 y/o F with + tuberculin skin testing
- 18 mm induration after travel to Peru
- HIV and pregnancy testing negative
- PA/lateral CXR negative

- **Treat latent TB infection in an immunocompetent person**

Latent TB

TABLE 3. Recommendations for regimens to treat latent tuberculosis infection

Priority rank*	Regimen	Recommendation (strong or conditional)	Evidence (high, moderate, low, or very low)
Preferred	3 mos isoniazid plus rifapentine given once weekly	Strong	Moderate
Preferred	4 mos rifampin given daily	Strong	Moderate (HIV negative)†
Preferred	3 mos isoniazid plus rifampin given daily	Conditional	Very low (HIV negative)
		Conditional	Low (HIV positive)
Alternative	6 mos isoniazid given daily	Strong§	Moderate (HIV negative)
		Conditional	Moderate (HIV positive)
Alternative	9 mos isoniazid given daily	Conditional	Moderate

Abbreviation: HIV = human immunodeficiency virus.

* *Preferred:* excellent tolerability and efficacy, shorter treatment duration, higher completion rates than longer regimens and therefore higher effectiveness; *alternative:* excellent efficacy but concerns regarding longer treatment duration, lower completion rates, and therefore lower effectiveness.

† No evidence reported in HIV-positive persons.

§ Strong recommendation for those persons unable to take a preferred regimen (e.g., due to drug intolerability or drug-drug interactions).

CDC guidelines, 2020

18. Which of the following is the most appropriate treatment?

- B; levofloxacin and metronidazole

- 45 y/o F with type 2 DM suffers a bite on her hand from a toddler in her class
- Anaphylaxis allergy to penicillin
- On PE, a few tiny puncture wounds with minimal erythema noted
- Wound is irrigated and debrided

- **Treat a human bite in a person who is allergic to penicillin**

Management of human bite wound

- Pathogens:
  - *Eikenella corrodens*
  - Strep, staph
  - Anaerobic bacteria *(fusobacterium, peptostreptococcus, and prevotella)*
- Regimens:
  - Amox-clav preferred
  - TMP-SMX, doxy, or FQ + anaerobic coverage
  - Moxifloxacin (has anaerobic coverage)
- Add MRSA coverage if pt at increased risk of MRSA colonization

- Indications for bite wound prophylaxis:
  - immunocompromised
  - asplenic
  - advanced liver disease
  - preexisting or resultant edema of the affected area
  - moderate to severe injuries, especially to the hand or face
  - have injuries that may have penetrated the periosteum or joint capsule

19. In addition to antiretroviral therapy initiation, which of the following is the most appropriate prophylactic treatment?

- C; trimethoprim-sulfamethoxazole

- 40 y/o M + for HIV
- HIV quantitative RNA is 500,000 copies/mL and CD4 count is 45/µL

- **Prevent opportunistic infection in a patient with AIDS**

Opportunistic infection prophylaxis

- PJP prophylaxis when CD4 count < 200/µL
  - TMP-SMX one DS or SS tab daily
  - Dapsone – G6PD
  - INH pentamidine – less effective
  - Atovaquone
- Toxoplasmosis when CD4 count < 100/µL and positive serology
  - TMP-SMX one DS tab daily
- MAC – no longer indicated in setting of quick ART initiation; use azithro if unable to start ART

- Stop PJP prophylaxis once CD4 > 200/µL for at least 3 months or once CD4 > 100/µL + consistent virologic suppression > 3 months

20. Which of the following is the most appropriate preventive measure?

- E; rifaximin

- 42 y/o F with travel planned to Guatemala City and nearby villages for 1 week
- Hx of UC with occasional flares

- **Prevent travelers' diarrhea**

Indications for chemoprophylaxis

- High risk:
  - Severe inflammatory bowel disease
  - Severe vascular, cardiac or renal disease
  - Severe immunocompromised state, such as advanced HIV disease or after a complicated organ transplant

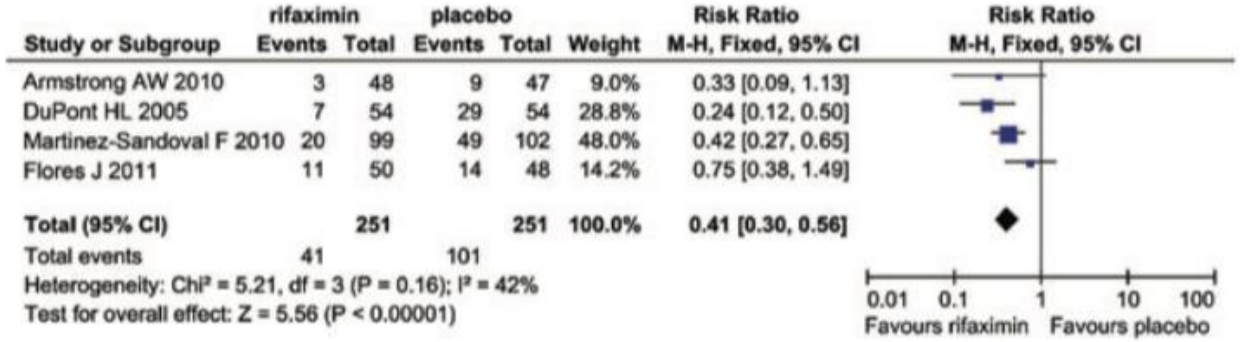


Figure 2 Efficacy of rifaximin in the prevention of TD. The CI for each study is represented by a horizontal line, and the point estimate is represented by a square. The size of the square corresponds to the weight of the study. The diamond is centered on the summary RR of the observational studies, and the width indicates the corresponding 95% CI. TD = travelers' diarrhea; CI = confidence interval; RR = relative risk.

Travelers diarrhea

- Other answers:
  - A. Bismuth subsalicylate – need multiple daily doses and increases risk of salicylate toxicity
  - B. FQ – safety concerns and increased bacterial resistance
  - C. Compact water filters have not been proven effective; consider purification by boiling or adding sodium hypochlorite or iodine
  - D. Lacking data for probiotics

- Treatment of travelers diarrhea
  - Limited role for antibiotics, as typically self-limited
  - Consider in cases of severe diarrhea, particularly if fever and blood, pus, or mucus in the stool
  - Azithromycin, either a single 1 g dose or 500 mg daily x 4 days
  - Symptomatic treatment:
    - Mild to moderate diarrhea: nonantibiotic symptomatic management (eg, bismuth or antimotility agents can be used
    - For travelers with severe diarrhea, we suggest that antimotility agents only be taken in conjunction with antibiotics