Overview

• Lecture Outline
  – Cases with questions (90%)
  – High yield information (10%)
Case 1

32 y/o M with 3 days of an enlarging, painful lesion on his L thigh that he attributes to a “spider bite”

T 36.9 BP 118/70 P 82
How would you manage this patient?

A. Incision and drainage alone
B. Incision and drainage plus cephalexin
C. Incision and drainage plus TMP-SMX
Abscesses: Do antibiotics provide benefit over I&D alone?

<table>
<thead>
<tr>
<th>% patients cured</th>
<th>Placebo</th>
<th>Antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rajendran '07</td>
<td>p=.25</td>
<td>Cephalexin</td>
</tr>
<tr>
<td>Duong '09</td>
<td>p=.12</td>
<td>TMP-SMX</td>
</tr>
<tr>
<td>Schmitz '10</td>
<td>p=.52</td>
<td>TMP-SMX</td>
</tr>
</tbody>
</table>

Antibiotic therapy is recommended for abscesses associated with:

- Severe disease, rapidly progressive with associated cellulitis or septic phlebitis
- Signs or symptoms of systemic illness
- Associated comorbidities, immunosuppressed
- Extremes of age
- Difficult to drain area (face, hand, genitalia)
- Failure of prior I&D

Liu C. *Clin Infect Dis*. 2011
Microbiology of Purulent SSTIs

- MRSA: 59%
- MSSA: 17%
- B-hemolytic strep: 3%
- non-B hemolytic strep: 4%
- other: 8%
- unknown: 9%

Moran NEJM 2006
<table>
<thead>
<tr>
<th>PO agents</th>
<th>Strep active</th>
<th>Dosing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMP-SMX</td>
<td>+/-</td>
<td>Q12h</td>
<td>HyperK+</td>
</tr>
<tr>
<td>Doxy/mino</td>
<td>+/-</td>
<td>Q12h</td>
<td>GI; Photosensitivity</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>++</td>
<td>Q8h</td>
<td>Susceptible: Adults 50%; Peds 75%</td>
</tr>
<tr>
<td>Linezolid</td>
<td>++</td>
<td>Q12h</td>
<td>$$$; Tox - heme, SSRI</td>
</tr>
</tbody>
</table>
## Empiric IV Antibiotics for Purulent SSTIs

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Dosing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancomycin</td>
<td>Q12h</td>
<td>OK for bacteremia, PNA</td>
</tr>
<tr>
<td>Daptomycin</td>
<td>Q24h</td>
<td>OK for bacteremia, not PNA</td>
</tr>
<tr>
<td>Televancin</td>
<td>Q24h</td>
<td>Approved for PNA, renal tox</td>
</tr>
<tr>
<td>Ceftaroline</td>
<td>Q12h</td>
<td>Active vs. Gram - (not pseudo)</td>
</tr>
<tr>
<td>Dalbavancin</td>
<td>Q7d x 2</td>
<td></td>
</tr>
<tr>
<td>Oritavancin</td>
<td>x1</td>
<td>VRE activity</td>
</tr>
</tbody>
</table>

*Linezolid and tedizolid come in IV formulation as well*
How would you manage this patient?

A. Incision and drainage alone

B. Incision and drainage plus cephalexin

C. Incision and drainage plus TMP-SMX
Case 2

28 y/o woman presents with erythema of her left foot over past 48 hrs

No purulent drainage, exudate, or fluctuance.

T 37.0 BP 132/70 P 78

Eels SJ et al Epidemiology and Infection 2010
How would you manage this patient?

A. Clindamycin 300 mg TID
B. Cephalexin 500 mg QID, monitor clinically with addition of TMP/SMX if no response
C. Cephalexin 500 mg QID + TMP/SMX 1 DS BID
Cephalexin vs. Cephalexin + TMP-SMX in patients with Uncomplicated Cellulitis

- **Cure**
  - Cephalexin: 82.0%
  - Cephalexin + TMP-SMX: 85.0%

- **Progression to abscess**
  - Cephalexin: 6.8%
  - Cephalexin + TMP-SMX: 6.8%

- **Adverse Events**
  - Cephalexin: 53.0%
  - Cephalexin + TMP-SMX: 49.0%

N=146

Source: Pallin CID 2013; 56: 1754-1762
<table>
<thead>
<tr>
<th>Empiric Antibiotics for Non-purulent SSTIs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSSA active</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td><strong>PO</strong></td>
</tr>
<tr>
<td>Penicillin</td>
</tr>
<tr>
<td>Cephalexin</td>
</tr>
<tr>
<td>Dicloxacillin</td>
</tr>
<tr>
<td>Clindamycin</td>
</tr>
<tr>
<td><strong>IV</strong></td>
</tr>
<tr>
<td>Penicillin</td>
</tr>
<tr>
<td>Cefazolin</td>
</tr>
<tr>
<td>Ceftriaxone</td>
</tr>
</tbody>
</table>
How would you manage this patient?

A. Clindamycin 300 mg TID

B. Cephalexin 500 mg QID, monitor clinically with addition of TMP/SMX if no response

C. Cephalexin 500 mg QID + TMP/SMX 1 DS BID
Case 3: A slight alteration...

- 34 y/o comes in with the similar symptoms
- Temp 38.9, HR 105, SBP 100, RR 20
- Appears ill and in more pain than what you would expect for cellulitis
Necrotizing soft tissue infection
Early diagnosis and intervention!

Mortality rate: > 30%

Wong CH. Jour of Bone and Joint Surg. 2003
Necrotizing soft tissue infections: clinical clues

Wong CH. Jour of Bone and Joint Surg. 2003
Necrotizing soft tissue infections: radiographic techniques

• Plain films
  – Low sensitivity
  – Helpful if gas present

• CT and ultrasound
  – May identify other Dx (abscess)

• MRI
  – Enhanced sensitivity, low specificity
### Necrotizing Skin and Soft Tissue Infection: Pathogens

<table>
<thead>
<tr>
<th>Monomicrobial</th>
<th>Polymicrobial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A strep</td>
<td>Aerobic Gram +/Gram -</td>
</tr>
<tr>
<td>CA-MRSA</td>
<td>PLUS</td>
</tr>
<tr>
<td>Clostridia sp</td>
<td>Anaerobes</td>
</tr>
<tr>
<td>Gram negatives</td>
<td></td>
</tr>
<tr>
<td>Vibrio vulnificus</td>
<td></td>
</tr>
</tbody>
</table>

Empiric treatment of necrotizing soft tissue infections

• Early surgical intervention! (be annoying)

• Antimicrobial therapy
  – Pip/tazo (*Gram neg/anaerobes*)
    plus
  – Vancomycin (*MRSA*)
    plus
  – Clindamycin (*group A strep*)
## Toxic shock syndromes

<table>
<thead>
<tr>
<th>Pathophys</th>
<th>Site</th>
<th>Clinical</th>
<th>Rx</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strep (GAS)</strong></td>
<td>Pyrogenic exotoxin</td>
<td>Sterile (blood, tissue)</td>
<td>Shock</td>
</tr>
<tr>
<td></td>
<td>(superantigen)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Staph</strong></td>
<td>TSST-1 (superantigen)</td>
<td>Non-sterile site often</td>
<td>Shock + Eythrodema</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(tampon, nasal packing)</td>
<td>(desquamation (1-2 weeks later))</td>
</tr>
</tbody>
</table>
Erythroderma
Case

- 61 y/o diabetic presents to ED with fever, stiff neck, and new onset seizure.
- Febrile to 39°C with stable vital signs.
- Lethargic but able to answer questions.
- Nuchal rigidity and photophobia seen but no focal neurological abnormalities.
Question: Does he need a CT scan before getting an LP?

A. Yes
B. No

71% Yes
29% No
Who needs a head CT before LP?

Who is at high risk for herniation from LP?

• Patients at high risk for mass lesions or increased intracranial pressure can be identified clinically and should then undergo CT scan

• Who are high risk patients?
  – New-onset seizure
  – Immunocompromised
  – Focal neurological finding
  – Papilledema
  – Moderate-severe impairment of consciousness

Question 4a: Does he need a CT scan before getting an LP?

A. Yes

B. No
Question: Which is the preferred antibiotic regimen for this patient? (61 y/o male)

A. Ceftriaxone
B. Ceftriaxone and Vancomycin
C. Ceftriaxone and Ampicillin
D. Vancomycin and Ceftriaxone and Ampicillin
Empiric antimicrobial therapy

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Pathogens</th>
<th>Antimicrobials</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 month</td>
<td>GBS, E. coli, L. monocytogenes</td>
<td>Ampicillin + cefotaxime</td>
</tr>
<tr>
<td>1-23 months</td>
<td>S. pneumoniae, N. meningitidis, H. influenzae</td>
<td>Vancomycin + 3rd gen ceph</td>
</tr>
<tr>
<td>2-50 yrs</td>
<td>N. meningitidis, S. pneumoniae</td>
<td>Vancomycin + 3rd gen ceph</td>
</tr>
<tr>
<td>&gt; 50 yrs</td>
<td>S. pneumoniae, N. meningitidis, L. monocytogenes</td>
<td>Vancomycin+ 3rd gen ceph + ampicillin</td>
</tr>
</tbody>
</table>

Adapted from Tunkel AR. CID 2004; GBS=group B strep (Strep agalactiae), 3rd gen ceph=ceftriaxone or cefotaxime
IDSA algorithm for management of bacterial meningitis

Indication for head CT

NO

Blood cx + Lumbar puncture

Steroids and empiric antimicrobials

CSF suggestive of bacterial meningitis

Refine therapy

YES

Blood cx

Steroids and empiric antimicrobials

Head CT w/o mass lesion or herniation

Lumbar puncture

Tunkel AR. CID 2004
Question: Which is the preferred antibiotic regimen for this patient? (61 y/o male)

A. Ceftriaxone

B. Ceftriaxone and Vancomycin

C. Ceftriaxone and Ampicillin

D. Vancomycin and Ceftriaxone and Ampicillin
Antibiotic prophylaxis for contacts?

- Only those with close contact to case of Neisseria or Haemophilus

- Prophylaxis options
  - Ciprofloxacin
  - Rifampin
  - Ceftriaxone
HSV infections of CNS

• Aseptic meningitis (HSV-2)
  – Benign course
  – Treatment of unclear benefit, IV->PO acyclovir
  – May recur (Mollaret's syndrome)

• Encephalitis (HSV-1)
  – Severe neurologic impairment
  – Classical MRI changes (temporal lobes)
  – Start treatment when you suspect diagnosis
  – Treatment - IV acyclovir (10 mg/kg IV q8)
West Nile virus

< 1% NEUROINVASIVE DISEASE

- Encephalitis (55-60%)
- Meningitis (35-40%)
- Poliomyelitis (5-10%)

20% WEST NILE FEVER

- Fever and HA
- Malaise/Fatigue
- Anorexia

80% ASYMPTOMATIC

Diagnosis: WNV IgM and IgG from serum and CSF

Peterson LR. JAMA. 2004
Case

- 65 y/o diabetic woman presents to clinic for routine evaluation. She has been feeling well. A urinalysis and culture are sent.

- UA: WBC->100, RBC-0, Protein-300

- The next day you are called because the urine culture has >100,000 *Klebsiella pneumoniae*
Question 5: What do you recommend?

A. No antibiotics
B. Empiric ciprofloxacin and await susceptibilities
C. Repeat culture in 1 week and if bacteria still present then treat

62%  31%  7%
Definition: Asymptomatic bacteriuria

- Bacteriuria without symptoms
  - Midstream: $\geq 10^5$ CFU/ml
  - Cath: $\geq 10^2$ CFU/ml

- Pyuria is present $> 50\%$ of patients
Asymptomatic bacteriuria in diabetic women

- Asymptomatic bacteriuria ~ 25% of diabetic women (pyuria is usually present)
- RCT, placebo controlled of 105 diabetic women
- 14 days of antibiotic vs. placebo
- 1° endpoint: symptomatic UTI
  - 42% antibiotic group vs. 40% placebo
  - RR 1.19 (0.28–1.81), p=0.42

Harding GKM. NEJM 2003
Treatment of asymptomatic bacteriuria?

• **Clear benefit**
  - Pregnant women
  - Pre traumatic urologic interventions with mucosal bleeding

• **Likely benefit**
  - Neutropenic

• **No benefit**
  - Postmenopausal ambulatory women
  - Institutionalized
  - Spinal cord injuries
  - Patients with urinary catheters
  - Diabetics
Question 5: What do you recommend?

A. No antibiotics

B. Empiric ciprofloxacin and await susceptibilities

C. Repeat culture in 1 week and if bacteria still present then treat
Case 6

• A 21 year-old college student, calls to say that she has “a urinary tract infection, again”

• You have treated her for uncomplicated cystitis 2 times in the past year

• You obtain a UA:
  – Leukocyte esterase 3+, RBC 1+
Question 6: According to the Infectious Diseases Society of America Guidelines (2011 last update) - what is the 1st line treatment for an uncomplicated UTI?

A. Ciprofloxacin 250mg  BID x 3d
B. Nitrofurantoin 100mg BID x 5d
C. TMP-SMX DS BID x 7d
D. Cephalexin 500 mg QID x 7d
IDSA guidelines for uncomplicated UTI treatment

Goal: Low resistance and low “collateral damage”

• Nitrofurantoin 100 mg PO BID x 5 days
• TMP-SMX DS PO BID x 3 days
  – avoid if resistance >20%, recent usage
• Fosfomycin 3 gm PO x 2

Gupta K. CID 2011
Question 6: According to the Infectious Diseases Society of America Guidelines (2011 last update) - what is the 1st line treatment for an uncomplicated UTI?

A. Ciprofloxacin 250mg BID x 3d

B. Nitrofurantoin 100mg BID x 5d

C. TMP-SMX DS BID x 7d

D. Cephalexin 500 mg QID x 7d
What would make the UTI “complicated?”

- Anatomic abnormality
- Indwelling catheter
- Recent instrumentation
- Men
- Healthcare-associated
- Recent antimicrobial use
- Symptoms > 7 days
- Diabetes or immunosuppression
- History of childhood UTI

How would you treat?

- Fluoroquinolones for empiric therapy
- Obtain cultures
- Duration 7-14 days
Prevention of recurrent UTIs

• Prevent vaginal colonization w/ uropathogens
  – Avoid spermicide
  – Intra-vaginal estrogen (post-menopausal)

• Prevent growth of uropathogens in bladder
  – Methenamine hippurate
  – Cranberry juice
  – Postcoital or daily antibiotics

• Correct anatomic/neurologic problems
  – Select cases consider urology evaluation (elevated Cr, hematuria, recurrent proteus infection)
Question: If this same patient presented with pyelonephritis what would be the best regimen?

A. Ceftriaxone 1 gm IV q24
B. Moxifloxacin 400 mg IV/PO q24
C. Nitrofurantoin 100 mg PO q12
D. Cefpodoxime 200 mg PO q12
Empiric treatment of pyelonephritis

• **Recommended**
  - Ciprofloxacin 500 mg q12 (7 days if uncomplicated)
    - Levofloxacin OK but **not** Moxifloxacin
  - Ceftriaxone 1 gm IV q24 (14 days)

• **Not recommended**
  - TMP-SMX (high resistance rate so not good empiric)
  - Nitrofurantoin (does not get into kidney parenchyma)

• **Health-care associated pyelonephritis**
  - Use antipseudomonal agent other than fluoroquinolone
Question: If this same patient presented with pyelonephritis what would be the best regimen?

A. Ceftriaxone 1 gm IV q24

B. Moxifloxacin 400 mg IV/PO q24

C. Nitrofurantoin 100 mg PO q12

D. Cefpodoxime 200 mg PO q12
Case

- 60 y/o woman with HTN presents with 3 days of cough with green sputum, dyspnea on exertion, fever, pleuritic chest pain. She otherwise has no past medical history.
- Exam: 38.5°, 145/90, 100, 18, 95% RA
- Chest: crackles at left base
- WBC: 15.5  CXR: LLL infiltrate
Question: How would you manage this patient?

A. Oral antibiotics at home
B. Hospitalize for IV antibiotics; when afebrile, switch to PO antibiotics and discharge home
C. Hospitalize for IV antibiotics; when afebrile, switch to PO antibiotics and discharge after 24 hours observation
D. Hospitalize for minimum of 7 days of IV antibiotics
## Pneumonia Severity Index

### Demographic
- **Age** (+1 point/yr, -10 if woman)
- **Nursing home** (+10)

### Comorbidities
- **Cancer** (+30)
- **Liver disease** (+20)
- **CHF** (+10)
- **Cerebrovascular dz** (+10)
- **Renal disease** (+10)

### Examination
- **Mental status** (+20)
- **Pulse > 125** (+20)
- **Resp rate > 30** (+20)
- **SBP < 90** (+15)
- **Temp < 35 or > 40** (+10)

### Labs
- **pH < 7.35** (+30)
- **BUN > 30** (+20)
- **Na < 130** (+20)
- **Glucose > 250** (+10)
- **pO2 < 60** (+10)
- **Hct < 30** (+10)
- **Pleural effusion** (+10)

*Don’t memorize this!*
### Pneumonia Severity Index

http://pda.ahrq.gov/clinic/psi/psicalc.asp

<table>
<thead>
<tr>
<th>Class</th>
<th>PSI score</th>
<th>Mortality</th>
<th>Triage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Age &lt; 50, no comorbidity, stable vital signs</td>
<td>0.1%</td>
<td>outpatient</td>
</tr>
<tr>
<td>II</td>
<td>≤ 70</td>
<td>0.7%</td>
<td>outpatient</td>
</tr>
<tr>
<td>III</td>
<td>71-90</td>
<td>3%</td>
<td>consider admission</td>
</tr>
<tr>
<td>IV</td>
<td>91-130</td>
<td>8%</td>
<td>admission</td>
</tr>
<tr>
<td>V</td>
<td>&gt; 130</td>
<td>29%</td>
<td>? ICU</td>
</tr>
</tbody>
</table>
CAP: When to Admit

Outpatient:
- Younger
- No cancer or end-organ disease
- No severe vital sign abnormalities
- No severe laboratory abnormalities

Inpatient:
- Doesn’t meet outpt criteria
- Hypoxia
- Active coexisting condition
- Unable to take oral meds
- Psychosocial issues
  - Homeless, drug abuse, risk of non-adherence
CAP: When to Discharge

- Afebrile, hemodynamically stable, not hypoxic, and tolerating POs
- No minimum duration of IV therapy needed
- No need to watch on oral antibiotics
- Most patients with CAP, 7 days of antibiotic treatment is adequate
Question: How would you manage this patient?

A. Oral antibiotics at home
B. Hospitalize for IV antibiotics; when afebrile, switch to PO antibiotics and discharge home
C. Hospitalize for IV antibiotics; when afebrile, switch to PO antibiotics and discharge after 24 hours observation
D. Hospitalize for minimum of 7 days of IV antibiotics
Case:

- 82 y/o with h/o CHF presents with 5 days of productive cough and dyspnea. Denies recent travel or hospitalization.
- 39° 110/90 110 24 85% RA
- Chest: crackles at right base
- CXR: Right lower & middle lobe infiltrates
- Labs: WBC 12, BUN=38, otherwise normal
Question: What is the most appropriate treatment?

A. Cefuroxime IV
B. Levofloxacin IV
C. Piperacillin-tazobactam IV
D. Azithromycin IV
E. Cefepime IV + vancomycin IV
Etiology of CAP

- Clinical and CXR not predictive of organism
  - *Streptococcus pneumoniae*
  - *Haemophilus influenzae*
  - *Mycoplasma pneumoniae*
  - *Chlamydophila pneumoniae*
  - *Legionella*
  - (Enteric Gram negative rods)
  - Viruses
  - *Staphylococcus aureus*

Covered by usual regimes

Not covered by usual regimes
### Empirical Treatment for Outpatients

| No comorbidity or recent antibiotics | • Macrolide or  
|                                     | • Doxycycline |
| Comorbid condition(s)              | • β-lactam (e.g. amox) +  
| age > 65, EtOH, CHF, severe liver or renal disease, cancer | either macrolide or doxycycline  
| or                                 | or           |
| Antibiotics in last 3 months       | • Respiratory FQ* |

B-lactam= High-dose amoxicillin [e.g., 1 g 3 times daily] or amoxicillin-clavulanate [2 g 2 times daily] is preferred; alternatives include ceftriaxone, cefpodoxime, and cefuroxime [500 mg 2 times daily];

*Respiratory FQ = Levofloxacin or Moxifloxacin*
## Empirical Treatment for Inpatients

<table>
<thead>
<tr>
<th>Inpatient non-ICU</th>
<th>(\beta)-lactam + macrolide or doxycycline or Respiratory FQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient ICU</td>
<td>(\beta)-lactam + azithromycin or Resp FQ (Penicillin allergy: fluoroquinolone + aztreonam)</td>
</tr>
<tr>
<td>MRSA concern</td>
<td>Add vancomycin or linezolid to above</td>
</tr>
</tbody>
</table>

*B-lactam* = cefotaxime, ceftriaxone, and ampicillin-sulbactam; ertapenem for selected patients

*Resp FQ = Levofloxacin or Moxifloxacin
Question: What is the most appropriate treatment?

A. Cefuroxime IV
B. Levofloxacin IV
C. Piperacillin-tazobactam IV
D. Azithromycin IV
E. Cefepime IV + vancomycin IV
Diagnostic Testing in CAP

• Chest radiography:
  – Indicated for all patients with suspected pneumonia

• Blood culture:
  – Recommended for inpatients (do before antibiotics)

• Sputum exam:
  – Controversial but recommended for inpatients

• Other:
  – Legionella urinary Ag, pnuemo urinary Ag, resp virus testing
Case

• 60 y/o intubated 17 days ago following MVA. Received ciprofloxacin for a UTI 8 days ago.

• Now she has new fever, WBC 15, and increased oxygen requirements.

• Chest X-ray was done
Question: Which antibiotics would you start after obtaining blood and sputum cultures?

A. Vancomycin
B. Vancomycin + ceftriaxone
C. Ceftriaxone + azithromycin
D. Vancomycin + meropenem
E. Moxifloxacin
Ventilator associated pneumonia (VAP)

• Clinical diagnosis!
  – Increased oxygen requirement
  – Fever
  – Increased WBC count
  – New infiltrate on CXR
  – Increased secretions

• Use respiratory culture to tailor therapy
<table>
<thead>
<tr>
<th>HAP/VAP pathogens</th>
<th>Empiric Treatment</th>
</tr>
</thead>
</table>
| **Gram negatives** | Anti-pseudomonal cephalosporin (ceftaz or cefepime)  
|                   | or               |
|                   | Anti-pseudomonal penicillin (piperacillin-tazobactam)  
|                   | or               |
|                   | Anti-pseudomonal carbapenem (imi-, mero-, doripenem)  
|                   | **PLUS**         |
| -Pseudomonas       | Anti-pseudomonal aminoglycoside (gent, tobra, amikacin)  
|                   | or               |
| -Acinetobacter     | Anti-pseudomonal fluoroquinolone (cipro, levo)  
| -Enterics          | **PLUS**         |
| **S. aureus (MRSA)** | Vancomycin or linezolid |
When do we need to cover for pseudomonas?

• Not cause of community acquired pneumonia but if any below present can consider...

✓ Recent or current hospitalization

✓ Recent antibiotics

✓ Structural lung disease (CF)
What antibiotics cover pseudomonas?

• B-lactams
  – Piperacillin and ticaricillin
  – Ceftazidime, cefepime
  – Aztreonam
  – Imipenem, meropenem, doripenem (not ertapenem)

• Fluoroquinolones
  – ciprofloxacin and levofloxacin (not moxifloxacin)

• Aminoglycosides
  – gentamicin, tobramycin, amikacin
Question: Which antibiotics would you start after obtaining blood and sputum cultures?

A. Vancomycin
B. Vancomycin + ceftriaxone
C. Ceftriaxone + azithromycin
D. Vancomycin + meropenem
E. Moxifloxacin
Case:

• 70 y/o M is hospitalized for diverticulitis. HD#9 he develops a new fever. Purulent drainage is noted from a central venous catheter, and it is removed.
• Fever persists for several days. Exam reveals new systolic murmur. Echo shows a small vegetation on the mitral valve.
• Which organism MOST LIKELY grew from his blood cultures?
Question:

A. Staphylococcus aureus
B. *Streptococcus bovis*
C. *Enterococcus spp.*
D. Candida
Endocarditis

• Most common organisms
  – *Staphylococcus aureus*
  – Streptococci, viridans group; also *S. bovis*
  – Coagulase-negative staph (prosthetic valve)
  – Candida
  – Culture negative
  – HACEK
Question:

A.  *Staphylococcus aureus*
B.  *Streptococcus bovis*
C.  *Enterococcus spp.*
D.  Candida
Endocarditis: Modified Duke Criteria

• Diagnosis: Clinical Criteria
  – Major
    • Blood culture criteria
    • Endocardial involvement (Echo veg, new regurgitation)
  – Minor
    • Predisposition
    • Fever
    • Other microbiologic
    • Vascular phenomena
    • Immunologic phenomena
Osler nodes

Janeway lesions

Roth spots
(white-centered retinal hemorrhages - arrow heads)

Splinter hemorrhages
Endocarditis

• Duke criteria continued...
  – Definite endocarditis:
    • 2 major OR 1 major + 3 minor OR 5 minor
  – Indications for surgery?
    • CHF, continued emboli, uncontrolled sepsis, perivalvular abscess
    • Difficult to treat organisms (fungi, Gram-negatives, resistant organisms)
    • Large vegetations (> 1 cm?)
Endocarditis - Treatment

Use recommended regimens!

• Penicillin-susceptible streptococcus
  – Penicillin G or ceftriaxone x 4 wk
  – Penicillin G or ceftriaxone + gentamicin x 2 wk

• Streptococcus MIC >0.1 to 0.5 mg/mL
  – Penicillin G or ceftriaxone x 4 wk + gentamicin x 2 wk

• Streptococcus MIC >0.5 mg/mL or enterococcus
  – Ampicillin or penicillin G + gentamicin x 4-6 wk
Endocarditis - Treatment

• Aortic or mitral valve MSSA
  – Nafcillin or cefazolin x 6 wk

• MRSA
  – Vancomycin x 6 wk

• HACEK
  – Ceftriaxone x 4 wk
Endocarditis - Prophylaxis

• Prophylaxis only for highest risk patients
  – Prosthetic valve, previous endocarditis, cardiac transplantation with valvulopathy, certain congenital heart disease

• Procedures requiring prophylaxis for above:
  – Dental with manipulation of gingiva or periapical region of teeth or perforation of oral mucosa
  – No prophylaxis for GI or GU procedures
## Recommended antibiotics when endocarditis prophylaxis is needed

<table>
<thead>
<tr>
<th>Oral</th>
<th>Amoxicillin</th>
<th>2 g 1 hour pre-procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clindamycin</td>
<td>600 mg 1 hour pre-procedure</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cephalexin</td>
<td>2 g 1 hour pre-procedure</td>
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<tr>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Azithromycin or clarithromycin</td>
<td>500 mg 1 hour pre-procedure</td>
</tr>
<tr>
<td>Penicillin allergy</td>
<td>Ampicillin</td>
<td>2 g IM or IV 30 min pre-procedure</td>
</tr>
<tr>
<td>Parenteral</td>
<td>Clindamycin</td>
<td>600 mg IV 1 hour pre-procedure</td>
</tr>
<tr>
<td>Penicillin allergy</td>
<td>Cefazolin</td>
<td>1 g IM or IV 30 min pre-procedure</td>
</tr>
</tbody>
</table>
Case

• 67 year-old male with COPD/asthma, presents to clinic with 3 days of fever, cough, wheezing, and achiness. You do a rapid flu test which is positive.

• How should you treat this patient?
Question

A. Start amantadine
B. Start oseltamivir
C. Start zanamivir
D. No treatment because symptoms > 48h
Influenza

• Two important types: A and B

• Influenza A
  – Typed by glycoproteins: hemagglutinin/neuraminidase
  – Treatments:
    • Adamantanes (amantadine, ramantidine)
    • Neuraminidase inhibitors (oseltamivir, zanamivir)

• Influenza B: not susceptible to adamantanes
Influenza

• Diagnosis (sensitivity):
  – PCR>>DFA (immunofluorescence)>Rapid test

• Treatment:
  – Who
    • Hospitalized or severe illness: anytime
    • Outpt high-risk for complications: anytime
    • Non-high-risk outpatients: < 48h of symptoms
  – What
    • Oseltamivir or Zanamivir
Question

A. Start amantadine
B. Start oseltamivir
C. Start zanamivir
D. No treatment because symptoms > 48h
Influenza Vaccine

- Recommended for everyone > 6 mo.
- Options
  - Inactivated vaccines: > 6 months
  - Live-attenuated: 2-49 years
## Infection Control

<table>
<thead>
<tr>
<th>Type of Precaution</th>
<th>Conditions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contact</strong></td>
<td>Diarrhea, Wounds, Vesicular rashes, Some resp infections</td>
<td><em>C. difficile</em>, <strong>chickenpox</strong>, smallpox, scabies, lice, viral conjunctivitis, drug resistant organisms</td>
</tr>
<tr>
<td><strong>Droplet</strong></td>
<td>Meningitis, seasonal resp viruses</td>
<td>Meningococcus, Pertussis, influenza</td>
</tr>
<tr>
<td><strong>Airborne</strong></td>
<td>Some resp infections</td>
<td>TB, <strong>chickenpox</strong>, measles, smallpox, SARS</td>
</tr>
</tbody>
</table>
High yield

- Device (and line) related infections
  - Answer usually “pull the line” plus antibiotics
- Endocarditis
  - Acute: *S. aureus* (MRSA) #1
  - Subacute: Viridans group streptococci #1
  - Prosthetic valve endocarditis: *S. aureus* or *S. epidermidis*
- Doxycycline is usually the answer for...
  - Lyme disease (also amoxicillin, ceftriaxone)
  - Rocky mountain spotted fever (even in children)
  - Ehrlichiosis and Anaplasmosis (“spotless fevers”)
  - Syphilis (when penicillin is not an option but not neuro dz)
High yield

• Fungal infections
  – Candidemia
    • Empiric treatment for critically ill is an echinocandin
    • Always remove central venous catheters
    • Always get an eye exam to rule-out ocular involvement
  – Histoplasmosis – itraconazole or ampho
  – Coccidiomycosis – fluconazole or ampho
  – Aspergillosis – voriconazole > ampho
  – Cryptococcal meningitis – treatment of choice is amphotericin B plus 5-FC followed by fluconazole
High yield

• Latent TB diagnostics
  – Prior BCG should not influence how you read PPD
  – Interferon gamma release assays (IGRAs)– no false positives with prior BCG
  – If + PPD or +IGRA, check chest X-ray and history to evaluate for active TB

• Active TB
  – Treatment of active TB in HIV often use rifabutin 
    not rifampin due to interactions with ARVs
High yield

• Severe infection in asplenic patients
  – Encapsulated organisms (*Streptococcus pneumoniae, Neisseria meningitidis, Haemophilus influenzae*)
    • Vaccinate 2 weeks before if possible
  – Babesiosis – ticks in New England
  – Capnocytophaga – dog bites
  – Anaplasmosis/Erllichiosis