

Pulmonary Infections

The two key decisions in initial empiric therapy are whether the patient has risk factors for healthcare-associated pneumonia, in which case the antibiotic guidelines for adult healthcare-associated pneumonia must be used. The second key factor that must be considered is the immune status of the patient. Additional factors that must be considered are the treatment site for the patient, the presence of modifying factors, and the presence of risk factors for *Pseudomonas* and CA-MRSA. Infectious Diseases consultation should be considered for any patients who are immunocompromised or at risk for resistant pathogens.

If the patient has any of the following characteristics, see the section for Healthcare-Associated Pneumonia Empiric Therapy:

- Hospitalization for 2 d or more in the preceding 90 d
- Residence in a nursing home or a long-term care facility
- Family member with multidrug-resistant pathogen
- Immunosuppressive disease and/or therapy
- Home wound care
- Home infusion therapy
- Chronic hemodialysis
- Antimicrobial therapy within prior 90 d

Community-acquired pneumonia in hospitalized patients

These guidelines are to be used in adult immunocompetent patients only. An Infectious Diseases consult is recommended when dealing with complicated patients or immunocompromised patients. All dosages are based on normal renal and hepatic function.

TREATMENT

Empiric Treatment - patient NOT in the ICU

- Ceftriaxone 1 gm IV q24h **PLUS EITHER** azithromycin 500 mg PO/IV once daily OR doxycycline 100 mg PO twice daily

OR

- Levofloxacin 750 mg PO/IV q24h x 5 days

In non-critically ill patients, switch to oral agents as soon as patient is clinically improving and eating. IV therapy does not need to be continued until discharge. It is not necessary to start all CAP patients on IV therapy if they can tolerate oral therapy. See Table on Empiric

Step-Down Therapy below.

Empiric Treatment - patient in the ICU

Not at risk for infection with *Pseudomonas* (see risks below)

- Ceftriaxone 1-2 g IV q24h **PLUS EITHER** azithromycin 500 mg IV q24h **OR** levofloxacin 750 mg PO/IV q24h
- OR**
- Severe penicillin allergy: levofloxacin 750 mg IV q24h **PLUS** aztreonam 2 g IV q8h

At risk for infection with *Pseudomonas* (see risks below)

- Piperacillin/tazobactam 4.5 g IV q6h
- OR**
- Cefepime 1-2 g IV q8h (preferred regimen if *S. pneumoniae* is also considered likely)
- OR**
- Meropenem 1 gm IV q8h (only if known to be colonized with ESBL organism or multidrug resistant pathogen such as *Pseudomonas* or *Acinetobacter*)
- OR**
- Severe penicillin allergy: aztreonam 2 g IV q8h

PLUS

- Levofloxacin 750 mg IV q24h **OR** gentamicin 7 mg/kg/dose IV daily

PLUS

- Azithromycin 500 mg PO/IV daily (IV for the first 24 hours, patient can be converted to PO after 24 hours)
- **Narrow coverage** (ceftriaxone + azithromycin) **OR** levofloxacin if *Pseudomonas* is not present on culture at 48 hours.
- The benefits of combination therapy in the treatment of *Pseudomonas* are not well-documented; if it is desired, then consider giving it only for the first 5 days of therapy. Please see the section on “double coverage of Gram-negative bacterial infections.”
- **NOTE:** It is a core measure requirement that all ICU patients with pneumonia initially receive IV therapy for the first 24 hours. In stable patients, conversion to PO therapy on day #2 is acceptable, if appropriate

Risks for *Pseudomonas*

- Prolonged hospital or long-term care facility stay (>5 days)
- Structural disease of lung (e.g., CF, bronchiectasis)
- Steroid Rx (>10 mg prednisone / day)
- Broad-spectrum antibiotics for >7 days in the past 1 month
- AIDS, especially CD4 < 50/mL
- Neutropenia (ANC <500/dL)

Other causes of pneumonia

- Suspected aspiration: Empiric coverage for aspiration is justified only in classic aspiration syndromes suggested by loss of consciousness (e.g. overdose, seizure) **PLUS** gingival disease or esophageal motility disorder. Ceftriaxone and Cefepime have adequate activity against most oral anaerobes. For classic aspiration, clindamycin 600 mg IV q8h or metronidazole 500 mg IV q8h can be added to regimens not containing anaerobic coverage. Piperacillin/tazobactam provides excellent anaerobic coverage and additional antibiotics are unnecessary. Anaerobic coverage should be provided when imaging findings (CXR or CT) suggest lung abscess or empyema. Antibiotic treatment of patients who develop fever, leukocytosis, and infiltrates in the first 48h after an aspiration is likely **UNNECESSARY** since most aspiration pneumonias are chemical and antibiotic treatment may only select for more resistant organisms.
- Community-acquired MRSA: Necrotizing pneumonia with cavitation in absence of risk factors for cavitation listed above is concerning for CA-MRSA pneumonia, particularly if associated with a preceding or concomitant influenza-like illness. In these cases, vancomycin 15 mg/kg IV q12h (target vancomycin trough levels: 15-20 mg/L) or linezolid 600 mg IV/PO q12h can be added while awaiting culture data. Infectious Diseases consult is strongly recommended. Use of linezolid monotherapy for MRSA bacteremia, even if associated with a pulmonary source, is not recommended. In the absence of necrotizing pneumonia with cavitation, empiric coverage for CA-MRSA can be deferred until sputum and blood culture results return given their high diagnostic yield for CA-MRSA.

Pathogen-specific treatment and duration

Susceptibility results should be utilized when choosing pathogen-specific therapy.

- *Streptococcus pneumoniae*: IV: penicillin G **OR** ceftriaxone **OR** azithromycin; PO: amoxicillin **OR** cefpodoxime **OR** azithromycin. Treatment for 5-10 days based on

clinical stability. Levofloxacin should not be used routinely as step-down therapy for pneumococcal pneumonia if the organism is susceptible to beta-lactams.

- *Legionella pneumophila*: IV/PO azithromycin for 7-10 days **OR** levofloxacin for 10-21 days.
- *Haemophilus influenzae*: doxycycline **OR** amoxicillin/clavulanate **OR** ceftriaxone are preferred. Other options include cefpodoxime or levofloxacin.

Empiric step-down therapy

Broad-spectrum empiric antibiotic therapy must be accompanied by a commitment to choose pathogen-specific therapy once the culture and susceptibility results are known, which is usually within 48-72 hours. Clinical improvement generally becomes apparent after the first 48-72 hours of therapy, and therefore, the selected antimicrobial regimen should not be changed during this time unless progressive deterioration is noted or initial microbiologic studies so dictate.

In the absence of positive cultures, oral options may be selected based on initial regimen:

Initial	Step-down (preferred)	Step-down (alternate)
Ceftriaxone PLUS azithromycin	Azithromycin	Doxycycline
Levofloxacin IV	Levofloxacin PO	Azithromycin OR doxycycline

Doses of oral agents

Oral Agent	Dose	Duration (days)*
Amoxicillin	1 g PO TID	5-10
Azithromycin	500 mg PO daily	5
Cefpodoxime	200 mg PO BID	5-10
Doxycycline	100 mg PO BID	5-10
Levofloxacin	750 mg PO daily	5

*Treat for a minimum of 5 days (include therapy before oral switch). Therapy can be

stopped after the patient is afebrile for 48-72 hours and has no more than one of the following signs and symptoms: HR > 100 bpm, RR > 24 breaths/min, BP < 90 mmHg, O2 sat < 90%, altered mental status. Therapy > 5 days without a clinical reason should be avoided.

TREATMENT NOTES

Diagnosis

- Immunocompetent patients MUST have an infiltrate on chest radiograph to meet diagnostic criteria for pneumonia.
- Sputum and blood cultures should be sent on all patients admitted to the hospital BEFORE antibiotics are given.
- Therapy should not be delayed if a sputum culture cannot be obtained.
- The *Legionella* urine antigen is the test of choice for diagnosing legionella infection. However, this test detects only *L. pneumophila* serogroup 1, which is responsible for ~70-80% of infections. The test is sent to a referral laboratory with ~6 day turn-around time.
- HIV test in all patients, but especially if age < 55, severe CAP, homeless, or other risk factors.

Indication	Blood Culture	Sputum Culture	Legionella Urinary Antigen	Other
ICU admission	X	X	X	X ^a
Cavitary infiltrates	X	X	X	X ^b
Active alcoholic	X	X	X	
Asplenia	X			
Travel within 2 weeks prior			X	X ^c
Positive <i>Legionella</i> urinary antigen result		X ^d	NA	
Pleural effusion	X	X	X	X ^e

^aEndotracheal aspirate or bronchoalveolar lavage if intubated.

^bFungal and mycobacterial (tuberculosis) cultures and stains. Consider *Coccidioides* if epidemiologic risk. Consider echocardiogram if septic emboli are a concern.

^c*Legionella*, Influenza, *Coccidioides* or other endemic mycoses, *Hantavirus*, *Burkholderia pseudomallei*, avian influenza, and SARS are all potential considerations depending on the destination and season.

^dSpecial media for *Legionella*

^eThoracentesis and pleural fluid cultures if loculated or effusions greater than 1cm on lateral decubitus film.

Management

- The decision to admit a patient should be based on clinical judgment with consideration of age, severity of illness, co-morbid conditions, and factors that may compromise the safety of home care.
- The nonresponding patient should be evaluated for noninfectious mimics of pneumonia, unsuspected or drug-resistant organisms, extrapulmonary sites of infection, and complications of pneumonia and its therapy. If a noninfectious etiology is identified, antibiotics should be discontinued.
- A CURB-65 score may be calculated to assist in patient disposition decisions.
- If BUN level is unavailable, the CRB-65 score can be calculated instead and appears to perform comparably to CURB-65 score.

CURB-65 Scoring System:

Patient Characteristic	Points Assigned
Confusion (based on specific mental test or disorientation to person, place, or time)	1
BUN level > 20 mg/dL	1
Respiratory rate \geq 30 breaths/min	1
Low blood pressure (systolic < 90 mmHg or diastolic < 60 mmHg)	1
Age \geq 65 years	1

Score	Recommend Site of Care
0	Outpatient
1	Outpatient
2	Inpatient
≥3	Inpatient, consider ICU

Resolution of symptoms

- Cough and chest radiographic abnormalities may take 4-6 weeks to improve. There is NO need to extend antibiotics if the patient is doing well otherwise (e.g. afebrile and clinically improving).
- There is no need for routine follow-up chest radiograph if the patient is otherwise improving.

Other considerations

- Consider influenza during season (November through March) or in returning travelers and test and treat appropriately.
- Consider Pneumococcal and Influenza vaccines if indicated.
- Consider HIV test.

References:

IDSA/ATS Consensus Guidelines for CAP: Clin Infect Dis 2007;44:S27.
 Capelastegui A, et al. Eur Respir J 2006;27:151-7

Healthcare-associated Pneumonia (NOT ventilator-associated)

Definitions

Hospital-acquired Pneumonia (HAP): Pneumonia occurring 48 hours or more after admission, which was not incubating at the time of admission.

Ventilator-associated Pneumonia (VAP): Pneumonia occurring more than 48-72 hours after endotracheal intubation.

Healthcare-associated Pneumonia (HCAP): Pneumonia within 48 hours of hospital admission in

any patient who was:

- Hospitalized in an acute care hospital for two or more days within 90 days of the infection
- Resided in a nursing home or long-term care facility
- Received recent intravenous antibiotic therapy, chemotherapy, or wound care within the past 30 days of the current infection
- Attended a hospital or hemodialysis clinic.

TREATMENT

These guidelines are to be used in adult immunocompetent patients only. An Infectious Diseases consult is recommended when dealing with complicated patients or immunocompromised patients. All dosages are based on normal renal and hepatic function.

Broad-spectrum empiric antibiotic therapy must be accompanied by a commitment to de-escalate antibiotics, on the basis of serial clinical and microbiologic data, to limit the emergence of resistance in the hospital.

NOTE: If the patient is on antibiotic therapy or has recently been on antibiotic therapy, choose an agent from a different class.

Empiric treatment

No risk factors for *Pseudomonas* infection (see risks below)

- Ceftriaxone 1 g IV q24h
- OR**
- Levofloxacin 750 mg IV q24h

At risk for *Pseudomonas* infection (see risks below)

- Piperacillin/tazobactam 4.5 g IV q6h
- OR**
- Cefepime 1 g IV q8h
- OR**
- Meropenem 1 gm IV q8h (only if known to be colonized with ESBL organism or multidrug resistant pathogen such as *Pseudomonas* or *Acinetobacter*)
- OR**
- Severe penicillin allergy: levofloxacin 750 mg IV q24h
 - If the patient is on immunosuppressive medications or is neutropenic, **ADD** azithromycin 500 mg IV/PO q24h to cover *Legionella* unless the patient is already on levofloxacin.

NOTE: Lower doses for piperacillin/tazobactam to 3.375 g IV q6h and cefepime to 1 g q12h if *Pseudomonas* is not recovered.

Risk factors for *Pseudomonas* infection:

- Prolonged hospital or long-term care facility stay (≥ 5 days)
- Steroid use (> 10 mg prednisone per day)
- Broad spectrum antibiotics for > 7 days in past month
- Structural lung disease
- AIDS (CD4 < 50)
- Granulocytopenia (ANC < 500)

TREATMENT NOTES

Diagnosis

- The clinical diagnosis can be made if the patient has a new radiographic infiltrate PLUS at least two of the following: fever $>38^{\circ}$ C, leukocytosis or leukopenia, or purulent secretions.
- Etiologic diagnosis generally requires a lower respiratory tract culture, preferably obtained before the administration of antibiotic therapy.

Microbiology

- Gram-negative rods including *Enterobacteriaceae* (e.g. *Klebsiella*, *E. coli*, *Serratia*)
- Anaerobes (rarely)
- *Legionella*
- *S. aureus* (MRSA and MSSA)
- *Pseudomonas* (IF risk factors are present - see above)
- Enterococci, *Stenotrophomonas*, and *Candida* species are often isolated from the sputum in hospitalized patients. In general, they should be considered to be colonizing organisms and should not be treated with antimicrobials.

Antimicrobial management of “aspiration” in the hospital

- Prophylactic antibiotics ARE NOT recommended for patients who are at increased risk for aspiration.
- Immediate treatment is indicated for patients who have small-bowel obstruction or are on acid suppression therapy given the increased risk of gastric colonization.
- Antibiotic treatment of patients who develop fever, leukocytosis, and infiltrates in the first 48h after an aspiration is likely UNNECESSARY since most aspiration pneumonias are chemical and antibiotic treatment may only select for more resistant organisms.
- Treatment IS recommended for patients who have symptoms for more than 48 hours or who are severely ill.

References:

Aspiration pneumonitis and aspiration pneumonia: N Engl J Med 2001;344(9):665.
 ATS/IDSA Guidelines for HAP/VAP: AJRCCM 2005;171:388.

Ventilator-associated Pneumonia (VAP)

These guidelines are to be used in adult immunocompetent patients only. An Infectious Diseases consult is recommended when dealing with complicated patients or immunocompromised patients. All dosages are based on normal renal and hepatic function.

- Sputum cultures should be obtained **prior to starting or changing antibiotics** by endotracheal suction or invasive techniques such as mini-BAL. ET suction appears just as sensitive but less specific than invasive methods.
- **Empiric treatment MUST be narrowed as soon as sputum culture results are known.**
- **Vancomycin can be STOPPED if no resistant Gram-positive organisms are identified.**
- If the patient is on antibiotic therapy or has recently been on antibiotic therapy, choose an agent from a different class.

TREATMENT

- **Treatment MUST be narrowed based on culture results**
- Vancomycin 15 mg/kg/dose q12h (see dosing section) **OR** Linezolid 600 mg IV/PO q12h
PLUS
- Piperacillin/tazobactam 4.5 g IV q6h **OR** Cefepime 1 g IV q8h (2g IV q8h if neutropenia)
OR meropenem 1 g IV q8h **OR** severe penicillin allergy: ciprofloxacin 400 mg IV q8h **OR** aztreonam 2 g IV q6h
PLUS
- Gentamicin 5-7 mg/kg IV q24h (preferred) **OR** ciprofloxacin 400 mg IV q8h

NOTE: These are antipseudomonal doses. LOWER the dose (piperacillin/tazobactam 3.375 g IV q6h, cefepime 1 g IV q12h) if *Pseudomonas* is NOT recovered

If the patient is immunocompromised, consider ADDING azithromycin 500 mg IV/PO q24h to cover *Legionella* unless the patient is already on levofloxacin.

Gentamicin is recommended as the second agent to broaden empiric coverage rather than fluoroquinolones because of high rates of resistance to fluoroquinolones in the institution (36% of *Pseudomonas* at UCLA is cipro-resistant).

Nebulized antibiotics (aminoglycosides or colistin) are not recommended for routine use due to an absence of data on their utility except in specific patient populations (e.g., cystic fibrosis). Nebulized antibiotics should not be used for suppressive therapy in patients with tracheal colonization.

Antimicrobial therapy should be tailored once susceptibilities are known. Vancomycin should be stopped if resistant Gram-positive organisms (MRSA) are not recovered. Gram-negative coverage can be reduced to a single susceptible agent in most cases. The benefits of combination therapy in the treatment of *Pseudomonas* VAP are not well-documented; if it is desired then combination therapy should be given for the first 5 days of therapy only (see the section on “double coverage” of Gram-negative organisms).

Duration

- **7-8 days** if the patient has clinical improvement, *Pseudomonas* may require longer treatment.
- If symptoms persist at 8 days consider: alternate sources for infection, non-infectious causes (e.g. ARDS, CHF), and bronchoscopy with quantitative cultures.
- VAP associated with *S. aureus* bacteremia should be treated for a minimum of 14 days.

TREATMENT NOTES

Microbiology

- *Staphylococcus aureus* (MRSA and MSSA), *Pseudomonas aeruginosa*, other Gram-negative bacilli, *Legionella*
- Enterococci, *Stenotrophomonas*, and *Candida* species are often isolated from the sputum in intubated patients. In general, they should be considered to be colonizing organisms and should NOT be treated with antimicrobials.

Diagnosis

- VAP is difficult to diagnose.
- Bacteria in endotracheal secretions may represent tracheal colonization and NOT infection. Not all positive sputum cultures should be treated.
- Quantitative cultures of BAL fluid can help distinguish between colonization and infection; $\geq 10^4$ cfu/ml is considered significant growth.

Other considerations

- Tracheal colonization of Gram-negatives and *S. aureus* is not eradicated even though lower airways are sterilized. Thus, post-treatment cultures in the absence of clinical deterioration (fever, rising WBC, new infiltrates, worsening ventilatory status) are not recommended.
- Inadequate initial treatment of VAP is associated with higher mortality (even if treatment is changed once culture results are known).
- Efforts to reduce the duration of therapy are justified by studies of the natural history of the response to therapy. Data support the premise that most patients with VAP who receive appropriate antimicrobial therapy have a good clinical response within the first 6 days. Prolonged therapy simply leads to colonization with antibiotic resistant bacteria.

References:

ATS/IDSA Guidelines for HAP/HAV: AJRCCM 2005;171:388.

Clinical response to VAP: AJRCCM 2001;163:1371-1375.

VAP: Arch Intern Med 2000;160:1926-6.

Mini-BAL: Chest 1998;113:412-20.

CPIS score: Am Rev Respir Dis 1991;143:1121-1129.

Determining course of therapy using CPIS Score: Am J Respir Crit Care Med 2000; 162: 505, Intensive Care Med 2004; 30: 735-738.

Seasonal Influenza Diagnosis and Management

Diagnosis

- Respiratory virus testing should be considered in individuals presenting during influenza season with fever and influenza-like symptoms of myalgia, arthralgia, headache, and/or sore throat. **Influenza testing is not needed for all patients with signs and symptoms of influenza to make antiviral treatment decisions.**
- A clinical diagnosis of influenza can be made for outpatients with signs and symptoms consistent with influenza. For outpatients and emergency room patients, results of diagnostic testing are not available in a timely manner to inform clinical decision making.
- Testing is appropriate for hospitalized inpatients, especially if a positive test would result in a change in clinical management.
- Nasopharyngeal swab specimens are the preferred specimen for the purpose of respiratory virus testing. A new influenza A/B/RSV PCR (#7255) is the diagnostic test offered at UCLA.
- Please see the CDC's flu site for further details.
<http://www.cdc.gov/flu/professionals/diagnosis/>

Treatment for inpatients

- treatment can shorten the duration of symptoms and may reduce the risk of complications from influenza.
- Benefit is greatest when treatment is started early, especially within 48 hours of illness onset.
- Antiviral treatment is recommended as early as possible for any patient with confirmed or suspected influenza who is hospitalized, has severe, complicated, or progressive illness, or who is at risk for complications.
- Decisions about starting treatment should not wait for laboratory confirmation of influenza
- Consideration can be given to treating immunocompromised patients who are outside the 48 hour window, although no data exist to show significant benefit.
- Antiviral recommendations for the 2013 influenza season are oseltamivir (Tamiflu) and zanamivir (Relenza)
- The recommended duration of antiviral treatment is 5 days.
- Please see the CDC's flu site for further details.
<http://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm>

Antiviral Agents

Medication	Adult Dosing	Side Effects	Notes
Oseltamivir	Treatment: 75 mg PO BID x 5d Prophylaxis: 75 mg PO daily	Common: nausea, vomiting Severe: hypersensitivity, neuropsychiatric	Dose adjustment needed for GFR <30 ml/min
Zanamivir	Treatment: 10 mg (2 oral inhalations) BID x 5d Prophylaxis: 10 mg (2 oral inhalations) daily	Common: diarrhea, nausea, cough, headache, and dizziness Severe: bronchospasm, hypersensitivity	Should NOT be used in patients with chronic airway diseases

Infection Control

- All established Occupational Health Services and Hospital Epidemiology policies should be followed by all UCLA employees. Policy IC002 (<http://www.mednet.ucla.edu/Policies/pdf/enterprise/HSIC002.pdf>) and Policy IC005 (<http://www.mednet.ucla.edu/Policies/pdf/enterprise/HSIC005.pdf>)
- All individuals with suspected influenza infection should be placed on Droplet Precautions. When outside their room (e.g. during transport) patients should wear a mask.
- All healthcare workers should receive the influenza vaccine yearly.
- All healthcare workers, as well as family/visitors must wear a surgical mask while caring for patients with confirmed or suspected influenza. These precautions should be maintained until it is determined that the cause of symptoms is not an infectious agent that requires Droplet Precautions.
- Employees who are febrile or have flu-like symptoms during flu season should stay home. If they become sick while at work, they must go to Occupational Health Services. <http://ohs.uclahealth.org>
- Employees who have cold symptoms, such as cough and runny nose, WITHOUT fever should wear a surgical mask during patient contact.

Tuberculosis (TB) Infection

DEFINITIONS

Acid fast bacilli (AFB): Bacteria, including *Mycobacterium tuberculosis* and non-tuberculous

mycobacteria (NTM) that are detected in clinical specimens by direct microscopy using and acid-fast stain.

- Negative AFB smear does not rule out active TB.
- Cultures may take 6 weeks to grow.

Tuberculin Skin Test (TST): Intradermal injection of purified protein derivative (PPD) and measurement of induration diameter in 48-72 hours for diagnosis of latest TB infection (also positive in most active TB cases).

Criteria for a positive test are:

- $\geq 5\text{mm}$ - high risk of developing active TB (e.g. HIV, close contact of TB case, immunocompromised)
- $\geq 10\text{mm}$ - other risk factors for TB infection (healthcare worker, IV drug use, diabetes)
- $\geq 15\text{mm}$ - no risk factors for TB

QuantiFERON Gold: Immunoserology test that measures T-cell release of interferon-gamma (IFN-gamma) following stimulation by antigens unique to *M. tuberculosis*. The results are reported as positive, negative, or indeterminate. QuantiFERON Gold results are NOT affected by prior BCG vaccination and thus are useful in diagnosing latent TB infection in patients with a history of BCG vaccination. As with the TST, results of this test should be interpreted with other relevant clinical information such as age, BCG status, history of contact with active TB, and risk factors that increase the risk of progression to active disease such as immunosuppression.

Latent TB Infection (LTBI): Previous infection with TB that has been contained by the host immune response.

- Patients may have a positive TST or suggestive radiographic findings such as calcified granulomata or minimal apical scarring, but do not have symptoms of active TB disease.
- Not infectious and does not require isolation.

Active TB disease: Active replication of *M. tuberculosis* causing pulmonary or extrapulmonary symptoms and/or signs.

- Confirmed by positive AFB smear, MTB test, or culture.
- Requires airborne isolation.

When to Suspect Active TB Disease

High-risk individuals

- Recent exposure to a person with known TB; history of a positive TST or QuantiFERON Gold; HIV infection; injection or non-injection drug use; foreign birth or residence in a region in which TB incidence is high; residents and employees of high-risk congregate settings (e.g. prisons); membership in a medically underserved, low-income population; anti-TNF alpha therapy

Clinical syndromes

- Cough of >2 week duration, with at least one additional symptom, including fever, night sweats, weight loss, or hemoptysis.
- Any unexplained respiratory illness of >2 week duration in a patient at high risk for TB.
- Any patient with HIV infection and unexplained cough and fever.
- Any patient on anti-TNF alpha therapy with unexplained fever.
- Community-acquired pneumonia which has not improved after 7 days of appropriate treatment.
- Incidental findings on chest radiograph suggestive of TB (even if symptoms are minimal or absent) in a patient at high risk for TB.

Radiographic findings

- Primary TB (often unrecognized): Can resemble CAP and involve any lobes; hilar adenopathy, pleural effusions are common; cavitation is uncommon. Findings often resolve after 1-2 months. These are common findings in patients with advanced HIV infection and TB.
- Reactivation TB: Infiltrates with or without cavitation in the upper lobes or the superior segments of the lower lobes; hilar adenopathy is variable; CT scan may have “tree-in-bud” appearance.

Diagnosis

- Patients with characteristic syndromes and radiographic findings should have expectorated sputum obtained for AFB smear and culture.
- Sensitivity of AFB smear on expectorated sputum is 50-70%; it is lower in HIV+ patients. Morning expectorated sputum, induced sputum, bronchoscopy have higher sensitivity. AFB culture of lower respiratory tract specimens is considered the gold standard.
- AFB smear and culture should be obtained regardless of chest x-ray findings in patients with high clinical suspicion, HIV infection, or other immunocompromised states. CXR is normal in approximately 10% of HIV+ patients with pulmonary TB.

TREATMENT

Active TB

- Infectious Diseases consult is strongly advised.
- Therapy should be initiated for patients with positive AFB smear and clinical findings consistent with active TB.
- Therapy should be considered for patients with negative AFB smears when suspicion of TB is high and no alternate diagnosis exists. Multiple specimens should be obtained for culture prior to initiation of treatment.
- Four drugs are necessary for the initial phase (2 months)
 - Isoniazid (INH) 300 mg* (5 mg/kg) PO daily

- Rifampin (RIF) 600 mg* (10 mg/kg) PO daily
- Pyrazinamide (PZA) 1000 mg (40-55 kg) OR 1500 mg (56-75 kg) OR 2000 mg* (76-90 kg) PO daily
- Ethambutol (EMB) 800 mg (40-55 kg) OR 1200 mg (56-75 kg) OR 1600 mg * (76-90 kg) PO daily

*Max dose, regardless of weight

- Pyridoxine 25 mg PO daily is recommended to prevent INH-associated peripheral neuropathy in patients with: HIV, malnutrition, alcohol abuse, diabetes mellitus, renal failure, pregnancy, or breastfeeding.
- NB: LA County TB Control must approve ALL discharge plans for patients with active TB. Hospital Epidemiology can assist with decisions about isolation and discharge plans.

Latent TB

- Treatment of latent tuberculosis should rarely be started in the hospital and requires a clear follow-up plan and commitment from the patient and their physician.

Drug toxicity and monitoring

- INH: asymptomatic elevation in hepatic enzymes, serious and fatal hepatitis, peripheral neuropathy.
- RIF: orange discoloration of body fluids, hepatotoxicity (cholestatic), pruritis with or without rash, numerous drug interactions.
- PZA: hepatotoxicity, nongouty polyarthralgia, asymptomatic hyperuricemia, acute gouty arthritis.
- EMB: retrobulbar and peripheral neuritis, color vision.
- Monitoring: baseline hepatic panel, creatinine and CBC are recommended for all adults initiating TB treatment. Monthly hepatic panel is recommended for patients with baseline abnormalities, history of liver disease or viral hepatitis, chronic alcohol consumption, HIV, IVU, pregnancy or immediate post-partum state, or those taking other potentially hepatotoxic medications.
- Therapy should be discontinued immediately if AST and ALT are >3 times the upper limit of normal in the presence of jaundice or hepatitis symptoms or >5 times the upper limit of normal in the absence of symptoms.

References

ATS/IDSA/CDC Guidelines for diagnosis of TB: Am J Respir Care Med 2000;161:1376.

ATS/IDSA/CDC Guidelines for treatment of TB: MMWR;52:RR-11.