ACOI Board Review Course
Bronchitis, Pneumonia and TB

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Disclosures

Objectives

At the conclusion of this section, participants;

- Will recognize the common clinical features of community acquired pneumonia include cough, fever, pleuritic chest pain, dyspnea, and sputum production.
- Will comprehend that most initial treatment regimens for community-acquired pneumonia are empiric and that a local epidemiology, travel history, and other epidemiologic and clinical clues should be considered when selecting an empiric regimen.
- At the end of the presentation the attendee will recognize that pulmonary complications of TB include hemoptysis, pneumothorax, bronchiectasis, extensive pulmonary destruction (including pulmonary gangrene), malignancy, venous thromboembolism, and chronic pulmonary aspergillosis.

Dr. Derys' Rule's for the Boards

MEMORIZE;

- Topics that save lives.
- Topics that prevent morbidity and mortality.

Bronchitis, Pneumonia and TB; Acute Bronchitis- Pathogens

Acute Bronchitis

PATHOGENS;

Viruses: most common

- Rhinovirus
- Parainfluenza virus
- Coronavirus
- Respiratory syncytial virus (RSV)
- Influenza: the only realistically treatable virus

- Common non-infectious offenders: allergens, smoke/smoking, toxic fumes, pollution

Bronchitis, Pneumonia and TB; Acute Bronchitis- Clinical

- History;
  - Cough is the predominant complaint for upper respiratory tract infection (URTI).
  - Cough may be productive of sputum or non-productive; sputum may be clear or purulent.
  - May be accompanied by sinus congestion, rhinorrhea, sore throat.

- Physical;
  - Fever is unusual, but if present is most common with influenza, rhinovirus, coronavirus, metapneumovirus, or parainfluenza infection.
  - Lung exam may reveal rhonchi or wheezing, but no crackles or evidence of lung consolidation.

- Differential acute cough: common conditions include subclinical asthma/ bronchospasm, postnasal drip and allergies, pertussis, CHF, GERD, neoplasm, ACE inhibitor reaction, pneumonia.

"Not all that coughs in pneumonia" - Dr. Dery

Bronchitis, Pneumonia and TB; Acute Bronchitis- Diagnosis

DIAGNOSIS;

- Clinical diagnosis based on compatible symptoms and normal vital signs or lack of concerning findings on exam (r/o pneumonia).
- Molecular multiplex assays available; however, usually only performed in patients who may be hospitalized.
- Indications for chest X-ray: abnormal vital signs (P >100, T >38°C, RR >20), rales, cough > 3wks.
- *Bordetella pertussis, C. pneumoniae, M. pneumoniae,* and influenza: best diagnostic method is PCR using nasopharyngeal swab.

Bronchitis, Pneumonia and TB; Acute Bronchitis- Treatment

- Principles: dx = URI symptoms (sore throat, rhinorrhea, sinus congestion) plus cough.
  - With recurrent “bronchitis", rule-out asthma, GERD, cancer or postnasal drip.
  - Obtain CXR if abnormal vital signs in order to R/O pneumonia.
  - No specific treatment (no antibiotics) unless concern for pertussis or higher risk patient with influenza in most cases.

- Indications for antimicrobials:
  - Pertussis
  - Seriously ill
  - Acute exacerbation of acute (some cases)
  - Case by case (for primary care patients):
  - >65 yrs. and 2 or more of the following conditions: hospitalization within prior 12 months, diabetes, heart failure, use of steroids.

Bronchitis, Pneumonia and TB; Acute Bronchitis- Treatment

- Influenza: consider anti-flu drug(s) if onset of symptoms < 48hrs or patient is hospitalized for this illness or is at high risk of serious infection.

- Oseltamivir or zanamivir is recommended.

- In hospitalized patients, drugs may confer survival benefit even if given beyond 48hrs of symptom onset, but no good evidence of benefit if used > 4-5d after onset of symptoms.

Antibacterials should not be used for acute bronchitis except for suspected or confirmed pertussis.

Bronchitis, Pneumonia and TB; Acute Bronchitis- Treatment

- Allergic rhinitis:
  - For example, loratadine.

- Sinusitis:
  - If present, +/- antibiotic if severe symptoms or > 7 days of sx (efficacy is unclear).

- Cough or bronchospasm (infectious-induced):
  - albuterol by inhaler.

- If cough lasts > 3 weeks: should r/o asthma, GERD, pertussis, cancer.

Bronchitis, Pneumonia and TB; Actue Bronchitis- Pertussis

- *Bordetella pertussis*:
  - Resurgence of cases in U.S.
  - Typically with persistent, usually dry cough 2-6 weeks or more, cough paroxysms, post-tussive emesis, rib pain due to violent coughing possible.
  - Characteristic inspiratory whoop seen mostly in children rather than adults.

- Most adults with pertussis lack typical sx due to partial immunity.
- Major clues: severe coughing paroxysms > 3 wks, whoop or post-tussive emesis.
- Preferred tests: nasopharyngeal swab for PCR and/or culture (not sensitive).
- Treatment: azithromycin.

Bronchitis, Pneumonia and TB;
Acute Exacerbations Chronic Bronchitis- Pathogens

Chronic Bronchitis

PATHOGENS;

- Haemophilus influenzae
- Streptococcus pneumoniae
- Moraxella catarrhalis
- Viruses: influenza, rhinovirus, parainfluenza, RSV and others
- Additional offenders:

- allergens,
- smoking,
- toxic fumes,

Bronchitis, Pneumonia and TB;
Acute Exacerbations Chronic Bronchitis- Clinical

- Principles: most exacerbations precipitated by viral upper respiratory tract infections in COPD flares but in those with chronic bronchitis up to half are caused by bacterial infection.

- PE: increased respiratory rate, wheezing, rhonchi, cyanosis +/- fever.

- Significant AECB flare; need all 3;
  - Increased sputum production
  - Increased cough
  - Increased dyspnea

- As heterogeneous reasons for AECB flare, key is supportive care includes bronchodilators (albuterol, ipratropium bromide), corticosteroids, select antibiotics and oxygen.

Bronchitis, Pneumonia and TB;
Acute Exacerbations Chronic Bronchitis- Treatment

Principle:
- No antibiotics for mild exacerbations.
- Target typical respiratory pathogens anticipated and local resistance patterns.

Uncomplicated flare;
- No risk factors:
  - Age < 65 yrs
  - FEV_1 > 50% of predicted
  - < 2 exacerbations/year, no cardiac disease
  - Azithromycin 500mg, then 250mg PO once-daily x 4d.

Complicated flare;
- 1 or more risk factors
  - Age > 65 years
  - FEV_1 < 50% of predicted
  - ≥ 2 exacerbations/year
  - Cardiac disease
  - Moxifloxacin 400 mg IV/PO daily
  - Levofloxacin 500 mg IV/PO daily
  - Amoxicillin/clavulanate 875 mg PO twice daily

Pseudomonas risk factors: use antipseudomonal agent (e.g., levofloxacin, piperacillin/tazobactam, cefepime);
- Severe COPD
- History of *Pseudomonas* in sputum
- Significant bronchiectasis
- Frequent antibiotics courses
- Multiple recent hospital admissions
- Systemic glucocorticoid use

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Pathogens

CAP

PATHOGENS;

- Streptococcus pneumoniae
- Haemophilus influenzae
- Moraxella catarrhalis
- Chlamydophila pneumoniae
- Legionella species
- Mycoplasma pneumoniae
- Viruses: influenza A, RSV, parainfluenza, adenovirus, human metapneumovirus, rhinovirus

- A CDC report of extensive microbiologic testing of 2,300 adults hospitalized for CAP showed the most common pathogens were rhinovirus (9%), influenza (6%) and *S. pneumonia* (5%), no pathogen detected in 62%.

Occasional pathogens that may need to be considered in setting of suspected community-acquired pneumonia, e.g., if immunocompromised or other special situations:

- Mycobacterium tuberculosis
- Nocardia
- Group A Streptococcus
- Neisseria meningiditis
- Anaerobes (aspiration pneumonia)

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Clinical

CLINICAL;

- Typical history for community-acquired pneumonia (CAP): cough, fever and sputum production, dyspnea +/- GI symptoms or pleurisy.

- PE: fever, tachypnea, rales or evidence of consolidation.

- Site of care--use judgment + CURB-65
  - CURB-65 (1pt each): if score = 0-1, patient may be treated as an outpatient;
    - decreased **C**onsciousness
    - increased blood **U**rea nitrogen BUN
    - **R**espiratory rate >30/min
    - **B**P < 90 systolic age >**65** years)

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Diagnosis

DIAGNOSIS;

- Consider epidemiologic and host clues to probable pathogens beyond classic CAP pathogens.
  - Local epidemic or travel-related exposure.
  - Influenza
  - Legionella (travel to hotel, recent stay in hospital)
  - MERS-CoV (travel to Arabian peninsula)
  - Endemic fungi: histoplasmosis (recent travel to cave, Ohio River regions), blastomycosis (rotting wood, beavers), coccidiomycosis (SW USA)
  - Bioterrorism agents:
    - Anthrax
  - PCP: undiagnosed HIV/AIDS

- Chest XR nearly always shows an infiltrate.
  - Pneumocystis jiroveci (PCP) is sometimes an exception.

- Typical patterns (but by no means specific) Bacteria: consolidation, most common Viral: bilateral and interstitial

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Diagnosis

Preferred diagnostic tests for detecting major treatable bacterial pathogens are blood culture and sputum Gram stain and culture;

- This is sensitive for detecting *S. aureus* and GNB.
- *S. pneumoniae* is better detected with urinary antigen (sensitivity 80%).
  - *S. pneumoniae*: blood culture, sputum Gram stain and culture, urine antigen assay.
- *Legionella*: urine antigen assay and culture on selective media (BCYE).
- Blood culture, sputum Gram stain and culture are standard for detecting common and/or important bacterial pathogens such as *S. pneumonia*, *H. influenzae*, *S. aureus*, *Moraxella catarrhalis*, *Klebsiella pneumonia* and other aerobic GNB. These methods are relatively weak though for detecting *S. pneumoniae* and *H.* influenzae.
- Viral: many now detectable with highly sensitive and specific nucleic amplification tests often multiplex platforms.
- Rapid influenza testing (non-molecular) ~ 30-70% sensitive tests, depending on circulating strains. FDA-cleared molecular test detects the following;17 respiratory viruses, *C. pneumoniae*, *M. pneumoniae*, and B. pertussis.

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Treatment

TREATMENT;
General considerations

- Even with modern, molecular methods, up to 70% of CAP without pathogen detected.
- Current guidelines for CAP:
  - Little guidance regarding diagnostic testing.
  - Antibiotic therapy standardized, recommendation to initiate antibiotic therapy within 4 hours, "door to needle" previously advocated, but now recommended to be administered as soon as possible and prior to the patient leaving the emergency department for hospitalized patients.
  - If septic shock, administer within 1 hour.

- Procalcitonin may help guide rationale antibiotic therapy regarding probably of a bacterial as opposed to a viral etiology though studies have not found a clear-cut threshold to distinguish.
- Anticipate patients should show clinical response within 48-72h of antibiotic administration. If not, consider a non-responder and re-evaluate for etiology and treatment (consider drug resistance).
- Duration of therapy: 5 day minimum and may be sufficient, although most recommend patients should be afebrile for 48-72h without supplemental oxygen requirement with otherwise stable vital signs.

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Treatment

Outpatient (empiric);

Outpatient and uncomplicated:

- Use doxycycline or macrolide.
  - Doxycycline
  - Azithromycin.
  -

Outpatient and comorbidity (COPD, diabetes, CHF, etc) and/or recent abx:

- Above drugs or use fluoroquinolone.
  - Levofloxacin
  - Moxifloxacin

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Treatment

Hospitalized patient (empiric, non-ICU);

- Preferred (IDSA guidelines, non-ICU): use either fluoroquinolone (levofloxacin or moxifloxacin) or cephalosporin + macrolide.

- Aspiration pneumonia:
  - Clindamycin + levofloxacin,moxifloxacin.
  - Other choices include ampicillin/sulbactam or piperacillin/tazobactam.

- Influenza+/- bacterial superinfection (*S. pneumoniae* > *S. aureus* > group A streptococcal infection):
  - ceftriaxone or cefotaxime + oseltamivir.
  - Permavir IV option as anti-influenza agent.
  - Consider MRSA, add vancomycin or linezolid.

- If structural lung disease exists, consider covering for *P. aeruginosa.*

Bronchitis, Pneumonia and TB; Community Acquired Pneumonia; Treatment

Inpatients, ICU treatment:

- Choose:
  - Cefotaxime
  - Ceftriaxone
  - Ampicillin/sulbactam
- PLUS either
  - Azithromycin
  - Moxifloxacin
  - Levofloxacin
- If penicillin allergy: use respiratory fluoroquinolone (moxifloxacin or levofloxacin) and aztreonam.

- *Pseudomonas aeruginosa*: if considered, use;
  - Antipneumococcal, antipseudomonal beta-lactam (piperacillin/tazobactam, cefepime, imipenem or meropenem) plus either ciprofloxacin/levofloxacin OR an aminoglycoside (gentamicin, tobramycin or amikacin).
  - For penicillin-allergic patients, substitute aztreonam for above beta-lactam.

- MRSA: add vancomycin or linezolid.

- Duration: five day minimum; if good response within first 48-72h then usual total course is 5-7d. Before stopping therapy patient should be afebrile for 48-72h, require no supplemental oxygen and have one or less abnormal vital sign (HR > 100, RR > 24, SBP ≤ 90).

Bronchitis, Pneumonia and TB; TB; Pathogens/Clinical

Tuberculosis, Active

PATHOGENS;

- Mycobacterium tuberculosis

CLINICAL

- Pulmonary TB: cough > 2 wks, fever, night sweats, weight loss, hemoptysis, SOB, chest pain.
- Disseminated TB: fevers, weight loss, organ involvement.
- CXR: upper lobe infiltrate classic (may be cavitary); atypical presentations especially in children or if HIV+; hilar adenopathy.
- Diagnostics:
  - Sputum AFB smear: ~50% sensitive
  - AFB culture: ~80% sensitive
  - PCR: best for sputum with positive AFB smear, expensive (e.g., GeneXpert).
  - Tuberculin skin test (Mantoux, PPD) and IFN-gamma release assays: cannot distinguish active disease from latent infection; either can be negative in >25% with active infection.

Bronchitis, Pneumonia and TB; TB; Diagnosis

DIAGNOSIS

- Culture: gold-standard; it also allows for determining drug susceptibility.
- AFB smear: provides indication of infectiousness in respiratory specimens, i.e., AFB smear-positive more infectious than smear-negative.
- Amplification methods:
  - GeneXpert MTB/RIF: highly sensitive and specific for detecting TB and RIF resistance directly in sputum.
  - IFN-gamma release assays (QuantiFERON-Gold, T.SPOT.TB) have been approved by the FDA for diagnosis of TB infection and disease, but they cannot distinguish between infection and disease.

Bronchitis, Pneumonia and TB; TB; Treatment

TREATMENT

- Typically four drugs used for 8 wks, then using susceptibilities reduce to 2 or 3 drugs (usually INH + RIF) used for balance of duration.
  - Initial therapy: four drug therapy standard (RIPE), all are oral and dosed daily.
    - RIF
    - INH
    - PZA
    - EMB
    - Vitamin B6 (pyridoxine)
- Check drug susceptibilities when available. Treat with at least 2 drugs to which M. tb is susceptible.
- Duration: determined by site of disease, response to therapy.
  - Usual duration 6 mos, but use 9 mos if cavitary disease and cx (+) after 2 mos.
  - Bone/joint TB: longer duration typical, usually 9-12 months
  - Refer to health department so pt can receive directly observed therapy (DOT).
  - Dosing less frequently than daily is possible, but must be done via DOT.
  - Drug-resistant TB: consult TB or infectious diseases expert for guidance.

Bronchitis, Pneumonia and TB; TB; Infection Control/Follow Up

INFECTION CONTROL;

- TB isolation: cough > 2 weeks + abnormal CXR.
- Can discontinue if 3 sputum samples (expectorated or induced) are AFB smear-negative. Three expectorated can be within 24 hours if one specimen is from early AM.
- If AFB smear-positive or on TB treatment, can discontinue infection control after 2 weeks of treatment, clinical improvement, and AFB smear-negative.
- Special concerns exist if patient will be transferred to high-risk setting or concern for drug-resistant organisms (e.g., nursing home, homeless shelter, contact with immunocompromised persons).

FOLLOW UP;

- Refer all cases to local health department for treatment and contact investigation.
- DOT preferred.
- If adverse drug reactions prompt change in 4- or later 2-drug therapy, this is best done in close consultation with a health expert in TB or infectious diseases.