Community Acquired Pneumonia

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References:
2. Seattle Children's Hospital Community Acquired Pneumonia Pathway
3. www.cdc.gov/flu

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OBJECTIVES:
1. Provide criteria for accurate diagnosis
2. Provide criteria for hospitalization
3. Outline appropriate, age-specific therapies
4. Reduce unnecessary laboratory testing, radiography, and hospitalization
5. Prevent complications of community acquired pneumonia

SUMMARY:
1. Do not routinely obtain laboratory studies or radiographs in patients well enough to be treated as outpatients.
2. High-dose amoxicillin is first line therapy for all children (regardless of immunization status)¹.
3. If ≥ 5 years old, consider adding coverage for atypical pneumonia with a macrolide (i.e., azithromycin).
4. Consider rapid influenza testing if influenza is suspected in patients who would require treatment per CDC guidelines.

¹ Note that this differs from the SCH Community Acquired Pneumonia pathway, which was developed for inpatients, and recommends a 3rd generation cephalosporin for partially immunized children.
Community Acquired Pneumonia

1. **Inclusion Criteria**
   a. ≥ 3 months of age

2. **Exclusion Criteria**
   a. < 3 months of age
   b. Immunocompromised
   c. Underlying lung disease other than asthma
   d. Mechanically ventilated
   e. Underlying neuromuscular disease
   f. Risk for aspiration pneumonia
   g. Complicated pneumonia (empyema, lung abscess)

3. **Assessment**
   a. **Definition**: Acute infection (typically viral or bacterial) of the lung parenchyma acquired outside of the hospital
   b. **Diagnosis**: Pneumonia is a clinical diagnosis made in the setting of fever, tachypnea, increased work of breathing, cough, and abnormal lung sounds on auscultation.
   c. **Diagnostic testing**
      i. Perform pulse oximetry.
      ii. Consider rapid influenza testing if influenza is suspected in patients who would require treatment per [CDC guidelines](https://www.cdc.gov/pneumonia/flu/index.html) (see Table 2).
      iii. Do not routinely obtain a chest radiograph. Consider the use of chest x-ray if there is more clinical uncertainty and imaging will affect plans for management (i.e., reduce the need for antibiotics).
   d. **If moderately/severely ill**, transfer to hospital for additional testing

4. **Disposition**
   a. **Outpatient management recommended if ALL following criteria met:**
      i. Tolerating PO
      ii. Not hypoxemic (>90%)
      iii. Normal or mildly increased work of breathing
   b. **Indications for hospitalization:**
      i. Respiratory distress (see table below)
      ii. Hypoxemia (oxygen saturation ≤90%)
      iii. Age 3-6 months
      iv. Dehydration, vomiting, or not tolerating PO medications
      v. Suspected or documented MRSA infection
      vi. Presence of co-morbid conditions
      vii. Not tolerating enteral fluids and/or dehydrated
      viii. Concerns for the family’s ability to adhere to recommended therapy, return for appropriate follow up, or seek/access emergency care
Community Acquired Pneumonia

5. Outpatient Management
   a. For bacterial pneumonia:
      i. In both fully and partially immunized children, high-dose amoxicillin 90mg/kg divided BID is considered acceptable first line therapy for outpatient management (note: TID therapy is provided for patients at SCH).
      ii. In children who are penicillin-allergic, consider a 3rd generation cephalosporin (cefpodoxime 5mg/kg q 12 hours, max 200mg children, 400mg adolescents) or clindamycin (10 mg/kg/day q8 hours). May consider daily IM ceftriaxone (75mg/kg/day).
      iii. Treatment duration is 10 days.
      iv. If ≥ 5 years old, consider adding coverage for atypical pneumonia with a macrolide (i.e., azithromycin 10mg/kg day 1, 5mg/kg days 2-5).
      v. Clinical improvement on antibiotics is typically seen in 48-72 hours.
   b. For influenza, treat with an antiviral if appropriate per CDC guidelines.
      i. Given the known association between influenza and Staphylococcus aureus, if bacterial superinfection in the setting of known influenza infection is suspected, add amoxicillin-clavulanate.

6. Re-assessment
   Patients who experience worsening of symptoms or lack of improvement after 48-72 hours of antibiotics are considered non-responders. In this situation,
   a. Obtain a 2-view chest x-ray.
   b. Re-evaluate need for hospitalization.
   c. Collect a sputum sample if child can expectorate.
   d. Consider resistant bacteria or atypical (fungal, mycobacterial, parasitic) pathogens.
   e. Consider pneumonia secondary to foreign body aspiration or an intrinsic airway obstruction.

7. Other Considerations
   a. For children age ≤ 2 years, consider bronchiolitis rather than pneumonia in the presence of diffuse coarse breath sounds and/or wheezing.
   b. In the preschool age group, the vast majority of CAP is viral, so antibiotics are often not indicated and should be used judiciously.
   c. Avoid macrolide (i.e., azithromycin) monotherapy for CAP as it may be inadequate for Streptococcus pneumoniae.
   d. However, do consider using a macrolide alone if clear signs and symptoms of atypical pneumonia are present (symptoms >3 days, headache, non-focal exam, not ill-appearing) in a patient ≥ 5 years old.
Table 1.

<table>
<thead>
<tr>
<th>Signs of Respiratory Distress</th>
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<tbody>
<tr>
<td><strong>1. Tachypnea, respiratory rate, breaths/min</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Age 0–2 months: &gt;60</td>
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<tr>
<td>Age 2–12 months: &gt;50</td>
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<tr>
<td>Age 1–5 Years: &gt;40</td>
</tr>
<tr>
<td>Age &gt;5 Years: &gt;20</td>
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<tr>
<td><strong>2. Dyspnea</strong></td>
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<tr>
<td><strong>3. Retractions (suprasternal, intercostals, or subcostal)</strong></td>
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<tr>
<td><strong>4. Grunting</strong></td>
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<tr>
<td><strong>5. Nasal flaring</strong></td>
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<tr>
<td><strong>6. Apnea</strong></td>
</tr>
<tr>
<td><strong>7. Altered mental status</strong></td>
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<tr>
<td><strong>8. Pulse oximetry measurement &lt;90% on room air</strong></td>
</tr>
</tbody>
</table>
## Antiviral therapy in Influenza

### Indications
- Age <2 years
- Chronic disease: pulmonary (including asthma), cardiovascular (except hypertension alone), renal, hepatic, hematological (including sickle cell disease), metabolic disorders (including diabetes mellitus) or neurologic and neurodevelopment conditions (including disorders of the brain, spinal cord, peripheral nerve, and muscle such as cerebral palsy, epilepsy [seizure disorders], stroke, intellectual disability [mental retardation], moderate to severe developmental delay, muscular dystrophy, or spinal cord injury)
- Immunosuppression
- Persons aged <19 years who are receiving long-term aspirin therapy
- American Indians/Alaska Natives
- Morbidly obese
- Residents of nursing homes and other chronic-care facilities

### Timing
- Benefit is strongest when treatment is initiated within 48 hours of illness onset.
- In any person hospitalized with influenza, treatment is recommended even if presentation occurs >48 hours after illness onset.
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- ≥ 3 months of age

**Exclusion Criteria**
- < 3 months of age
- Immunocompromised
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- Mechanically ventilated
- Risk for aspiration pneumonia
- Complicated pneumonia (empyema, lung abscess)

**Perform Initial Assessment**
- Respiratory distress
- Hypoxemia (O2 saturation <90%)
- Age 3-6 months
- Suspected or documented MRSA infection
- Presence of comorbid conditions
- Not tolerating enteral fluids and/or dehydrated
- Concerns for the family’s ability to adhere to recommended therapy, return for appropriate follow up or seek/access emergency care

**Outpatient Management**

**Refer for Hospitalization**
Consider obtaining prior to hospital transfer:
- CBC with differential
- Blood culture
- Influenza and/or other viral PCR
- 2-view chest x-ray

**Diagnostic Testing**
**DO:**
- Perform pulse oximetry
- Perform rapid influenza testing if it would change management.

**DO NOT:**
- Routinely obtain CBC, CRP, ESR, blood culture, sputum culture, urine antigen testing, or Chlamydia testing
- Routinely obtain a CXR unless this will change clinical management (i.e., decrease need for antibiotics)

**Treatment**
- First line therapy for both fully and partially immunized children is high-dose amoxicillin.
- If ≥ 5 years old, consider adding coverage for atypical pneumonia with a macrolide (i.e., azithromycin).
- Treatment duration is 10 days.
- Clinical improvement on antibiotics is typically seen in 48-72 hours.

**Other Considerations**
- For children age ≤2 years, consider bronchiolitis rather than pneumonia in the presence of diffuse coarse breath sounds and/or wheezing.
- In the preschool age group, the vast majority of CAP is viral, so antibiotics are not often indicated.
- If influenza is detected, treat with an antiviral if appropriate per CDC guidelines. Add amoxicillin-clavulanate if bacterial superinfection suspected.