CLINICAL PATHWAY:
Community Acquired Pneumonia (CAP)

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

Inclusion Criteria: ≥2 month old with suspected community acquired pneumonia (CAP)
Exclusion Criteria: <2 months old (see Fever & Sepsis in Neonate 0-28 Days Clinical Pathway, Fever & Sepsis in Infant 29-60 Days Clinical Pathway), signs of sepsis (see Septic Shock Clinical Pathway), immunocompromised, Cystic Fibrosis, non-Cystic Fibrosis bronchiectasis, Primary Ciliary Dyskinesia/Immotile Cilia Syndrome, Sickle Cell Disease, concern for tuberculosis, tracheostomy in place, hospital acquired pneumonia, ventilator associated pneumonia

Initial Evaluation:

- CXR
- *If moderate-large effusion:* consider obtaining ultrasound to evaluate for size of effusion and loculated/septated effusion
- *If under immunized for Hib (i.e., did not receive at least 2 doses of Hib vaccine), progression of CAP despite appropriate therapy , severely ill, or complicated CAP (i.e., large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele):*
  - Obtain CBC w diff, lytes, blood culture (aerobic), procalcitonin
  - *For complicated CAP*: add anaerobic blood cultures
- *Consider adding:* MRSA nasal swab PCR if concern for MRSA pneumonia (abscess, cavitation, empyema, or necrosis), viral testing if virus is circulating (influenza, Sars-CoV-2 PCR, RSV; BIOFIRE and/or Pertussis PCR only if concerned for pertussis, atypical pneumonia, or if result would change antibiotic management; see Appendix A)

Note: If signs of sepsis, exit pathway and follow Septic Shock Clinical Pathway.

Confirmed CAP? — NO → Exit pathway. Consider alternative diagnosis.

YES

Uncomplicated CAP
(including pneumonia with trace/small and moderate effusions)

Patient fully immunized (i.e., received at least 2 doses of Hib vaccine) or **progression of CAP despite appropriate therapy:**

- **Ampicillin IV** 200 mg/kg/day div q6hr (max 2 g/dose) **or Amoxicillin PO** 90 mg/kg/day div 2 doses (max 1 g/dose)
- *If PCN allergy:* Consider Penicilln Allergy Delabeling Pathway, if able. If not able to proceed with delabeling, Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose); alternatives: cefuroxime PO (preferred) or PO clindamycin (see dosing below[2]) (Consider consulting ID for most appropriate options)

Patient not fully immunized (i.e., did not receive at least 2 doses of Hib vaccine) or **aspiration pneumonia suspected:**

- **Ampicillin/sulbactam IV** 200 mg of ampicillin/kg/day div q6hr (max 3 g of unasyn/dose) **or**
- **Amoxicillin/clavulanate ES PO** (600 mg/5 ml) 90 mg amox/kg/day div 2 doses (max 1 g/dose); or if >40 kg and tablet preferred: Augmentin PO (875 mg tablets) 1 tab BID; [Augmentin XR is not recommended]
- *If PCN allergy:*
  - *If not fully immunized*: start only Ceftriaxone IV 75 mg/kg/day div q12hr (max 2 g/dose)
  - *If aspiration pneumonia:* start only Clindamycin IV/PO 30 mg/kg/day div 3 doses (max 600 mg/dose)

Additional Considerations:

- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A

Consultations:

- Consult Infectious Diseases (ID) if allergies prohibit agents above

Complicated CAP
(large effusion, any size loculated/septated effusion, empyema, abscess, necrotic lung, pneumatocele)

- *Preference:* **Ceftriaxone IV** 75 mg/kg/day div q12hr (max 2 g/dose) **and Clindamycin IV/PO** 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *Alternative:* Ampicillin/sulbactam IV 300 mg of ampicillin/kg/day div q6hr (max 3 g of Unasyn/dose)
  - *If additional alternatives needed*: ID will discuss on a case-by-case basis

Additional Considerations:

- If concern for MRSA (e.g., previously infected or recently colonized in last 6 months, nasal MRSA swab positive):
  - Obtain MRSA nasal PCR if not done (*note: this test has a high negative predictive value*)
  - If MRSA nasal PCR positive, add Vancomycin IV (ideally after obtaining blood cultures):
    - <52 weeks PMA[‡]/about <3 mo old: 15 mg/kg q8hr or as determined by pharmacy based on estimated AUC; ≥52 weeks PMA[‡]/about ≥3 months old – 11 years old: 70 mg/kg/day div q6hr; ≥12 yrs old: 60 mg/kg/day div q8hr (max 3 g/day) [[‡]PMA (Post-Menstrual Age) = gestational age + postnatal age]
    - *If concern for renal insufficiency or signs of AKI (Appendix B) on vancomycin:* substitute vancomycin with linezolid IV: <12 yrs old: 30 mg/kg/day div q8hr (max 600 mg/dose), ≥12 yrs old: 600 mg q12hr (if ≥12 yrs old and <45 kg: 20 mg/kg/day div q12hr, max 600 mg/dose)
- If concern for atypical pneumonia, pertussis, COVID-19 or influenza: see Appendix A
- Consider scheduled NSAIDS as persistent pleural inflammation may contribute to ongoing pleural fluid production

Consultations:

- Consult Infectious Diseases (ID)
- Consult Surgery if large effusion or empyema
  - If drained, obtain aerobic and anaerobic fluid cultures (send in sterile cup)

Meets admission criteria?[1] — No → Discharge home. See discharge medications[2] below.

Yes

Ongoing Management

- Duration of antibiotics per discharge medication section below[2]
- **Uncomplicated CAP:**
  - *If blood culture was obtained and positive, or there is no clinical improvement:* consult Infectious Diseases
  - *If disease progresses in 24-48 hours for patients on clindamycin for aspiration PNA:* add Ceftriaxone and consult ID
  - Transition to PO antibiotics when clinically appropriate
  - Consider stopping antibiotics for uncomplicated CAP after 5 days of therapy, if clinically improved
- **Complicated CAP:**
  - Consult Infectious Diseases (and surgery, if needed) if not already done
  - If MRSA coverage started, consider discontinuing if nasal MRSA screen, blood cultures and pleural cultures (if available) are negative. If patient is unstable or MRSA is detected, discuss continuation of vancomycin with ID.
  - Consideration: do not change to PO antibiotics unless CRP is reduced by at least 50%; discuss with ID

[1]Admission Criteria:

- Hypoxemia <90%
- Increased WOB/ respiratory distress/ tachypnea
- Lethargy
- Progression of CAP despite appropriate therapy
- Complicated CAP
- Concern for compliance

Discharge Criteria:

- O2 >90% on RA x12-24 hr
- Decreased fevers for 24 hours
- Able to tolerate PO antibiotics
- Increased activity/appetite
- Baseline mentation
- Compliance with treatment
- Appropriate follow up in place

[2]Discharge Medications:

Total duration of treatment: mild uncomplicated CAP: 5 days; moderate uncomplicated CAP: 7 days; complicated CAP: 10 days minimum (discuss with ID)

- **Uncomplicated CAP:** Continue (or change to) appropriate PO options as listed above.
  - *If PCN allergy :* Consider Penicillin Allergy Delabeling Pathway to assess if patient can utilize amoxicillin or amox/clavulanate
    - *If PCN allergy confirmed*: start Cefuroxime PO 30 mg/kg/day div 2 doses (max 500 mg/dose) [Note: only 250 mg and 500 mg tablets are commercially available; ensure availability for home prior to discharge] or Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
    - *If aspiration PNA and unable to utilize amox/clavulanate:* Clindamycin PO 30 mg/kg/day div 3 doses (max 600 mg/dose)
  - *If alternative antibiotics were selected with ID:* ID will select appropriate antibiotics for discharge
- **Complicated CAP:** ID will advise selection of antibiotics at discharge
- If atypical pneumonia: azithromycin (see Appendix A) x5 days total
- If influenza: oseltamivir (see Appendix A) x5 days total

CONTACTS: IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

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Connecticut Children's

<3 month old with *Chlamydia trachomatis*:

- Consult Infectious Diseases (ID)
- Send diagnostic tests as directed by ID
- *If proven or strongly suspected*: **ADD** azithromycin IV/PO 20 mg/kg x3 days

Documented Pertussis at Any Age:

- Azithromycin IV/PO (monotherapy):
  - <6 mo old: 10 mg/kg x5 days
  - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical pneumonia, and resulted with a positive *Chlamydia pneumoniae*:

- **ADD** azithromycin IV/PO:
  - <6 mo old: 10 mg/kg x5 days
  - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

If respiratory BIOFIRE was sent due to significant concern for atypical pneumonia, and resulted with a positive *Mycoplasma pneumoniae*:

- Consider adding azithromycin (the addition of azithromycin to antibiotic regimen may have no added benefit to patient's overall clinical course)
  - <6 mo old: 10 mg/kg x5 days
  - ≥6 mo old: 10 mg/kg (max 500 mg/dose) x1 day, then 5 mg/kg (max 250 mg/dose) to complete 5 days

Documented Influenza:

- Those who receive oseltamavir <2 days from hospital admission have been shown to have shorter length of stays
- **ADD** oseltamavir PO:
  - Preterm neonates ≤40 weeks PMA: discuss dosing with pharmacy
  - Preterm neonates >40 weeks and term neonates up to 9 months: 3 mg/kg BID
  - ≥9 months up to 12 months: 3.5 mg/kg BID
  - ≥12 months:
    - >15 kg – 23 kg: 45 mg BID
    - >23 kg – 40 kg: 60 mg BID
    - >40 kg: 75 mg BID

Suspect COVID-19:

- Place on Special Precautions
  - **ED/Inpatient COVID-19 Algorithm**
  - **Inpatient Therapies for COVID-19 Clinical Pathway**

CONTACTS: IAN MICHELOW, MD | GRACE HONG, APRN | ILANA WAYNIK, MD

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Definition of Acute Kidney Injury (AKI)

(It should be noted that this definition does not apply to children <1 year of age)

AKI is defined by having ***either***:

- At least a 50% increase in Scr above baseline* **and** new Scr ≥0.5 mg/dL **OR**
- An increase by 0.3 mg/dL from baseline*, **and** new Scr ≥0.5 mg/dL

If a baseline creatinine is unknown, estimate baseline Cr using the Schwartz Calculation ($baseline\ creatinine = (0.413 * height\ cm)/120\ GFR$). For patients with Chronic Kidney Disease (CKD), use the **CKiD U25 Calculator.*

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