Alaska Antimicrobial Stewardship Collaborative (A2SC) announces the Alaska specific ***Community-Acquired Pneumonia (CAP) Treatment Guidelines.*** These clinical guidelines are intended to aid in the selection of antimicrobial therapy for patients residing in Alaska who present with community acquired pneumonia. Treatment guidelines available for the following Alaska care setting:

- Adult Inpatient CAP Treatment Guidelines
- Adult Ambulatory CAP Treatment Guidelines
- Pediatric Inpatient CAP Treatment Guidelines
- Pediatric Ambulatory CAP Treatment Guidelines

These guidelines will help Alaska physicians and pharmacists ensure patients receive the right antibiotic at the right time and only when necessary. As a companion to the guidelines the 2019 Alaska State Antibiogram is also available to help guide the best antibiotic choice.

Antibiotics save lives, but any time antibiotics are used, they can cause side effects and lead to antibiotic resistance. In U.S. doctors' offices and emergency departments, at least 47 million antibiotic prescriptions each year are unnecessary, which makes improving antibiotic prescribing and use a national priority.

About Alaska Antimicrobial Stewardship Collaborative

The Alaska Antimicrobial Stewardship Collaborative (A2SC) is an active partnership of hospitals and other health care stakeholders dedicated to developing innovative strategies to ensure appropriate antibiotic use. A2SC's goal is a simple one: all patients in Alaska will receive the right antibiotic at the right time and only when necessary.

The emergence of antibiotic-resistant bacteria caused by the misuse and overuse of antibiotics is pushing the healthcare industry to re-evaluate how medicine is practiced. Together we will accelerate positive changes to achieve this critical goal. For more information: alaskahha.org/antimicrobial-stewardship-collaborative

Alaska Antimicrobial Stewardship Collaborative
ADULT Inpatient Community-Acquired Pneumonia (CAP) Guideline

Major Criteria	Minor Criteria	Severity and Risk Factor Considerations
• Septic shock with need for vasopressors • Respiratory failure requiring mechanical ventilation	• Respiratory rate ≥ 30breaths/min • Pao2/FIo2 ratio ≤ 250 • Multilobar infiltrates • Confusion/disorientation • Uremia (BUN ≥ 20 mg/dl) • Leukopenia (WBC < 4,000 cells/µl) • Thrombocytopenia (plts <100,000/µl) • Hypothermia (<36° C) • Hypotension requiring aggressive fluid resuscitation	**NOTE:** Prior categorization of healthcare-associated pneumonia (HCAP) has been abandoned. The following are **NOT** predictive of multi-drug resistant pneumonia and should **NOT** be used alone as an indication for empiric broad-spectrum coverage: • Hospitalized in an acute care hospital for 2 or more days within 90 days of infection • Resided in a nursing home or long term care facility • Received recent chemotherapy or wound care in last 30 days • Attended a hemodialysis clinic in the last 30 days

Treatment Recommendations

Infection	Standard Treatment	Hospitalized within 90 days PLUS IV antibiotics#	Prior MRSA in Respiratory Culture#	Prior *Pseudomonas* in Respiratory Culture#	Duration
Non-Severe	**Preferred Therapy:** ○ **Ceftriaxone 1g** IV q24hr **PLUS Azithromycin 500mg** PO/IV q24hr x3 days **Anaphylactic β-Lactam Allergy:** ¥ ○ **Levofloxacin 750mg** PO/IV q24hr	Empiric treatment for MRSA or *P. aeruginosa* **not recommended** Escalate based upon culture results	**Preferred Therapy:** ○ **Vancomycin 15mg/kg x1 then** (Pharmacy to Dose) ○ **Ceftriaxone 1g** IV q24hr **PLUS Azithromycin 500mg** PO/IV q24hr x3 days **Anaphylactic β-Lactam Allergy:** ¥ ○ **Vancomycin 15mg/kg x1 then** (Pharmacy to Dose) ○ **PLUS Levofloxacin 750mg** PO/IV q24hr	**Preferred Therapy:** ○ **Cefepime 2gm** IV q8hr **PLUS Azithromycin 500mg** PO/IV q24hr x3 days **Anaphylactic β-Lactam Allergy:** ¥ ○ **Levofloxacin 750mg** PO/IV q24hr **PLUS Aztreonam 2gm** IV q8hr	○ **5 days** for patients **without** immunosuppression or structural lung disease ○ **7 days** for patients with **moderate** immunosuppression& or structural lung disease ○ **10-14 days** for poor clinical response, initial inappropriate treatment, or **significant** immunosuppression Patients should be afebrile for 48-72hr and demonstrate signs of clinical stability before therapy is discontinued
Severe (1 major or ≥ 3 minor criteria)	**Preferred Therapy:** ○ **Ceftriaxone 1g** IV q24hr **PLUS Azithromycin 500mg** PO/IV q24hr x3 days **Anaphylactic β-Lactam Allergy:** ¥ ○ **Levofloxacin 750mg** PO/IV q24hr **+/- Vancomycin 15mg/kg** (Pharmacy to Dose)	**Empiric MRSA treatment:** **Add Vancomycin 15mg/kg** (Pharmacy to Dose) **Empiric *P. aeruginosa* treatment:** **Substitute Cefepime 2g** IV q8h for ceftriaxone			
Aspiration pneumonia	Addition of anaerobic therapy is **NOT** recommended unless lung abscess or empyema is suspected.				
Suspected+ or confirmed Influenza	**Oseltamivir 75mg** PO BID x5 days				
Oral options to consider for de-escalation of β-lactam (total duration IV + PO as above)**	**Preferred Therapy:** ○ **Amoxicillin 1g** PO TID^ ○ **Augmentin 875mg** BID ▪ **Consider additional amoxicillin 1g** BID in addition to **Augmentin** for CAP complicated by empyema, asplenia or Strep pneumo PenG MIC 2-4 **Non-Anaphylactic Penicillin Allergy:** ○ **Cefuroxime axetil 500mg** PO BID				

Consideration

Prior positive cultures within 1 year. If empiric treatment for MRSA or *P. aeruginosa*, blood and respiratory cultures should be collected prior to antibiotic administration
¥ If patient reports penicillin allergy, inquire about onset and severity of symptoms, as well as prior beta-lactam exposure and update patient medical record. Severe or life-threatening allergic reactions may include: anaphylaxis, angioedema, urticaria, Stevens-Johnson Syndrome (SJS), etc.
Dosage recommendations based upon an assumed CrCl > 60 ml/min. If patient has diminished renal function, doses should be dose-reduced.
+Certain patient populations are at a higher risk for influenza related complications and may require treatment in absence of confirmed influenza. Refer to local guidelines.
**Patient should complete macrolide therapy
^ Strep pneumo and/or cefinase negative H.influenzae / M.cattarhalis use high-dose amoxicillin
& Severe immunosuppression: Neutropenia (WBC < 4 or ANC < 500), HIV+ with CD4 < 200, active chemotherapy, undergone solid organ transplant on active immunosuppression, Moderate immunosuppression: all other diseases (including long-term steroid use with prednisone at 10mg/day or equivalent)

Metlay JP, et al. Diagnosis and treatment of adults with community-acquired pneumonia, clinical practice guideline of the American Thoracic Society and Infectious Diseases Society of America. *Am J Respir Crit Care Med*. 2019; 200(7):e45-e67.

Approved A2SC Advisory April 2021

Alaska Antimicrobial Stewardship Collaborative (A2SC)
Adult Ambulatory Community-Acquired Pneumonia (CAP) Treatment Guideline

Common Etiologies

Bacterial: *S. pneumoniae, H. influenzae, Chlamydia pneumoniae, Mycoplasma pneumoniae, M. catarrhalis*

Respiratory viruses: influenza A & B, adenovirus, respiratory syncytial virus, parainfluenza, COVID-19

Diagnostic Criteria Tools

Pneumonia Severity Index (PSI) Scoring Tool

Demographics
- Age (1 point per year)
  - -Male (Age)
  - -Female (Age -10)
- Nursing home residency +10

Comorbidities
- Neoplasia +30
- Liver disease +20
- Heart Failure +10
- Cerebrovascular disease +10
- Renal disease +10

Physical Exam/Vitals
- Confusion +20
- Resp rate >30 +20
- SBP <90 +20
- Temperature <35C or >40C +15
- HR >125 bpm +15

Labs/Imaging
- Arterial pH <7.35 +30
- BUN >30mg/dL +20
- Sodium <130 +20
- Glucose >250 +10
- Hematocrit <30% +10
- Pleural Effusion +10
- PaO2 <60 +10

Risk Class (Points)	Mortality (%)	Recommended site of care
I (<50)	0.1	Outpatient
II (51-70)	0.6	Outpatient
III (71-90)	2.8	Outpatient or brief inpatient
IV (91-130)	8.2	Inpatient
V (>130)	29.2	Inpatient

Symptoms

- Productive cough
- Chest pain
- Dyspnea/Shortness of breath
- Diminished breath sounds
- Crackles not cleared with coughing
- Abdominal pain
- +/- Fever

Testing/Imaging

- Chest x-ray
- Pulse Oximetry

PCR respiratory pathogen panel testing is discouraged in the ambulatory setting.

If concern for viral respiratory illnesses, influenza or COVID PCR can be ordered

Duration of Therapy

- Typically healthy, no structural lung disease: **5 days**
- Moderately immunocompromised, suspected or proven MRSA or *P. aeruginosa,* or moderate structural lung disease (ie. diabetes, asplenia): **7 days**

Antibiotic Selection

	Preferred Treatment	Alternatives
Azithromycin monotherapy is no longer recommended in any circumstance for treatment of community-acquired pneumonia due to local resistance rates >25%.		
No comorbidities or risk factors for MRSA or *Pseudomonas aeruginosa*	• **Amoxicillin 1gm** PO TID x5-7 days	• **Doxycycline 100mg** PO BID x5-7 days
Comorbidities present* • Comorbidities including chronic heart, lung, liver, or renal disease; diabetes mellitus; alcoholism; malignancy; asplenia	• **Amoxicillin/Clavulanate 875mg/125mg** PO BID x 5-7 days **PLUS** • **Azithromycin 500mg** PO daily x 3 days	**Non-anaphylactic PCN allergy:** • **Cefuroxime 500mg** PO BID x 5-7 days **PLUS** • **Azithromycin 500mg** PO daily x 3 days **Anaphylactic PCN allergy:** • **Levofloxacin 750mg** PO daily x 5 days
Risk factors for MRSA or *Pseudomonas aeruginosa* • Prior respiratory isolation of MRSA or *P. aeruginosa*; OR • Recent hospitalization AND receipt of parenteral antibiotics in previous 90 days	• **Treatment should be based on previous culture & susceptibility, IV antimicrobials may be required**	

CONSIDERATIONS

- *Consider additional **Amoxicillin 1g** BID in addition to **Augmentin** for CAP complicated by empyema, asplenia or *Strep pneumoniae* PenG MIC 2-4
- For patient diagnosed with influenza, it is recommended to also treat with anti-influenza agents; most benefit is seen if started within 48 hours of symptom onset

REFERENCES: Metlay et al. IDSA/ATS Consensus Guideline CAP in Adults. Am J Respir Crit Care. 2019;200(7):e45-e67.

Approved A2SC Advisory April 2021

Alaska Antimicrobial Stewardship Collaborative (A2SC)
Pediatric (>3mo) Inpatient Community Acquired Pneumonia (CAP) Treatment Guideline

Initial Testing/Imaging

- Vital Signs: VS including BP and Pulse Oximetry
- Labs:
  - Blood work: CBC with differential, CRP, blood culture
  - Viral Testing: Influenza PCR during influenza season and COVID
  - Sputum gram stain and culture: if intubating, collect at time of initial ET tube placement; consider testing in older children who can produce sputum sample
  - Urinary antigen detection testing is not recommended in children; false-positive tests are common.
- Radiography:
  - AP and lateral CXR

Inpatient Admission Criteria

Pediatric Floor	PICU
• Respiratory distress • SpO2 <90% on room air • Unable to tolerate PO • Suspected or documented CAP caused by pathogen with increased virulence (ex. CA-MRSA) • Concerns about observation at home, inability to be comply with therapy, inability to be followed up	• Respiratory support: Intubated or requiring non-invasive positive pressure ventilation • Concern for respiratory failure • Concern for sepsis • FiO2 needs HNFC >50% to keep saturation ≥92% • Altered mental status

Treatment Selection

Suspected Bacterial Pneumonia

Most Common Pathogens: *Streptococcus pneumoniae, Haemophilus influenzae*

Demographics	Parenteral Treatment	Oral Step-Down
Previously healthy AND Fully immunized	Preferred: **Ampicillin** 50mg/kg IV q6hr (max 12g/day) Alternatives: *Non-Type 1 β-Lactam Allergy*: **Ceftriaxone** 50mg/kg IV q24hr (max 2g/day) *Type 1 β-Lactam Allergy*: **Levofloxacin** <5 years: 10mg/kg IV BID (max dose 750mg/day) >5 years: 10mg/kg IV q24hr (max dose 750mg/day)	Antibiotic choice: • If culture positive: based on cultures and susceptibilities. • If culture negative: refer to Ambulatory CAP Treatment Guidelines Antibiotic Duration: • Uncomplicated pneumonia: complete a 10 day course • Complicated pneumonia: dependent on clinical response, in general 2-4 week course
Not appropriately immunized with PCV13 + Hib OR Suspicion for *H. influenzae* OR Severe disease and/or Complicated Pneumonia	Preferred: **Ceftriaxone** 50mg/kg IV q24hr (max 2g/day) Alternatives: *Type 1 β-Lactam Allergy*: **Levofloxacin** <5 years: 10mg/kg IV/PO BID (max dose 750mg/day) >5 years: 10mg/kg IV/PO q24hr (max dose 750mg/day)	
Suspicion for *S. aureus*	***In addition*** to one of the above antibiotics, **add**: **Clindamycin** 10mg/kg IV q6hr (max 900mg/dose) For PICU or Severe Infection**: Vancomycin** 15mg/kg IV q6hr (max 4g/day)	Antibiotic choice: Based on cultures and susceptibilities Antibiotic duration: May require longer treatment

Suspected Atypical Pneumonia

Most Common Pathogens: *Mycoplasma pneumoniae, Chlamydophila pneumoniae*

Demographics	Preferred Treatment	Oral Step-Down
In ≥5yo empirically add macrolide if atypical CAP cannot be ruled out	**Azithromycin** 10mg/kg IV daily x 1-2 days then transition to oral step down if possible (max 500mg/dose)	**Azithromycin** 10mg/kg PO daily to complete a 3 day course (max 500mg/dose)

Suspected Viral Pneumonia

Most Common Pathogens: Influenza A & B, Adenovirus, Respiratory Syncytial Virus, Parainfluenza

Most common in <5yo	No antimicrobial therapy is necessary. If influenza positive, see influenza guidelines for treatment algorithm.

CONSIDERATIONS

- Children should show clinical signs of improvement within 48-72 hours allowing de-escalation of therapy based on available culture results and consideration of transition to oral step-down therapy
- If no improvement or worsening pursue further diagnostic work up as indicated, consider broadening antibiotics and formal infectious disease consultation

REFERENCES: Bradley IDSA CAP Infants & Children 2011; AAP endorsed; Ficnar B, et al. Azithromycin: 3-Day Versus 5-Day Course in the Treatment of Respiratory Tract Infections in Children. J Chemother. 1997;9(1):38-43.

Kogan R, et al. Comparative Randomized Trial of Azithromycin versus Erythromycin and Amoxicillin for Treatment of Community-acquired Pneumonia in Children. Pediatr Pulmonol. 2003; 35(2):91-8.

Approved A2SC Advisory April 2021

Alaska Antimicrobial Stewardship Collaborative (A2SC)
Pediatric (≥3mo) Ambulatory Community Acquired Pneumonia (CAP) Treatment Guideline

Criteria for Respiratory Distress	Criteria For Outpatient Management	Testing/Imaging for Outpatient Management

• Tachypnea, in breaths/min:
  • Age 0-2mo: >60
  • Age 2-12mo: >50
  • Age 1-5yo: >40
  • Age >5yo: >20
• Dyspnea
• Retractions
• Grunting
• Nasal flaring
• Apnea
• Altered mental status
• Pulse oximetry <90% on room air
	• Mild CAP: no signs of respiratory distress
	• Able to tolerate PO
	• No concerns for pathogen with increased virulence (ex. CA-MRSA)
	• Family able to carefully observe child at home, comply with therapy plan, and attend follow up appointments
	
	If patient does not meet outpatient management criteria refer to inpatient pneumonia guideline for initial workup and testing.
		• Vital Signs: Standard VS and Pulse Oximetry
		• Labs: No routine labs indicated
		  • Influenza PCR during influenza season
		  • COVID testing
		  • Blood cultures if not fully immunized OR fails to improve/worsens after initiation of antibiotics
		  • Urinary antigen detection testing is not recommended in children; false-positive tests are common.
		• Radiography: No routine CXR indicated
		  • AP and lateral CXR if fails initial antibiotic therapy
		  • AP and lateral CXR 4-6 weeks after diagnosis if recurrent pneumonia involving the same lobe

Treatment Selection

Suspected Viral Pneumonia
Most Common Pathogens: Influenza A & B, Adenovirus, Respiratory Syncytial Virus, Parainfluenza

Most common in <5yo	**No antimicrobial therapy is necessary.** If influenza positive, see influenza guidelines for treatment algorithm.

Suspected Bacterial Pneumonia
Most Common Pathogens: *Streptococcus pneumoniae, Haemophilus influenzae*

Demographics	Preferred Treatment	Treatment Alternatives for β-Lactam Allergy
Previously healthy AND Appropriately Immunized for Age	**Amoxicillin** 45mg/kg PO BID (Max dose 4000mg/day) x5 days*	Non-anaphylactic β-Lactam Allergy: **Cefprozil suspension** 15mg/kg PO BID (max 1000mg/day) x5 days* **Cefuroxime tablets** 15mg/kg PO BID (Max 1000mg/day) x5 days* Anaphylactic β-Lactam Allergy: **Levofloxacin** <5 years: 10mg/kg PO BID (Max dose 750mg/day) x5 days* >5 years: 10mg/kg PO daily (Max dose 750mg/day) x5 days*
Not appropriately immunized with PCV13 + Hib OR Suspicion for *H. influenzae*	**Amoxicillin/clavulanate** <40kg: (**ES 600mg/42.5mg/5mL**) 45mg/kg PO BID or 15mg/kg PO TID (Max dose 4000mg/day) x5 days* >40kg: 875mg/125mg PO BID **PLUS** **Amoxicillin** 1g PO BID x5 days*	

Suspected Atypical Pneumonia
Most Common Pathogens: *Mycoplasma pneumoniae, Chlamydophila pneumoniae*

Demographics	Preferred Treatment	Alternatives
Most common in ≥5yo In ≥5yo macrolide may be empirically added if there is no clinical evidence that distinguishes bacterial from atypical CAP	**Azithromycin** 10mg/kg PO daily (Max dose 500mg/day) x3 days	For children >7yo: **Doxycycline** 1-2 mg/kg PO BID (Max dose 200mg/day) x10 days

CONSIDERATIONS

- *Exclusion criteria for short course therapy includes: pneumonia with atypical pathogens, hospital acquired pneumonia (admission for >48 hours in previous 2 months, CAP in previous month, or lung abscess in previous 6 months), empyema or necrotizing pneumonia, preexisting pulmonary disease, congenital heart disease, history of aspiration, malignant neoplasm, immunodeficiency, or kidney dysfunction.
- Children should show clinical signs of improvement within 48-72 hours

Approved A2SC Advisory April 2021

REFERENCES: Bradley IDSA CAP Infants & Children 2011;AAP endorsed. Ficnar B, et al. Azithromycin: 3-Day Versus 5-Day Course in the Treatment of Respiratory Tract Infections in Children. J Chemother. 1997;9(1):38-43. Kogan R, et al. Comparative Randomized Trial of Azithromycin versus Erythromycin and Amoxicillin for Treatment of Community-acquired Pneumonia in Children. Pediatr Pulmonol. 2003; 35(2):91-8. Pernica JM et al. Short-Course Antimicrobial Therapy for Community-Acquired Pneumonia: The SAFER Randomized Clinical Trial. JAMA Pediatrics. 2021; Published online March 08, 2021.