**Montefiore Respiratory Infection Guidelines**

 (Revised 2022, includes CAP, HAP/VAP, aspiration, lung abscess/empyema, COPD exacerbations; adapted from IDSA/ATS or NYS, CDC, NIH guidelines)

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| General notes: * “De-label” penicillin allergy when possible and update medical record if patient able to tolerate beta-lactams
* Reassess patient condition daily and switch to PO whenever possible
* Do NOT “restart the antibiotic clock at discharge,” 5 days for CAP = 5 days, not 5 MORE days after discharge
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 **Highlights:**

* No role for routine steroids (outside of refractory septic shock)
* Obtain respiratory and blood cultures ONLY in severe disease and those who receive empiric MRSA or *Pseudomonas aeruginosa* coverage
* Procalcitonin is not recommended to determine need for initial therapy but can assist in monitoring response to treatment
* MRSA nasal swab is recommended to guide de-escalation when empiric MRSA coverage is started
* Routine follow up X-rays not recommended for bacterial PNA
* COVID-19 guidelines not included here, please visit <https://www.covid19treatmentguidelines.nih.gov/therapeutic-management/>

**Risk factors for MRSA or *P. aeruginosa***(obtain nasal MRSA PCR; respiratory culture and nasal influenza/RSV swab as indicated; note that *S. aureus* PNA was observed in COVID-19 patients at MMC as a complication of prolonged intubation; if COVID-19 suspected, obtain SARS-CoV-2 PCR):

* Prior isolation of either on cultures
* Hospitalization AND treatment with IV antibiotics in prior 90 days
* IVDU (specifically MRSA)
* Pneumonia associated with influenza (specifically S. aureus and Streptococci)

**Treatment**

**Outpatient CAP**: non-severe, no risk factors for antibiotic resistant pathogens (e.g. MRSA, *P. aeruginosa*). Pathogens: *Streptococci, Haemophilus*, atypicals like *Mycoplasma, Legionella* (esp. warmer months)

* Amoxicillin 1g three times daily, OR
* Doxycycline 100mg twice daily
* Azithromycin 500mg on day 1, then 250mg daily for remaining course (ONLY recommended in areas with macrolide resistance <25%) – *Note MMC microbiology laboratory does not routinely test for S. pneumoniae susceptibilities vs. macrolides*

 **Inpatient CAP:** non-severe, no risk factors for antibiotic resistant pathogens (e.g., MRSA, *P. aeruginosa*). Pathogens: see above.

* Combination beta-lactam (ceftriaxone 1-2g IV daily) with a macrolide (azithromycin 500mg PO daily) OR doxycycline 100mg PO twice daily (if contraindication to macrolide or quinolone); **OR**
* Monotherapy with respiratory fluoroquinolone (levofloxacin 750mg) *especially if anaphylaxis to beta-lactams*
	+ 750mg dose recommended for those with normal renal function (CrCl >50ml/min) in order to maximize concentration-dependent killing properties of fluoroquinolones; elderly patients and those with diminished renal function may require lower dose
* Azithromycin IV and Levofloxacin IV/PO dose of 750mg require ID/stewardship approval *on initiation*

**Inpatient severe CAP but no risk factors for MRSA or *P. aeruginosa***

* Combination beta-lactam (ceftriaxone 1-2g IV daily) with a macrolide (azithromycin 500mg IV daily); **OR**
* Combination beta-lactam plus a respiratory fluoroquinolone (levofloxacin 500mg to 750mg depending on age and renal function); *lower quality of evidence than bullet 1*

**Inpatient severe CAP with risk factors for MRSA (see above)**

* Ceftriaxone 1-2g IV daily + Azithromycin 500mg IV daily + Vancomycin 15-20mg/kg IV (or linezolid 600mg IV every 12 hours, or ceftaroline 600mg IV every 12 hours)
* ID/stewardship approval is required for vancomycin IV beyond 72 hours and azithromycin IV. ID consult is required for PO/IV linezolid or ceftaroline *on initiation*
* Severe allergy to penicillin: Levofloxacin 750mg IV daily if CrCl >50ml/min (or equivalent dose adjusted for renal function) + Vancomycin 15-20mg/kg IV

**Inpatient severe CAP/HAP/VAP with risk factors for *P. aeruginosa* (see above)**

* Piperacillin/tazobactam 4.5g every 8 hours extended infusion over 4 hours if CrCl >20ml/min (or equivalent dose adjusted for renal function) **OR** Cefepime 2g every 8 hours if CrCl >60ml/min (or equivalent dose adjusted for renal function)
	+ *If in ICU, extended infusion of piperacillin/tazobactam and cefepime is recommended*
* Severe allergy to penicillin: Levofloxacin 750mg IV daily if CrCl >50ml/min (or equivalent dose adjusted for renal function) + Vancomycin 15-20mg/kg IV +/- Gentamicin 3mg/kg IV ideal body weight (for added Pseudomonal coverage)
* *Contact ID/Stewardship if prior history of multidrug resistant Pseudomonas*

**Inpatient severe CAP/HAP/VAP with septic shock, ARDS +/- ECMO, unknown organism; compromised host**

* Add azithromycin 500mg IV to above regimen to cover atypicals (*Legionella, mycoplasma* spp.)
* If urine *Legionella* Ag (for serogroup 1) is negative, azithromycin IV can be continued for other *Legionella* and *Mycoplasma* species at discretion of ID consult

 **Inpatient severe pneumonia w/ lung abscess or empyema**

* ID consult strongly advised for assistance with work up and treatment; can contact antimicrobial stewardship for initial recommendations
* Pathogens can include *S. aureus, Streptococcal* species, *Haemophilus* species, Gram negatives, Anaerobes, or Mycobacteria

**Aspiration pneumonia (cover oral *Streptococcus* and other oral flora):**

* Regimens: ampicillin/sulbactam 3g IV every 6 hours; amoxicillin/clavulanate 500mg-875mg/125mg PO twice daily; clindamycin 300-600mg PO/IV every 6-8 hours

**COPD Exacerbations**

* **Suggested work-up:** chest X-ray, sputum culture if bacterial infection suspected, influenza/RSV PCR if in season, SARS-CoV-2 PCR
* **GOLD Criteria for antibiotics:**
	+ Sputum purulence and either increased sputum volume or dyspnea **OR**
	+ Severe disease requiring positive pressure ventilation
* **Mild (treated with short acting bronchodilators only):**
	+ No antibiotics recommended
* **Moderate (treated with short acting bronchodilators plus antibiotics and/or corticosteroids):**
	+ Doxycycline 100mg twice daily **OR** Azithromycin 500mg daily
* **Severe (requiring hospitalization or emergency room visit):**
	+ **No risk factors for *P. aeruginosa:***
		- **PO:** Amoxicillin/clavulanate 500-875/125mg twice daily, **OR** cefdinir 300mg twice daily, **OR** Levofloxacin 500mg daily (severe PCN allergy)
		- **IV**: Ampicillin/sulbactam 3g every 6 hours, **OR** Ceftriaxone 1g daily, **OR** Levofloxacin 500mg daily (severe PCN allergy)
	+ **Risk factors for *P. aeruginosa*:** chronic colonization or prior isolate of *P. aeruginosa* (particularly within the past 12 months), very severe COPD (FEV1 <30% predicted), bronchiectasis on chest imaging, intravenous broad-spectrum antibiotic use within the past 3 months, chronic systemic glucocorticoid use
		- **PO:** Levofloxacin 750mg daily if CrCl >50ml/min (or equivalent dose adjusted for renal function)

**IV:** Piperacillin/tazobactam 4.5g every 8 hours extended infusion over 4 hours if CrCl >20ml/min (or equivalent dose adjusted for renal function), **OR** Cefepime 2g every 8 hours if CrCl >60ml/min (or equivalent dose adjusted for renal function), **OR** Levofloxacin 750mg daily if CrCl >50ml/min (or equivalent dose adjusted for renal function) (severe PCN allergy)

**Duration of Antibiotics**

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|  | **Duration** | **Comments** |
| **CAP (not *Legionella,* MRSA, or *Pseudomonas*)** | 5 days | None |
| **CAP with above organisms** | *Legionella* – 7-21 days*MRSA and P. aeruginosa* – 7 days or more, may depend on host factors and other complications | ID consult advised for work up and treatment recommendation |
| **Aspiration pneumonitis** | 3-5 days | Some cases may not require antibiotics (chemical pneumonitis) |
| **HAP/VAP** | 7 days | Includes treatment of MDROs |
| **Empyema or lung abscess** | ~3-4 weeks of treatment (IV or PO) and possible need for reimaging to confirm adequate improvement | ID consult advised for antibiotic selection/duration, esp. for XDR organisms; refer to OPAT upon discharge |
| **COPD exacerbation** | 5-7 days | None |

**Oral Step-down Options**

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| **Suspect *P. aeruginosa*** | **Suspect MRSA** | **Ampicillin-sulbactam or ceftriaxone started** |
| * Levofloxacin 750mg PO daily if CrCl >50ml/min (or equivalent dose adjusted for renal function)
 | * Doxycycline 100mg PO twice daily
* Linezolid 600mg twice daily
 | * Amoxicillin/clavulanate 500mg-875mg/125mg PO twice daily
* Cefdinir 300mg PO twice daily
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**Levofloxacin Dosing Table**

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| **Creatinine Clearance (mL/min)** | **Dose\*** |
| >50 | 750mg IV/PO daily |
| 20-49 | 750mg IV/PO q48h |
| 10-19 | 750mg IV/PO x 1, then 500mg q48h |
| HD | 750mg IV/PO x 1, then 500mg after each HD |
| CVVH | 750mg IV/PO q48h |

 **\* 750mg dose requires ID/antimicrobial stewardship approval**