## Community-acquired pneumonia (CAP) in adults

### Case definition & exclusion criteria

**Case definition:** New or worsening shadowing on the chest X-ray or CT of a patient with clinical features which usually include cough, fever (>38°C) and difficulty breathing (although these clinical features may be absent, e.g. older patients).

**Exclusions** (refer to relevant guideline or seek senior advice):
- Septic shock; immunocompromised; hospital-acquired pneumonia; bronchiectasis; pneumonia expected as terminal event.
- Absent, e.g. older patients.
- Evidence of a patient with clinical features which usually include cough, fever.

### Evidence of infection

- One respiratory complaint (including cough, chest pain or shortness of breath) AND
- At least one abnormality of the vital signs (temperature >38°C; pulse >100/min; respiration rate >20/min; or pulse oximetry <95% on room air) [Sensitivity 90%, specificity 76% for X-ray confirmed CAP].
- If both, order X-ray and start provisional antibiotics according to severity (see table below).
- If no vital signs abnormality, order X-ray; withhold antibiotics until X-ray result and if X-ray negative, withhold antibiotics and monitor patient.

### Risk of antibiotic resistance

- Recent travel to Europe or USA – risk of penicillin-resistant pneumococcus (use high-dose penicillin or cephalosporin).
- Nursing home resident – no adjustment to CAP regimen recommended for the UK.
- Alcohol dependence / homelessness – risk of Gram-negative enteric bacilli & Klebsiella (treat as high-severity CAP).
- Risk of Pseudomonas – bronchiectasis/interstitial lung disease or enteral tube feeding.
- If recent hospital admission, REVIEW PREVIOUS MC&S results and response.

### Severity & course length

<table>
<thead>
<tr>
<th>Severity &amp; course length</th>
<th>Risk factors for antibiotic resistance</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate severity CAP</td>
<td>No resistance risk factors</td>
<td>First-line (irrespective of \textit{Clostridium difficile} risk)</td>
</tr>
<tr>
<td>Treat for 5 days (azithromycin for 3 days only)</td>
<td><a href="#">Review treatment choice pre-72 hours according to MC&amp;S results and response</a></td>
<td>Alternative (e.g. if penicillin allergy)</td>
</tr>
</tbody>
</table>

### High-risk of resistance

- Alcohol dependence / homelessness: treat as per high-severity CAP patients.

### High-severity CAP (≥3 severity criteria) OR if treated on HDU/ICU

<table>
<thead>
<tr>
<th>Treat for 5 days if good clinical response (azithromycin for 3 days only; see duration guide)</th>
<th>No resistance risk factors</th>
<th>Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check MC&amp;S results and direct therapy at the pathogen, OR (cefuroxime or ceftriaxone)</td>
<td>High risk of \textit{Pseudomonas aeruginosa} (anticipated in fewer than 1% of all CAP patients)</td>
<td>If penicillin-allergic or pregnant, contact microbiology for advice</td>
</tr>
<tr>
<td>cephalaxin or cefuroxime) if severe penicillin allergy) 500mg oral 8-hourly OR co-amoxiclav (not if penicillin allergy) 1.2g IV 8-hourly &amp; PLUS azithromycin 500mg IV once-daily</td>
<td>OR co-amoxiclav (not if penicillin allergy) 625mg oral 8-hourly</td>
<td>\textit{Clostridium difficile} risk:</td>
</tr>
<tr>
<td>Oral switch criteria: haemodynamic stability; + RR≤24; + SaO₂ saturations ≥90%; + temperature decrease of at least 1°C (if fever); + absence of mental confusion; + ability to take oral drugs.</td>
<td>If pregnant, contact microbiology</td>
<td>\textit{Clostridium difficile} risk:</td>
</tr>
<tr>
<td>Check MC&amp;S results and direct therapy at the pathogen, OR (cefuroxime or ceftriaxone) cephalaxin or cefuroxime) if severe penicillin allergy) 500mg oral 8-hourly OR co-amoxiclav (not if penicillin allergy) 1.2g IV 8-hourly &amp; PLUS azithromycin 500mg IV once-daily</td>
<td></td>
<td>If pregnant, contact microbiology</td>
</tr>
</tbody>
</table>

### Typical pathogen profile

<table>
<thead>
<tr>
<th>Gram positive</th>
<th>Gram negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{Streptococcus pneumoniae} 39%</td>
<td>\textit{Haemophilus influenzae} 5.2%</td>
</tr>
<tr>
<td>\textit{Staphylococcus aureus} 1.9%</td>
<td>\textit{Moraxella catarrhalis} 1.9%</td>
</tr>
<tr>
<td>\textit{Streptococcus pyogenes} 1.9%</td>
<td>\textit{Gram-negative bacilli} 1.9%</td>
</tr>
</tbody>
</table>

### Anaerobes

- \textit{Clostridium difficile} 1.2%
- \textit{Eubacterium} 1.2%
- \textit{Fusobacterium} 1.2%

### Atypicals

- \textit{Legionella} spp. 3.6%
- \textit{Mycoplasma pneumoniae} 10.8%
- \textit{Chlamydophila pneumoniae} 13.1%
- \textit{Chlamydia psittaci} 2.6%
- \textit{Coxiella burnetii} 1.2%

### Microbiology investigations

- Take blood and sputum cultures and combined nose & throat swab for influenza and other respiratory virus detection.
- Consider pneumococcal and legionella urinary antigen tests (by consultant request) for patients managed as high-severity CAP.

### Therapy

- **First-line (irrespective of \textit{Clostridium difficile} risk):**
  - [Review treatment choice pre-72 hours according to MC&S results and response](#)
  - Agents considered lower risk for \textit{Clostridium difficile} [NICE advice (ESMPB1), March 2015]

- **Alternative (e.g. if penicillin allergy):**
  - If pregnant, contact microbiology
  - If high-risk for \textit{Clostridium difficile}:
    - \textit{co-trimoxazole} 960mg oral 12-hourly (monotherapy) OR (if nil-by-mouth or not absorbing):
      - **chloramphenicol** 12.5mg/kg IV 6-hourly (monotherapy)
  - If low-risk for \textit{Clostridium difficile}:
    - **Moxifloxacin** 400mg oral/IV once-daily (monotherapy)

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[1] NICE advice (ESMPB1), March 2015
[3] Highest severity (≥3 criteria)
[4] ≥3 criteria: consider referral to critical care
[5] Moderate severity
[6] 0-2 criteria: treat on ward as moderate severity CAP
[7] Reassess regularly
[8] See table below
[9] Review previous MC&S results and response
[10] Agents considered lower risk for \textit{Clostridium difficile} [NICE advice (ESMPB1), March 2015]
[11] If nil-by-mouth or not absorbing
[12] By 6-hourly
[13] By 12-hourly
[14] By 48-hourly
[15] By 24-hourly
Follow-up: Halm's stability criteria\(^a,\(^b\)

1. Temp ≤37.8°C
2. HR ≤100
3. RR ≤24
4. Systolic BP ≥90mmHg
5. O2 sats ≥90%
6. (Normal mental status)
7. (Normal oral intake)

Time to stability
• Median time to achieve individual criteria is 2-3 days.
• Median time to achieve all of first 5 stability criteria is 4 days.
• Expect 70% to achieve 4 of first 5 stability criteria by day 5.\(^c,\(^d\)

In vitro antibiotic susceptibility for CAP pathogens

(local data from 2015; UHS respiratory specimens (excluding cystic fibrosis) from primary and secondary care; presented as % susceptible)

<table>
<thead>
<tr>
<th>Drug/Organism</th>
<th>S. pneumoniae</th>
<th>Staph. aureus</th>
<th>Haemophilus influenzae</th>
<th>Enteric bacilli</th>
<th>Legionella</th>
<th>Chlamydia phila pneumoniae etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence in CAP (NICE 2014; BTS 2009 n=1137)</td>
<td>39%</td>
<td>1.9%</td>
<td>5.2%</td>
<td>1.9%</td>
<td>3.6%</td>
<td>27.7%</td>
</tr>
<tr>
<td>Benzylopenicillin</td>
<td>100%</td>
<td>-</td>
<td>23%</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>100%</td>
<td>75%</td>
<td>68%</td>
<td>21%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Co-amoxiclav</td>
<td>100%</td>
<td>-</td>
<td>40%</td>
<td>55%</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>0</td>
</tr>
<tr>
<td>Pip-taz</td>
<td>100%</td>
<td>-</td>
<td>94%</td>
<td>93%</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>78%</td>
<td>93%</td>
<td>99%</td>
<td>93%</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Co-trimoxazole</td>
<td>80%</td>
<td>-</td>
<td>93%</td>
<td>93%</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>100%</td>
<td>-</td>
<td>99%</td>
<td>99%</td>
<td>63%</td>
<td>-</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>80%</td>
<td>76%</td>
<td>99%</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>Movifloxacin</td>
<td>-</td>
<td>91%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>-</td>
<td>91%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Sanford Guide accessed April 2016: +/- first-line; - second-line [active in vitro]; +/- variable activity; 0 not recommended; N/A no activity; - no data

Selected References (for full literature review, see CAP hiGuide Evidence Summary on Staffnet)

1. UHS local guideline development group consensus.