Hospital-acquired pneumonia (HAP)

**Definition**
Hospital-acquired pneumonia (HAP): pneumonia that occurs 48 hours or more after admission, and was not present at the time of admission.

**Microbiology**
A review of respiratory cultures from Fraser Health medical units showed the following distribution:

<table>
<thead>
<tr>
<th>Organism(s)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus (including MSSA and MRSA)</td>
<td>30 %</td>
</tr>
<tr>
<td>Haemophilus &amp; Moraxella</td>
<td>15 %</td>
</tr>
<tr>
<td>Gram-negative enteric bacilli (primarily <em>E. coli</em>, Klebsiella, Enterobacter)</td>
<td>15 %</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>15 %</td>
</tr>
</tbody>
</table>

- *Enterococcus* and *Candida* are commonly isolated in sputum cultures of hospitalized patients. They are generally considered colonizers and do not warrant antimicrobial therapy.
- Viruses (rhinovirus, influenza, parainfluenza) are increasingly recognized as a cause of HAP.

**Empiric Therapy**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Duration (days)</th>
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<tbody>
<tr>
<td>Mild HAP</td>
<td></td>
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</table>
| Not meeting criteria for moderate or severe HAP | amoxicillin-clavulanate 875-125 mg one tab PO BID OR ceftriaxone 2 g IV q24h  
*If severe beta-lactam allergy:* moxifloxacin 400 mg PO/IV q24h | 7 |
| Moderate HAP   |                 |
| Any of:        |                 |
| Hospitalized >2 weeks | piperacillin-tazobactam 4.5 g IV q6h  
*If severe beta-lactam allergy:* levoﬂoxacin 750 mg PO/IV q24h  
*If known/suspected MRSA:* ADD vancomycin¹ | 7 |
| Severe HAP     |                 |
| Sepsis/Septic Shock OR Requiring ICU Admission | piperacillin-tazobactam 4.5 g IV q6h AND vancomycin¹  
*If severe beta-lactam allergy:*  
meropenem 500 mg IV q6h AND vancomycin¹  
OR levoﬂoxacin 750 mg PO q24h AND vancomycin¹  
*If septic shock or needing ventilatory support, consider adding 2nd anti-pseudomonal agent from a different class:*  
ADD tobramycin 7 mg/kg IV q24h² OR ciproﬂoxacin 400 mg IV q8h | 7 |

*Doses may require adjustment for renal insufficiency*

¹ For vancomycin dosing, refer to “Vancomycin Dosing and Therapeutic Monitoring” in the ASP Handbook
² For aminoglycoside dosing, refer to dosing reference (such as Lexicomp) or discuss with clinical pharmacist

**Oral Step-Down**
- Guided by microbiology results (See “Pathogen-Directed Therapy for Pneumonia”)
- In the absence of positive microbiology, recommended step-down:
  - amoxicillin-clavulanate 875-125 mg one tab PO BID  
*If severe penicillin/cephalosporin allergy:* moxifloxacin 400 mg PO q24h

**Duration**
- 7 days sufficient for the vast majority of HAP, including *Pseudomonas*.
- For HAP due to *S. aureus*:
  - Without *S. aureus* bacteremia 7 days
  - With *S. aureus* bacteremia Minimum 14 days (ID Consult recommended)
- If diagnosis of HAP was questionable and patient quickly improves, consider stopping therapy after 3 days.