Aminoglycoside Dosing and Monitoring Recommendations

Aminoglycoside antibiotics have limited tissue distribution, are dependent on renal elimination, and have a narrow therapeutic index. Thus, careful selection of empiric dosing regimens and serum level monitoring are needed to ensure safety and efficacy of these drugs.

There are several approaches to dosing aminoglycosides (does not cover special populations such as cystic fibrosis, pregnancy, or post-partum):

**HIGH-DOSE, EXTENDED-INTERVAL DOSING (?ONCE-DAILY?)**

-This approach exploits the concentration-dependent killing and post-antibiotic effect of aminoglycosides, and is generally as efficacious as traditional dosing with possibly less toxicity. However, this strategy has not been adequately studied in all populations.

**Inclusion criteria:**

- Patients with suspected or documented Gram-negative infections

**Use with caution and consultation for:**

- Creatinine clearance <60 ml/min

- Abnormal body composition (e.g. morbid obesity, burns)

- Meningitis, endocarditis, or osteomyelitis
Dosing:

For underweight patients, use **total body weight** to calculate dose. For patients whose weight is 1-1.2 times their ideal body weight, use **ideal body weight**. For patients weighing >1.2 times ideal body weight, use **adjusted body weight**.

<table>
<thead>
<tr>
<th>CrCl</th>
<th>Dose (gentamicin, tobramycin)</th>
<th>Dose (amikacin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;60 ml/min</td>
<td>7mg/kg IV q24h</td>
<td>15mg/kg</td>
</tr>
</tbody>
</table>

Monitoring:

Patients with who are anticipated to receive aminoglycosides for >3 days should have levels monitored. Patients anticipated to receive aminoglycosides for >2 weeks should be considered for audiometry.

For patients who require monitoring, in most circumstances a **single random level** drawn between 6 and 14 hours after the start of the infusion is adequate. It is **not** necessary to wait until the third or fourth dose to draw the level, because the drug should not accumulate with repeated doses. Use the nomogram below to determine whether continued once-daily dosing is appropriate.
Patients who require more complete pharmacokinetic characterization should have peak level drawn one hour after the end of the infusion and a random level drawn five hours after the end of the infusion.

**MULTIPLE-DAILY DOSING (TRADITIONAL?)**

- This approach should be used for the treatment of Gram-negative infections when once-daily? dosing is not appropriate.

**Inclusion criteria:**

- Patients with suspected or documented Gram-negative infections not eligible for once-daily? dosing.
Patients with documented serious Gram-negative infections (e.g. Pseudomonas) receiving aminoglycosides in combination with a β-lactam agent.

Exclusion criteria:

- Patients using aminoglycosides for synergistic activity against Gram-positive organisms (see below).

Dosing: A one-time loading dose of 2mg/kg (gentamicin/tobramycin) or XXmg/kg (amikacin) is recommended for patients with severe infections, followed by the next maintenance dose at the next scheduled dosing interval.

For underweight patients, use **total body weight** to calculate dose. For patients whose weight is 1-1.2 times their ideal body weight, use **ideal body weight**. For patients weighing >1.2 times ideal body weight, use **adjusted body weight**.

<table>
<thead>
<tr>
<th>CrCl</th>
<th>Dose (gentamicin, tobramycin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;60 ml/min</td>
<td>1.5 - 1.7mg/kg IV q8h</td>
</tr>
<tr>
<td>40-60 ml/min</td>
<td>1.2 - 1.5mg/kg IV q12h</td>
</tr>
<tr>
<td>20-40 ml/min</td>
<td>1.2 - 1.5mg/kg IV q12-24h</td>
</tr>
<tr>
<td>&lt;20 ml/min</td>
<td>2mg/kg IV loading dose x1, then contact pharmacy for maintenance dose</td>
</tr>
</tbody>
</table>

Monitoring:

Patients with who are anticipated to receive aminoglycosides for >3 days should have levels monitored. Patients anticipated to receive aminoglycosides for >2 weeks should be considered for audiometry.

For patients who require monitoring, draw a **peak** and **trough** level. Peak levels should be drawn 30 minutes after the end of the infusion. Trough levels should be drawn immediately before the next dose (within 30 minutes is acceptable). Levels should be drawn around the 3rd or 4th dose to allow the drug to reach steady-state.

<table>
<thead>
<tr>
<th>Desired Level (gentamicin, tobramycin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trough</td>
</tr>
</tbody>
</table>
Peak  Bacteremia, pneumonia, sepsis: 8-10 mg/L UTI: 4-8 mg/L

?GRAM-POSITIVE COMBINATION DOSING (?SYNERGY?)

-Patients with serious Gram-positive infections may receive aminoglycosides in combination to achieve synergistic killing.

Inclusion criteria: Patients with serious Gram-positive infection (e.g. endocarditis) being treated with a b-lactam or vancomycin.

Exclusion criteria: Patients with documented serious Gram-negative infections (e.g. Pseudomonas) receiving aminoglycosides in combination with a b-lactam agent. (see above)

Dosing: For underweight patients, use total body weight to calculate dose. For patients whose weight is 1-1.2 times their ideal body weight, use ideal body weight. For patients weighing >1.2 times ideal body weight, use adjusted body weight.

<table>
<thead>
<tr>
<th>CrCl</th>
<th>Dose (gentamicin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;60 ml/min</td>
<td>1mg/kg IV q8h</td>
</tr>
<tr>
<td></td>
<td>(for some streptococcal endocarditis: 3mg/kg IV q24h)</td>
</tr>
</tbody>
</table>

Contact pharmacy for doses for patients with CrCl<60ml/min

Monitoring:

Patients with who are anticipated to receive aminoglycosides for >3 days should have levels monitored. Patients anticipated to receive aminoglycosides for >2 weeks should be considered for audiometry.

For patients who require monitoring and who are receiving every 8 hour dosing, draw a peak and trough level. Peak levels should be drawn 30 minutes after the end of the infusion. Trough levels should be drawn immediately before the next dose (within 30 minutes is acceptable). Levels should be drawn around the 3rd or 4th dose to allow the drug to reach steady-state.
<table>
<thead>
<tr>
<th>Trough</th>
<th>&lt;1 mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak</td>
<td>3-4 mg/L</td>
</tr>
</tbody>
</table>

© 2013 The Regents of the University of California

Source URL: http://idmp.ucsf.edu/aminoglycoside-dosing-and-monitoring-recommendations?mag_q=printpdf/241