Acute respiratory distress syndrome: advances in diagnosis and treatment.

**Clinical Summary:**
Mortality from ARDS remains high, ranging from 35% to 46% with higher mortality being associated with greater degrees of lung injury severity at onset.

**Berlin Definition of ARDS:**
1) Acute onset within 7 days of known clinical insult or worsening respiratory symptoms
2) Bilateral opacities on radiograph
3) Respiratory failure not fully explained by cardiac etiology
4) ALI category (with PEEP or CPAP
   - a. Mild (<200 mm Hg<PaO₂/FIO₂<300 mm Hg)
   - b. Moderate (100 mm Hg<PaO₂/FIO₂<200 mm Hg)
   - c. Severe (PaO₂/FIO₂<100 mm Hg)

**Principles of Management**
The cornerstone of management is mechanical ventilation, with a goal to minimize ventilator-induced lung injury (VILI). Ventilator management is based upon the “open lung hypothesis” which focuses on recruitment of collapsed lung units and aims to maintain them open throughout the respiratory cycle.

**Initial Ventilator Management**
1) Mode
   - a. Either volume control (VC) or pressure control (PC) may be used
2) Tidal volume
   - a. Initial tidal volume should be set at 6 cc/kg PBW, as low tidal volume (6-8 cc/kg PBW) significantly reduces mortality.
   - b. Initial tidal volume should be reduced to ensure a plateau pressure (Pplat) ≤ 30 cm H₂O.
3) PEEP
   - a. Higher PEEP is used to facilitate alveolar recruitment and minimize atelectasis that occurs during the respiratory cycle.
   - b. There is no optimal strategy for setting PEEP, but in general, higher FIO₂ should be accompanied by higher PEEP. The ARDSnet PEEP titration tables shown below can be used as a guide.
   - c. The goal driving pressure (Pplat – PEEP) should be ≤ 16 cm H₂O, as this is associated with significant reduction in mortality

**Table 1. Comparison of Lower and Higher PEEP/FIO₂ Combination Tables**

<table>
<thead>
<tr>
<th>PEEP, cm H₂O</th>
<th>0.3</th>
<th>0.4</th>
<th>0.4</th>
<th>0.5</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
<th>0.8</th>
<th>0.9</th>
<th>0.9</th>
<th>1.0</th>
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<tbody>
<tr>
<td>FIO₂</td>
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<tr>
<td><strong>Lower PEEP/FIO₂ Combination</strong></td>
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</tr>
<tr>
<td>PEEP, cm H₂O</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>FIO₂</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
<td>0.9</td>
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</tr>
</tbody>
</table>

| PEEP, cm H₂O | 12  | 14  | 14  | 16  | 16  | 18  | 20  | 20  | 20  | 22  | 22  |
| FIO₂          | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 |

**Higher PEEP/FIO₂ Combination**

<table>
<thead>
<tr>
<th>PEEP, cm H₂O</th>
<th>18</th>
<th>18-24</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIO₂</td>
<td>0.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

*Definition of abbreviation: PEEP = positive end-expiratory pressure.

4) Oxygenation
   - a. FIO₂ should be set to achieve PaO₂ 55-80 mmHg and SpO₂ 88-95%

5) Respiratory rate
   - a. Respiratory rate should be set to achieve a goal pH≥7.25 and allowing for permissive hypercapnia, as necessary. In general, this will be 20-30 breaths/minute.