The Portuguese Consensus Document on Hospital-Acquired Pneumonia (HAP): five years later

José Artur Paiva

Director of Emergency and Intensive Care
Centro Hospitalar S. João - Porto

Associate Professor of Medicine
University of Porto

Infection & Sepsis ID Group

Portugal
2006 Portuguese Nosocomial Pneumonia Consensus Document

Revista Portuguesa de Pneumologia 2007; 13: 419-486
Medicina Intensiva 2007; 14: 7-30
Hospital characteristics

- ESBL information: 6 in 9
- MIC information: 2 in 9
- Quantitative cultures: 2 in 9
- Susceptibility data feedback: 3 in 9
- Isolation rooms: 3 in 9
- Scarcity of epidemiological data
Chapters

Concepts    Diagnosis    Treatment    Reassessment

Prevention
Concepts

- Treat pneumonia associated with invasive procedures as nosocomial.
- Rather than considering a group of health care associated pneumonias, focus on each individual patient’s risk factors.
- Early and late onset are important for treatment selection, but they must be considered in conjunction with other risk factors for MRMo.
- Criteria for referral to the ICU are: need for invasive or non-invasive ventilation, severe sepsis and septic shock, FIO2>35% to maintain PaO2>90% or P/F<200 or other organ failure in addition to respiratory failure.
- Nothing is said about differences between HAP and VAP.
Concepts

- Treat pneumonia associated with invasive procedures as nosocomial.

- Rather than considering a group of health care associated pneumonias, focus on each individual patient’s risk factors

- Early and late onset are important for treatment selection, but they must be considered in conjunction with other risk factors for MRMo

- Criteria for referral to the ICU are: need for invasive or non-invasive ventilation, severe sepsis and septic shock, FIO2>35% to maintain PaO2>90% or P/F<200 or other organ failure in addition to respiratory failure

- Nothing is said about differences between HAP and VAP
Do you agree with the inclusion of healthcare-associated pneumonia patients in the treatment schedule for “late onset pneumonia / risk of multidrug-resistant microorganism pneumonia”?

Seven participants disagreed and the other five agreed. It was pointed out that the results of studies in the United States were not validated for other countries, like Europe for example. Everyone agreed that the definition of healthcare-associated pneumonia was useful for epidemiological studies in Portugal. They agreed that, until these studies were conducted it was preferable to make individual, patient-by-patient assessments of each health care-associated pneumonia criterion.
Proposed Algorithm For HCAP Therapy

HCAP Is Present: From a nursing home, Home infusion Therapy, Home wound care, Dialysis center, Hospitalized in past 90 days

Assess Severity of Illness (ICU or Mechanical Ventilation) and MDR risks (Recent Antibiotic Therapy, Presence of Poor Functional Status)

Severe Illness?

NO

0-1 Risk:
Treat for common CAP Pathogens (consider oral rx)
Quinolone, Beta-lactam/ Macrolide

2 Risks:
Consider Hospital.
Treat for MDR pathogens With HAP recommendations

YES

0-1 Risk:
Consider hospital, IV therapy
Beta-lactam with Macrolide Or Quinolone

2 Risks:
Treat for MDR pathogens With HAP recommendations Need 3 drugs

Concepts

- Treat pneumonia associated with invasive procedures as nosocomial.
- Rather than considering a group of health care associated pneumonias, focus on each individual patient’s risk factors.
- **Early and late onset are important for treatment selection, but they must be considered in conjunction with other risk factors for MRMo**
- Criteria for referral to the ICU are: need for invasive or non-invasive ventilation, severe sepsis and septic shock, FIO2>35% to maintain PaO2>90% or P/F<200 or other organ failure in addition to respiratory failure.
- Nothing is said about differences between HAP and VAP.
# Ventilator-associated Pneumonia Caused by Potentially Drug-resistant Bacteria

**JEAN-LOUIS TROUILLET, JEAN CHASTRÉ, ALBERT VUAGNAT, MARIE-LAURE JOLY-GUILLOU, DANIÈLE COMBAUX, MARIE-CHRISTINE DOMBRET, and CLAUDE GIBERT**

Réanimation Médicale, and Laboratoire de Bactériologie, Hôpital Bichat, Paris, France

AJRCCM 1998;157: 531

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 22)</td>
<td>(n = 12)</td>
<td>(n = 17)</td>
<td>(n = 84)</td>
</tr>
<tr>
<td>MV &lt; 7</td>
<td>MV &lt; 7</td>
<td>MV ≥ 7</td>
<td>MV ≥ 7</td>
<td></td>
</tr>
<tr>
<td>ABT = no</td>
<td>ABT = yes</td>
<td>ABT = no</td>
<td>ABT = yes</td>
<td></td>
</tr>
<tr>
<td>Multiresistant bacteria</td>
<td>0*</td>
<td>6 (30)</td>
<td>4 (12.5)†</td>
<td>89 (58.6)</td>
</tr>
<tr>
<td>*P. aeruginosa</td>
<td>0</td>
<td>4 (20)</td>
<td>2 (6.3)</td>
<td>33 (21.7)</td>
</tr>
<tr>
<td>*A. baumannii</td>
<td>0</td>
<td>1 (5)</td>
<td>1 (3.1)</td>
<td>20 (13.2)</td>
</tr>
<tr>
<td>*S. maltophilia</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6 (3.9)</td>
</tr>
<tr>
<td>MRSA</td>
<td>0</td>
<td>1 (5)</td>
<td>1 (3.1)</td>
<td>30 (19.7)</td>
</tr>
<tr>
<td>Other bacteria</td>
<td>41 (100)</td>
<td>14 (70)</td>
<td>28 (87.5)</td>
<td>63 (41.4)</td>
</tr>
<tr>
<td>Enterobacteriaceae</td>
<td>10 (24.4)</td>
<td>4 (20)</td>
<td>7 (21.9)</td>
<td>23 (15.1)</td>
</tr>
<tr>
<td>*Hemophilus spp.</td>
<td>8 (19.5)</td>
<td>2 (10)</td>
<td>1 (3.1)</td>
<td>4 (2.6)</td>
</tr>
<tr>
<td>MSSA</td>
<td>6 (14.6)</td>
<td>0</td>
<td>7 (21.9)</td>
<td>7 (4.6)</td>
</tr>
<tr>
<td>*S. pneumoniae</td>
<td>3 (7.3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other streptococci</td>
<td>7 (17.1)</td>
<td>5 (25)</td>
<td>7 (21.9)</td>
<td>14 (9.2)</td>
</tr>
<tr>
<td>*Neisseria spp.</td>
<td>5 (12.2)</td>
<td>2 (10)</td>
<td>4 (12.5)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Other pathogens</td>
<td>2 (4.9)</td>
<td>1 (5)</td>
<td>2 (6.3)</td>
<td>12 (7.9)</td>
</tr>
<tr>
<td>Total number of bacteria</td>
<td>41 (100)</td>
<td>20 (100)</td>
<td>32 (100)</td>
<td>152 (100)</td>
</tr>
</tbody>
</table>

* p < 0.02 versus Groups 2, 3, or 4.
† p < 0.0001 versus Group 4.
When Should Potentially Resistant Microorganisms be Covered in ICU-acquired Pneumonia?

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n=37)</th>
<th>Group 2 (n=10)</th>
<th>Group 3 (n=9)</th>
<th>Group 4 (n=55)</th>
<th>Total (n=111)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>MRSA</td>
<td>1 (3)</td>
<td>0</td>
<td>0</td>
<td>17 (31)</td>
<td>18 (16)</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>1 (3)</td>
<td>2 (20)</td>
<td>2 (22)</td>
<td>20 (36)</td>
<td>25 (23)</td>
</tr>
<tr>
<td><em>Acinetobacter</em> spp.</td>
<td>0</td>
<td>1 (10)</td>
<td>0</td>
<td>4 (7)</td>
<td>5 (5)</td>
</tr>
<tr>
<td><em>S. maltophilia</em></td>
<td>1 (3)</td>
<td>0</td>
<td>0</td>
<td>2 (4)</td>
<td>3 (3)</td>
</tr>
<tr>
<td><em>S. pneumoniae</em></td>
<td>5 (14)</td>
<td>0</td>
<td>1 (11)</td>
<td>1 (2)</td>
<td>7 (6)</td>
</tr>
<tr>
<td><em>H. influenzae</em></td>
<td>11 (30)</td>
<td>1 (10)</td>
<td>1 (11)</td>
<td>2 (4)</td>
<td>15 (14)</td>
</tr>
<tr>
<td>MSSA</td>
<td>8 (22)</td>
<td>2 (20)</td>
<td>2 (22)</td>
<td>1 (4)</td>
<td>13 (12)</td>
</tr>
<tr>
<td>Enterobacteriaceae</td>
<td>13 (35)</td>
<td>4 (40)</td>
<td>4 (44)</td>
<td>13 (24)</td>
<td>34 (31)</td>
</tr>
</tbody>
</table>

Pereira JM, Paiva JA et al. ESICM, 2003
Clinical Score for Assessing the Risk of MRMo in CAP

- **Modification / limitation of HCAP definition:**
- **Risk score:** Recent hospitalization – 4; Nursing home – 3; Chronic haemodyalisis - 2; Critically ill - 1

![Prevalence of resistant pathogens as function of score.](image)

<table>
<thead>
<tr>
<th>Total Score</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>n = 336</td>
</tr>
<tr>
<td>1–5</td>
<td>n = 456</td>
</tr>
<tr>
<td>6–10</td>
<td>n = 185</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCAP definition</td>
<td>91.0%</td>
<td>34.3%</td>
<td>54.8%</td>
<td>81.3%</td>
<td>60.7%</td>
</tr>
<tr>
<td>Risk score &gt;0</td>
<td>88.6%</td>
<td>54.5%</td>
<td>63.0%</td>
<td>84.5%</td>
<td>70.4%</td>
</tr>
</tbody>
</table>

An Unified Concept of Pneumonia

An Ethical Dimension of Treatment

CAP

HCAP

EO-HAP

LO-HAP

EOLP

Risk of MR Mo

No Risk of MR Mo
**Concepts**

- Treat pneumonia associated with invasive procedures as nosocomial.

- Rather than considering a group of health care associated pneumonias, focus on each individual patient’s risk factors.

- Early and late onset are important for treatment selection, but they must be considered in conjunction with other risk factors for MRMo.

- Criteria for referral to the ICU are: need for invasive or non-invasive ventilation, severe sepsis and septic shock, FIO2>35% to maintain PaO2>90% or P/F<200 or other organ failure in addition to respiratory failure.

- Nothing is said about differences between HAP and VAP.
Diagnosis

- If NP is suspected, obtain samples for microbiological tests, - blood cultures, respiratory secretions and pleural fluid (if appropriate) - begin empiric antibiotic therapy and exclude extra-pulmonary infection sites and non-infectious causes. In two words, test and treat

- Microbiological tests should not delay the start of antibiotic treatment.

- In the non-intubated patient, risk/benefit ratio of invasive procedures should be considered individually

- BAL or PSB should be carried out on intubated patients if the technique is feasible and the sample viable
Diagnosis

• If NP is suspected, obtain samples for microbiological tests, - blood cultures, respiratory secretions and pleural fluid (if appropriate) - begin empiric antibiotic therapy and exclude extra-pulmonary infection sites and non-infectious causes.

– Test and treat

• Microbiological tests should not delay the start of antibiotic treatment.

• In the non-intubated patient, risk/benefit ratio of invasive procedures should be considered individually

• BAL or PSB should be carried out on intubated patients if the technique is feasible and the sample viable
A **streamlined version** of VAP definition was faster, more objective and predicted patient outcomes – ventilation, ICU, hospital days and hospital mortality – almost as effectively as the conventional CDC definition and may, therefore, facilitate quality assessment.

Combining CPIS and PCT levels for the initial diagnosis of VAP, a **100% specificity** was obtained. The major advantage of this combination is the avoidance of false-positive results and can be very useful in order to **restrict unnecessary antibiotic treatments**.

Suspected nosocomial pneumonia
- new or worsened radiological infiltrate + 2 of (fever, leukocytosis or purulent respiratory secretions)
- in case of severe sepsis, haemodynamic instability or refractory hypoxemia, new or worsened radiological infiltrates + 1 of (fever, leukocytosis or purulent respiratory secretions)

Grading of severity
- Referral criteria for ICU:
  - invasive or non-invasive mechanical ventilation
  - septic shock or severe sepsis
  - FiO₂ > 35% for SaO₂ > 90% or PaO₂ / FiO₂ < 200
  - other organ failure (in addition to respiratory)

Microbiological exams
- 2 blood cultures (all patients)
- Thoracocentesis (with effusion)

Rule out other sites of infection and non-infectious causes
- Non-infectious causes: atelectasis, ARDS, CCF, pulmonary embolism with infarction, alveolar haemorrhage, neoplasm, pulmonary contusion (trauma)

Respiratory secretions

Patient WITHOUT endotracheal intubation
- Collection of sputum when possible
- Invasive techniques case by case on a risk/benefit basis

Patient WITH endotracheal intubation
- BAL/PSB, if possible and reliable diagnosis is likely. If not, tracheal aspirate.
Diagnosis: Potential limitations of quantitative culture methods

- False positive results if prolonged MV
- False negative results if the patient is on antibiotics recently started
- Sample may interest nonpneumonic area
- The idea of diagnostic threshold
- Results may not be reproducible
- Decreased sensitivity compared to non-quantitative ETA
- No impact in outcomes

It depends on the purpose:

- for maximum sensitivity, non-quantitative ETA
- for maximum specificity, quantitative BAL: high NPV, especially for MR Mo

Niederman M. Clin Infect Dis 2010; 51: S93-S99
Treatment

Suspected nosocomial pneumonia

Diagnosis and initial assessment (Algorithm 1)

Initial empiric therapy (Algorithm 2)

Re-evaluation based on clinical response and microbiological results (Algorithm 3)

End of treatment course
Focus on MDR Mo prediction

- “A common cause of delay in the appropriate treatment of NP and especially in VAP is the existence of a MDR Mo as the pathogen and it is therefore very important to predict its presence and begin treatment accordingly”

Portuguese Consensus Document 2007
Empirical therapy for HAP and VAP in Europe

- Prospective, observational cohort study in 27 ICUs, from 9 European countries.
- Admission categories, sickness severity and basal Acinetobacter prevalence > 10% in HAP were the major determinants of antibiotic choice.

VAP severity does not discriminate the pathogen

- ICU mortality depends on the severity of VAP
- Severity of VAP relates to clinical status prior to VAP (preVAP SOFA), but not to the type of bacteria
- The occurrence of new OD during VAP was similar regardless of the pathogen
- In multivariate analysis, type of bacteria is not a risk factor for the occurrence of septic shock and mortality

Empiric Antibiotic Therapy for HAP

HAP, VAP or HCAP (all disease severities)

Late onset (≥5 days) or risk factors for multidrug-resistant (MDR) pathogens

No

Limited-spectrum antibiotic therapy

Yes

Broad-spectrum antibiotic therapy for MDR pathogens

Risk Factors for MDR Pathogens Causing HAP, HCAP and VAP

• Antimicrobial therapy in the preceding 90 days
• Current hospitalisation of $\geq 5$ days
• High frequency of antibiotic resistance in the community or in the specific hospital unit
• Presence of risk factors for HCAP
  – Hospitalisation for $\geq 2$ days in the preceding 90 days
  – Residence in a nursing home or extended care facility
  – Home infusion therapy (including antibiotics)
  – Chronic dialysis within 30 days
  – Home wound care
  – Family member with multidrug-resistant pathogen
• Immunosuppressive disease and/or therapy

Treatment

- Adequate, empiric, IV antibiotic treatment at maximum dose should be initiated in the first hour after a presumed diagnosis of NP
- **MDR bacteria risk factors are:**
  - Late onset pneumonia (≥ 5 days)
  - Hospitalization in the preceding 3 months
  - Recent antibiotic treatment
  - Severe COPD or structural lung disease
  - Immunosuppression
Initial Antibiotherapy

Risk factors?

No risk factor

1 Risk factor

≥2 risk factors or 1 risk factor + high MRSA

Pseudomonas spp. coverage

1- Amoxicillin–clavulanate
2- Ceftriaxone/cephotaxime (3- Levofloxacin)

Pseudomonas spp. and MRSA coverage

1- β-lactam + aminoglycoside
2- β-lactam + quinolone
Guidelines for the management of possible MDR ICU pneumonia: an observational, multicenter cohort study

The most common reason for non-compliance was failure to use a secondary anti-Gram negative drug

Reasons for the addition of MRSA coverage to combination therapy for NFGN

- Whenever there are risk factors for MRMo?
- When there is a combination of risk factors?
- Where there is a high prevalence of MRSA as a NP pathogen?
- Based on rapid non cultural microbiological tests?
Initial Antibiotherapy

Risk factors?

≥2 risk factors or
1 risk factor + high MRSA

Pseudomonas spp. and MRSA coverage

Modifying factor?
Vancomycin in the last 3 months
Vancomycinemia monitoring unavailable
Renal dysfunction

No MF
Vancomycin + Pseudomonas spp. coverage

At least 1 MF
Linezolid + Pseudomonas spp. coverage
In this direct, prospective comparison, clinical response at EOS in the PP population was significantly better with linezolid than with vancomycin for the treatment of nosocomial pneumonia due to MRSA; no statistically significant differences in mortality were demonstrated. Tolerability profiles of both agents appeared to be equivalent, although nephrotoxicity was more common with vancomycin.

Coverage of Acinetobacter or even MRSA on the basis of local conditions and characteristics

VAP >7 days and previous antibiotherapy

Pharmacokinetics (PK)/Pharmacodynamics (PD)

Concentration

- $C_{max}:MIC$
- $AUC:MIC$

Aminoglycosides
Fluoroquinolones

Vancomycin
β-lactams
Carbapenems
Macrolides

T > MIC
Effect of vancomycin dose on PK/PD parameters in ICU patients

Loading dose of 25-30 mg/kg, followed by 15-20 mg/kg q8-12h (actual body weight)

### Doses and levels

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Dose</th>
<th>Administration time</th>
<th>Interval</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colistimethate (colistin prodrug):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Colomycin (Denmark)</td>
<td>If weight (\leq 60) kg:</td>
<td>1 hour</td>
<td>Every 8 hrs</td>
<td>kidney failure</td>
</tr>
<tr>
<td></td>
<td>6 mg/kg/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(75,000 U/kg/day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If weight &gt; 60 kg:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>480 mg/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(6 MU/day)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Loading dose
- Initial dose of 1.0 g if weight ≤ 65 Kg or
- 1.5 g if weight > 65 Kg in 1 hour

#### Continuous infusion of vancomycin
(adjusted for creatine clearance)

<table>
<thead>
<tr>
<th>Creatine clearance</th>
<th>Equivalent daily dose</th>
<th>Debit (500 mg / 50 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;50 ml/min</td>
<td>2.0 g/day</td>
<td>8.3 ml/h</td>
</tr>
<tr>
<td>20-50 ml/min</td>
<td>1.5 g/day</td>
<td>6.3 ml/h</td>
</tr>
<tr>
<td>10-20 ml/min</td>
<td>1.0 g/day</td>
<td>4.2 ml/h</td>
</tr>
<tr>
<td>&lt;10 ml/min</td>
<td>500 mg/day</td>
<td>2.1 ml/h</td>
</tr>
</tbody>
</table>

- Continuous veno-venous haemofiltration
  - 1.0 g/day
  - 4.2 ml/h

#### Adjusting administration in accordance to serum concentrations (target: 20-25 mg/ml)

<table>
<thead>
<tr>
<th>Serum levels</th>
<th>Dose adjustment</th>
<th>Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 15 μg/ml</td>
<td>increase dose 500 mg (2.1 ml/h)</td>
<td>after 6 hours</td>
</tr>
<tr>
<td>15-20 μg/ml</td>
<td>increase dose 250 mg (1.0 ml/h)</td>
<td>after 6 – 12 hours</td>
</tr>
<tr>
<td><strong>20-25 μg/ml</strong></td>
<td>maintain dose</td>
<td>after 12 -24 hours</td>
</tr>
<tr>
<td>25-30 μg/ml</td>
<td>reduce dose 500 mg (2.1 ml/h);</td>
<td>after 6 – 12 hours</td>
</tr>
<tr>
<td></td>
<td>if 500 mg/d decrease to 250 mg/d;</td>
<td>after 6 – 12 hours</td>
</tr>
<tr>
<td></td>
<td>if 250 mg/d, stop 6 hrs and repeat dose</td>
<td>after 6 hours</td>
</tr>
<tr>
<td>&gt; 30 μg/ml</td>
<td>stop 6 hrs and repeat dose</td>
<td>after 6 hours</td>
</tr>
</tbody>
</table>

Vancomycin serum concentrations assay 12 hrs after initiating infusion.
Reassessment

- Reassess at 48-72h base on clinical evolution, temperature, leukocytosis, biomarkers, CPIS, P/F ratio and microbiological data
- Keep up systematic suspicion of other infection sites, whenever clinical condition and microbiological data differ
- De-escalate antibiotics whenever possible
- Stop antibiotic if clinical improvement, low suspicion of NP and reliable negative microbiological results
If there is improvement:

- **Negative microbiology tests**
  - **Reliable microbiology and low suspicion of NP**
    - Yes: Stop antibiotic
    - No: Maintain antibiotic

- **Inconclusive microbiology tests**
  - Look for other source or non-infectious causes: Maintain antibiotic

- **Positive microbiology tests**
  - **Agent covered**
    - De-escalate if possible
  - **Agent not covered**
    - Look for other source
    - Maintain antibiotic. Reassessment and individual decision
Duration of Therapy

• Criteria for decision: time to clinical response and pathogen

• 10–15 days for HAP caused by non-fermentative Gram-negative bacilli or *Legionella* spp.

• 7–8 days for all others

• If combined therapy with aminoglycoside: stop it at Day 5

• If good clinical response and effective digestive tract: early switch to oral therapy
HAP/VAP
Short versus prolonged course

- 8 studies – 1703 patients
- 7-8 compared to 10-15 days

Results:
- Same outcome
- More antibiotic free days OR 4,2
- Less recurrence of VAP due to multiresistant organisms OR 0,44

Pugh R et al. Cochrane Intervention Review 2011
## HAP/VAP
Short versus prolonged course

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA: 28 day mortality</td>
<td>1.28</td>
</tr>
<tr>
<td></td>
<td>(0.32-5.09)</td>
</tr>
<tr>
<td>MRSA: recurrence of pneumonia</td>
<td>1.56</td>
</tr>
<tr>
<td></td>
<td>(0.12-19.61)</td>
</tr>
<tr>
<td>NF-GNB: 28 day mortality</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>(0.32-1.56)</td>
</tr>
<tr>
<td>NF-GNB: recurrence of pneumonia</td>
<td>2.18</td>
</tr>
<tr>
<td></td>
<td>(1.14-4.16)</td>
</tr>
</tbody>
</table>

Pugh R et al. Cochrane Intervention Review 2011
Therefore:

- For NFGNB-VAP 10-15 days, because of recurrence risk
- But even for these ones, maybe……..

Individualized strategy, based on

- clinical response,
- scores,
- microbiology and
- lab biomarkers

to do shorter courses
Is it time to review the document?

• No

• But we need to:
  - Promote epidemiological studies in Portugal
  - Study risk factors for MRMo
  - Study predictors of MRSA NP
  - Study predictors of NFGNB NP
  - Study HCAP pathogens
  - Study severity criteria
TUGA-VAP study