ΚΑΤΗΓΟΡΙΕΣ ΝΟΣΟΚΟΜΙΑΚΗΣ

ΠΟΣΟ ΕΥΔΙΑΚΡΙΤΑ ΕΙΝΑΙ ΤΑ ΟΡΙΑ?

ΠΝΕΥΜΟΝΙΑΣ

ΛΙΑΠΙΚΟΥ ΑΔΑΜΑΝΤΙΑ
ΕΠΙΜΕΛΗΤΡΙΑ ΝΝΘΑ ΣΩΤΗΡΙΑ

GUIDELINES FOR THE MANAGEMENT OF ADULTS WITH HOSPITAL-ACQUIRED, VENTILATOR-ASSOCIATED, AND HEALTHCARE-ASSOCIATED PNEUMONIA

2005 *Am J Respir Crit Care Med*;171:388-416

Hospital Acquired Pneumonia(HAP) – η πνευμονία που συμβαίνει 48 ώρες μετά την εισαγωγή , που δεν εκκολαπτόταν την στιγμή της εισαγωγής

ICU-acquired pneumonia-πνευμονία στη ΜΕΘ με ή χωρίς μηχανικό αερισμό

Ventilator Associated Pneumonia(VAP) - πνευμονία που συμβαίνει > 48-72 ώρες μετά από ενδοτραχειακή διασωλήνωση

Healthcare-associated pneumonia (HCAP)-πνευμονία σχετιζόμενη με φορείς παροχής υγείας

Am J Respir Crit Care Med;171:388-416

Health Care Associated Pneumonia
HCAP

Pneumonia occurring ≤48h of hospital admission in patient with ≥1 of the following risk factors for MDR bacteria:

TABLE 2. RISK FACTORS FOR MULTIDRUG-RESISTANT PATHOGENS CAUSING HOSPITAL-ACQUIRED PNEUMONIA, HEALTHCARE-ASSOCIATED PNEUMONIA, AND VENTILATOR-ASSOCIATED PNEUMONIA

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

ATS/IDSA Guidelines. Am J Resp Crit Care Med 2005; 171:388-41


ASPIRATIONS
This is a patient with HCAP!

ΕΠΙΠΤΩΣΗ ΚΑΙ ΘΝΗΤΟΤΗΤΑ ΤΗΣ HCAP

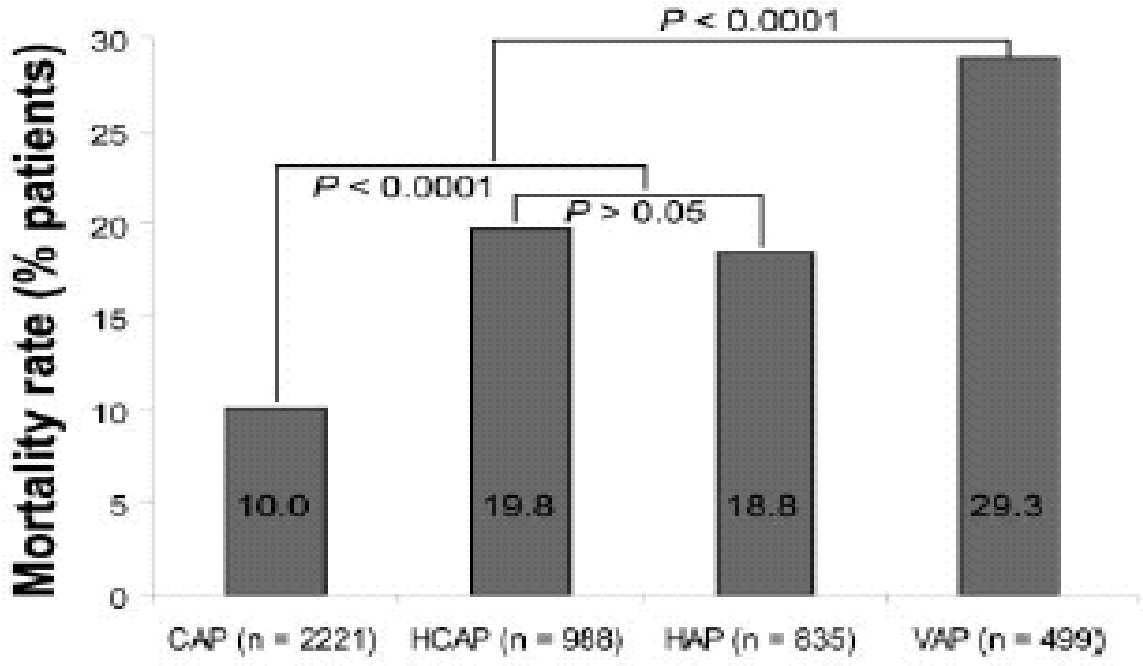
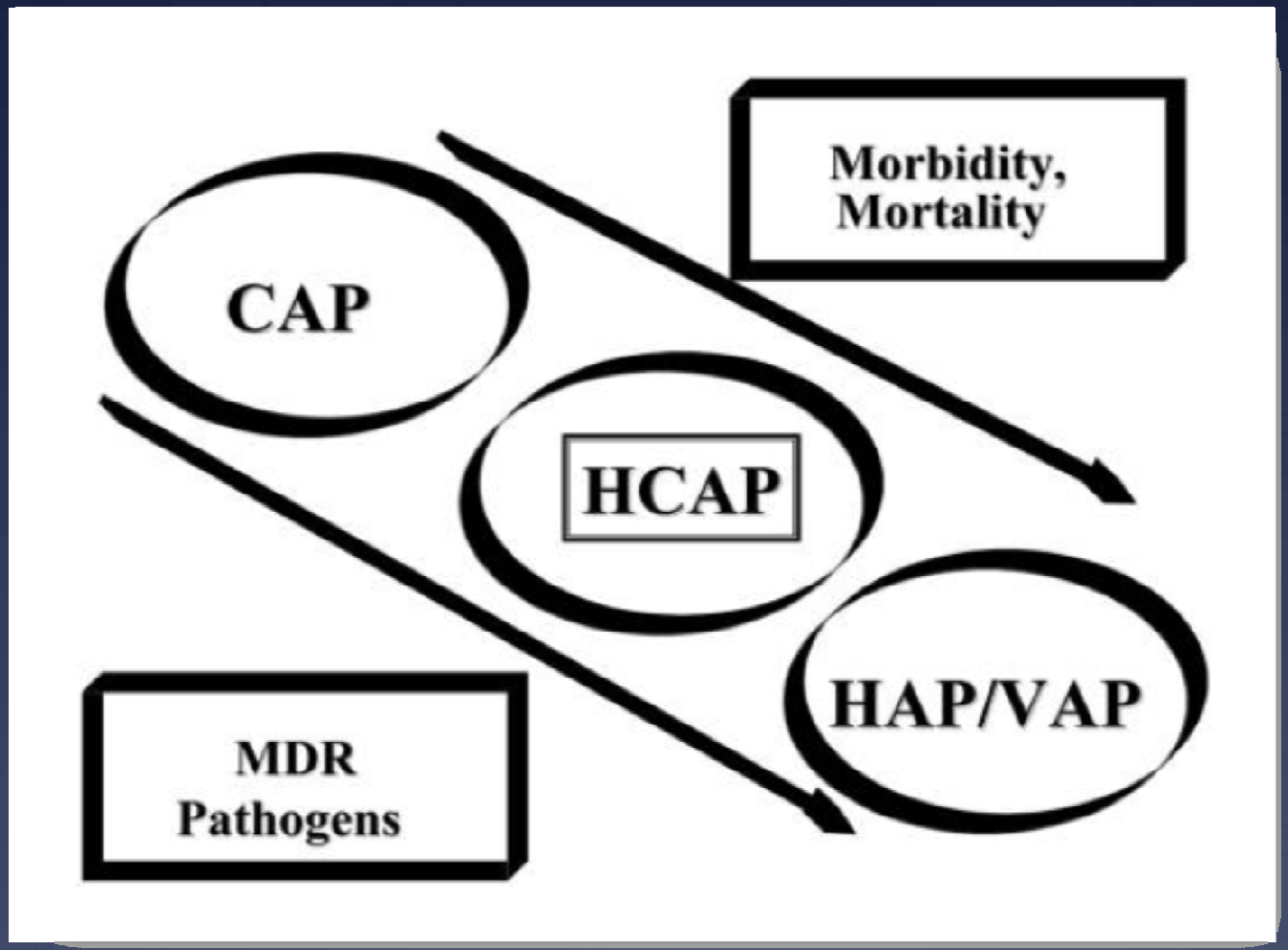


FIGURE 1. Mean mortality rates in patients with CAP, HCAP, HAP, and VAP.

Marin H. Kollef et al. Chest 2005; 128:3854–3862



M. H. Kollef. *Clin.Infect.Dis. 46 Suppl 4:S296-S334, 2008.*

Health–Care–Associated Pneumonia
Αιτιολογία

Author	Micek[1]	Kollef[2]	El-Sohl[3]	El-Sohl[4]	Carratalà[5]	Polverino[6]	Martinez Moragón[7]	Lim[8]
Journal	*Antim Ag Chemother* 2007	*Chest* 2005	*Am J Resp Crit Care Med* 2002	*Am J Resp Crit Care Med* 2001	*Arch Int Med* 2007	*Thorax* 2010	*Arch Bronc* 2004	*ERJ* 2001
Design	Retrosp. Cultivos +	Retrosp. Cultivos +	Prosp. "Severe" NH	Prosp. >75aa NH	Prosp. HCAP	Prosp. NH	Prosp. NH	Prosp. NH
Number	431	988	52	47	126 (NH:32)	155	25 (Et:6)	40 (Et:15)
MSSA	14%	21%	0%	23%	5%	7%	50%	0%
MRSA	31%	27%	33%	6%	2%	5%	0%	
Enterobact.	20%	16%	24%	16%	5%	10%	17%	
P. aeruginosa	26%	25%	14%	4%	3%	3%		
Atipicos			2%		3%	8%		27%
S. pneumoniae	10%	6%		9%	54%	57%	33%	80%
H. influenzae	4%	6%		2%	23%	3%		0%

1. Micek S, et al. *Antimicrob Agents Chemother*. 2007;51:3568-3573.
2. Kollef M, et al. *Chest*. 2005;128:3854-3862.
3. El-Solh A, et al. *Am J Respir Crit Care Med*. 2002;166:1038-1043.
4. El-Solh A, et al. *Am J Respir Crit Care Med*. 2001;163:645-651.
5. Caratalà J, et al. *Arch Intern Med*. 2007;167:1393-1399.
6. Polverino E, et al. *Thorax. 2010*. In press.
7. Martinez-Moragón E, et al. *Arch Bron*. 2004;40:547-552.
8. Lim WS, Macfarlane JT. *Eur Respir J*. 2001;18:362-368.

ORIGINAL ARTICLE

Nursing-home-acquired pneumonia in Germany: an 8-year prospective multicentre study

Santiago Ewig,[1] Benjamin Klapdor,[1] Mathias W Pletz,[2] Gernot Rohde,[3] Hartwig Schütte,[4] Tom Schaberg,[5] Torsten T Bauer,[6] Tobias Welte,[7] for the CAPNETZ study group

Table 4 Aetiology of pneumonia

Variable	Total population			Cases with microbial sampling		
	Patients with CAP≥65 years (n=2569)	Patients with NHAP≥65 years (n=518)	p Value	Patients with CAP≥65 years (n=2569)	Patients with NHAP≥65 years (n=518)	p Value
Streptococcus pneumoniae, n (%)	259/2569 (10.1)	38/518 (7.3)	0.053	259/2413 (10.7)	38/417 (9.1)	0.319
Mycoplasma pneumoniae, n (%)	35/2569 (1.4)	1/518 (0.2)	0.024	35/2065 (1.7)	1/330 (0.3)	0.054
Legionella spp., n (%)	102/2569 (4.0)	13/518 (2.5)	0.109	102/2243 (4.5)	13/357 (3.6)	0.439
Haemophilus influenzae, n (%)	30/2569 (1.2)	1/518 (0.2)	0.042	30/2350 (1.3)	1/382 (0.3)	0.082
Enterobacteria, n (%)	67/2569 (2.6)	17/518 (3.3)	0.390	67/2350 (2.9)	17/382 (4.5)	0.093
Pseudomonas aeruginosa, n (%)	23/2569 (0.9)	4/518 (0.8)	0.784	23/2350 (1.0) 91.4	4/382 (1.0) 73.7	0.900
*Staphylococcus aureus**, n (%)	18/2569 (0.7)	12/518 (2.3)	0.001	18/2350 (0.8) 91.4	12/382 (3.1) 73.1	<0.001
Moraxella catarrhalis, n (%)	9/2569 (0.4)	1/518 (0.2)	0.366	9/2350 (0.4)	1/382 (0.3)	0.716
Influenza A, n (%)	59/2569 (2.3)	9/518 (1.7)	0.429	59/1786 (3.3)	9/312 (2.9)	0.700
Other pathogens, n (%)†	57/2569 (2.2)	11/518 (2.1)	0.893			

Ewig S, Klapdor B, Pletz MW, *et al*. *Thorax* (2011). doi:10.1136/thoraxjnl-2011-200630

HCAP: what you get is what you put in

Previous hospitalization

Immunosuppression

Dialysis

NHAP

Infusions

Antibiotics

Θεραπεία της HCAP

TABLE 4. INITIAL EMPIRIC THERAPY FOR HOSPITAL-ACQUIRED PNEUMONIA, VENTILATOR-ASSOCIATED PNEUMONIA, AND HEALTHCARE-ASSOCIATED PNEUMONIA IN PATIENTS WITH LATE-ONSET DISEASE OR RISK FACTORS FOR MULTIDRUG-RESISTANT PATHOGENS AND ALL DISEASE SEVERITY

Potential Pathogens	Combination Antibiotic Therapy*
Pathogens listed in Table 3 and MDR pathogens *Pseudomonas aeruginosa* *Klebsiella pneumoniae* (ESBL$^+$)† *Acinetobacter* species†	Antipseudomonal cephalosporin (cefepime, ceftazidime) *or* Antipseudomonal carbepenem (imipenem or meropenem) *or* β-Lactam/β-lactamase inhibitor (piperacillin–tazobactam) *plus* Antipseudomonal fluoroquinolone† (ciprofloxacin or levofloxacin) *or* Aminoglycoside (amikacin, gentamicin, or tobramycin) *plus*
Methicillin-resistant *Staphylococcus aureus* (MRSA) *Legionella pneumophila*†	Linezolid or vancomycin‡

* *See* Table 5 for adequate initial dosing of antibiotics. Initial antibiotic therapy should be adjusted or streamlined on the basis of microbiologic data and clinical response to therapy.

† If an ESBL$^+$ strain, such as *K. pneumoniae*, or an *Acinetobacter* species is suspected, a carbepenem is a reliable choice. If *L. pneumophila* is suspected, the combination antibiotic regimen should include a macolide (e.g., azithromycin) or a fluoroquinolone (e.g., ciprofloxacin or levofloxacin) should be used rather than an aminoglycoside.

‡ If MRSA risk factors are present or there is a high incidence locally.

Am J Respir Crit Care Med Vol 171. pp 388–416, 2005

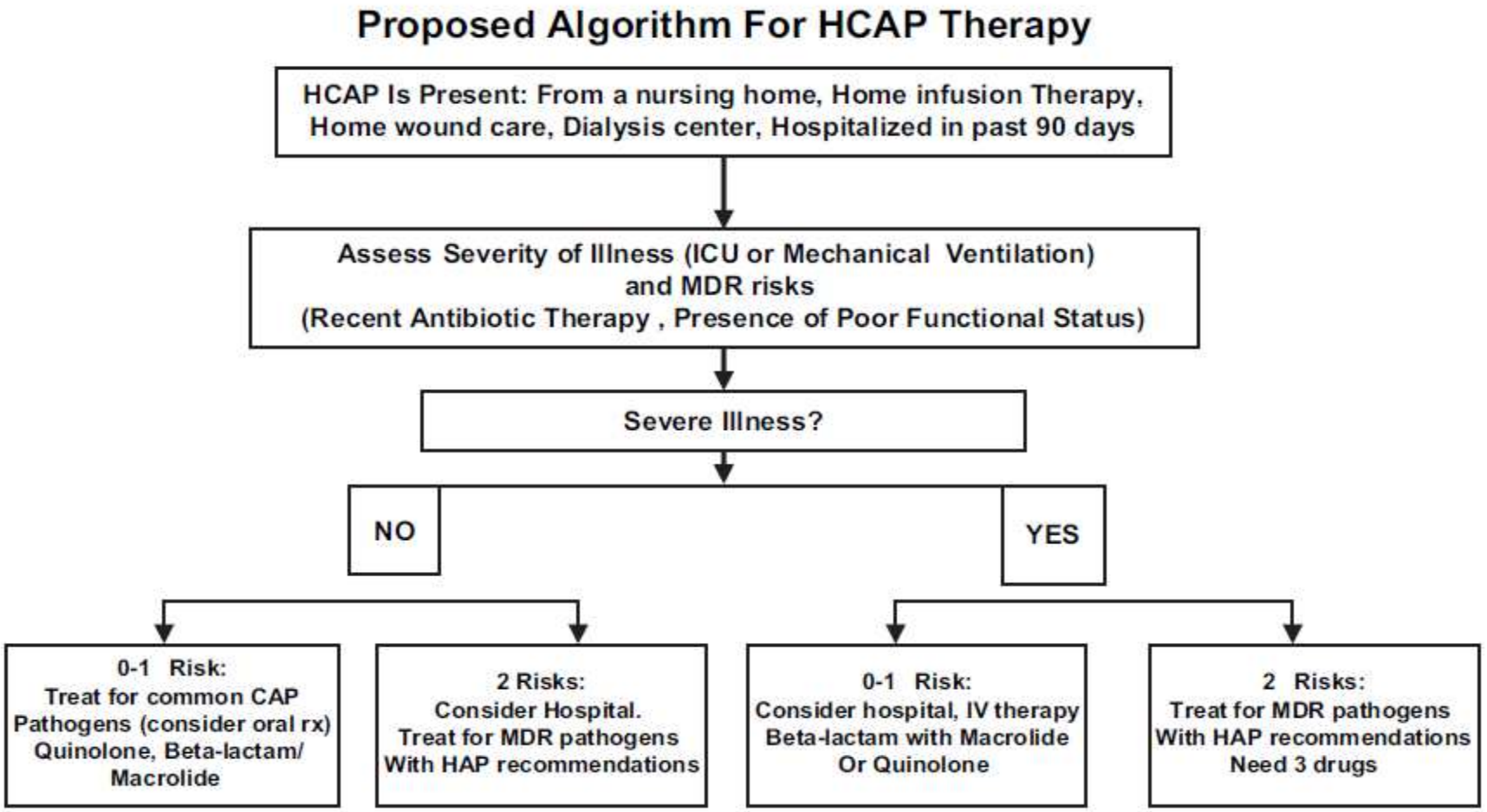
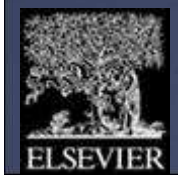


Fig. 1. All patients with HCAP should be identified and then divided on the basis of severity of illness to guide initial therapy. Patients in each group are further divided based on whether they have risk factors for drug-resistant pathogens (MDR pathogens), which include recent antibiotic therapy in the past 3 to 6 months, and poor functional status, as defined by activities of daily living.

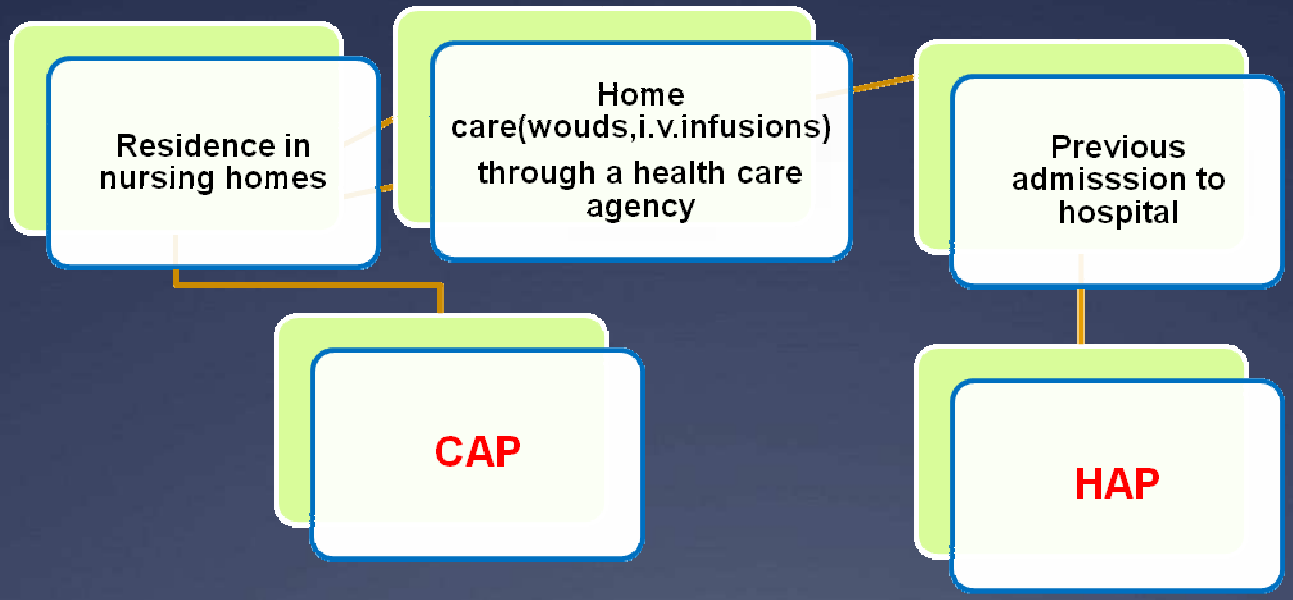
Rethinking the concepts of community-acquired and health-care-associated pneumonia

Santiago Ewig, Tobias Welte, Jean Chastre and Antoni Torres

The Lancet Infectious Diseases
Volume 10, Issue 4, Pages 279-287 (April 2010)
DOI: 10.1016/S1473-3099(10)70032-3

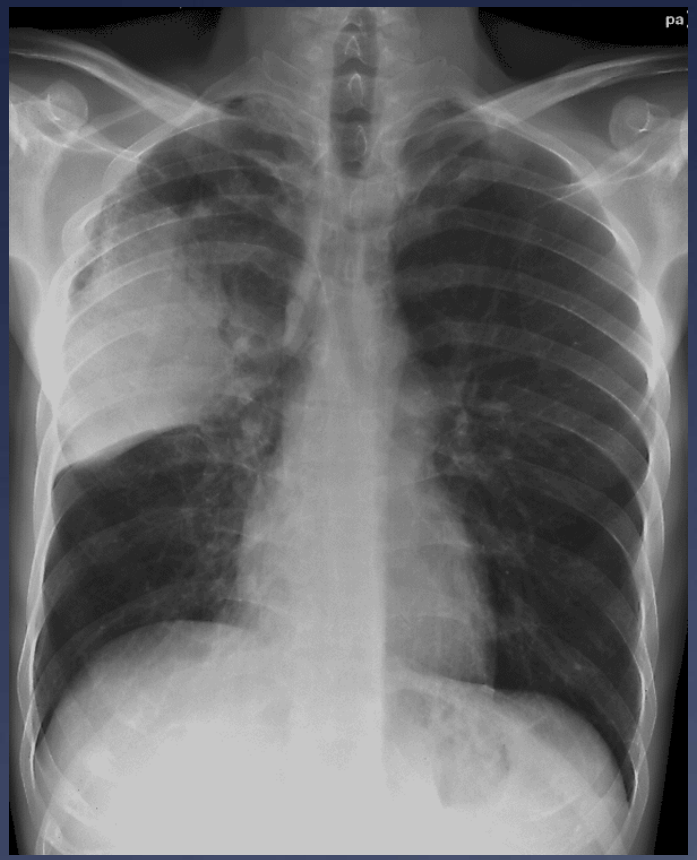


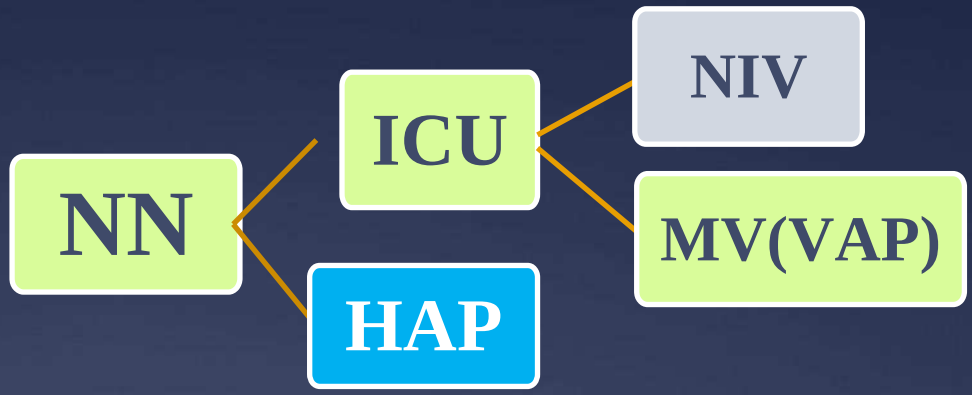
Rearrangement of criteria used to define HCAP



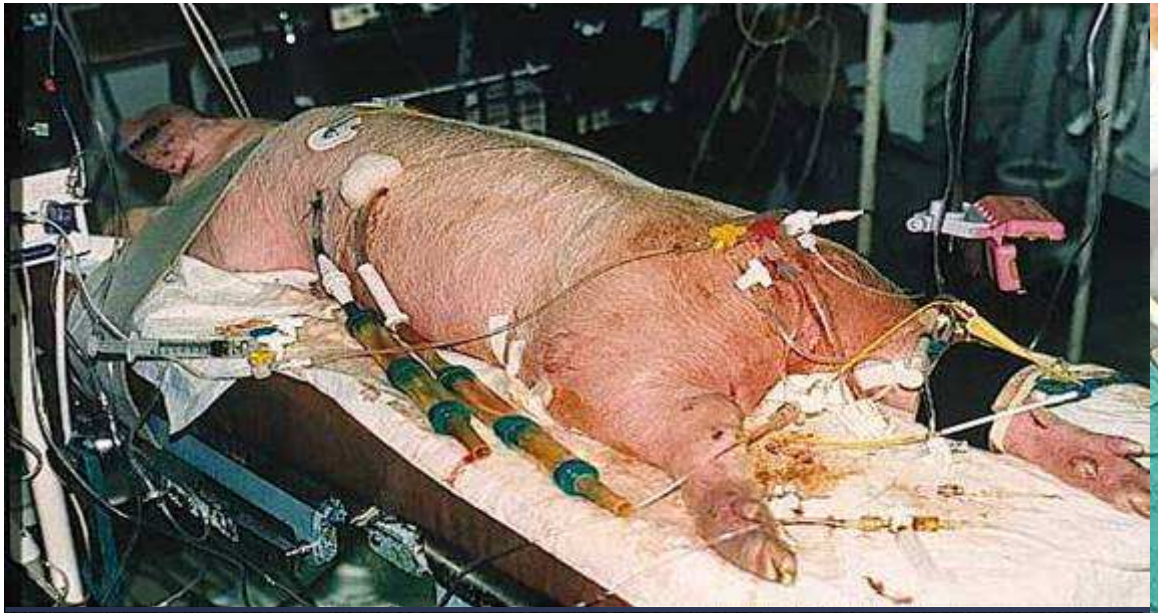
Source: The Lancet Infectious Diseases 2010; 10:279-287 (DOI:10.1016/S1473-3099(10)70032-3)

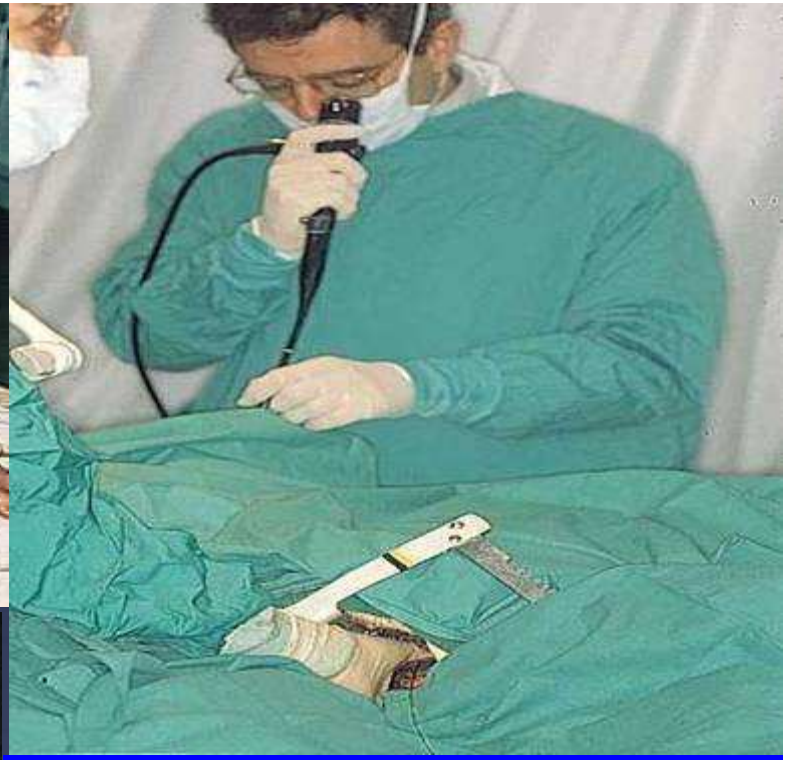
HAP



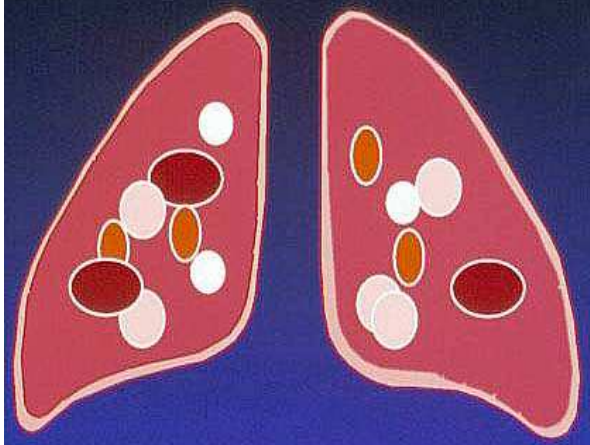


Πνευμονία του αναπνευστήρα
VAP



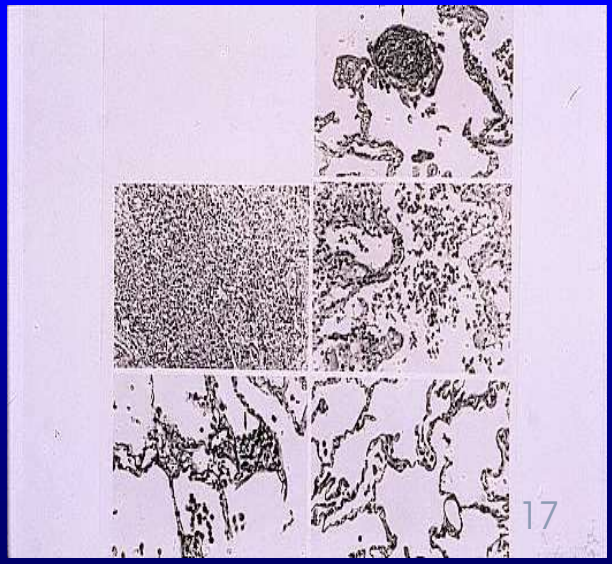


Histology of Nosocomial Pneumonia

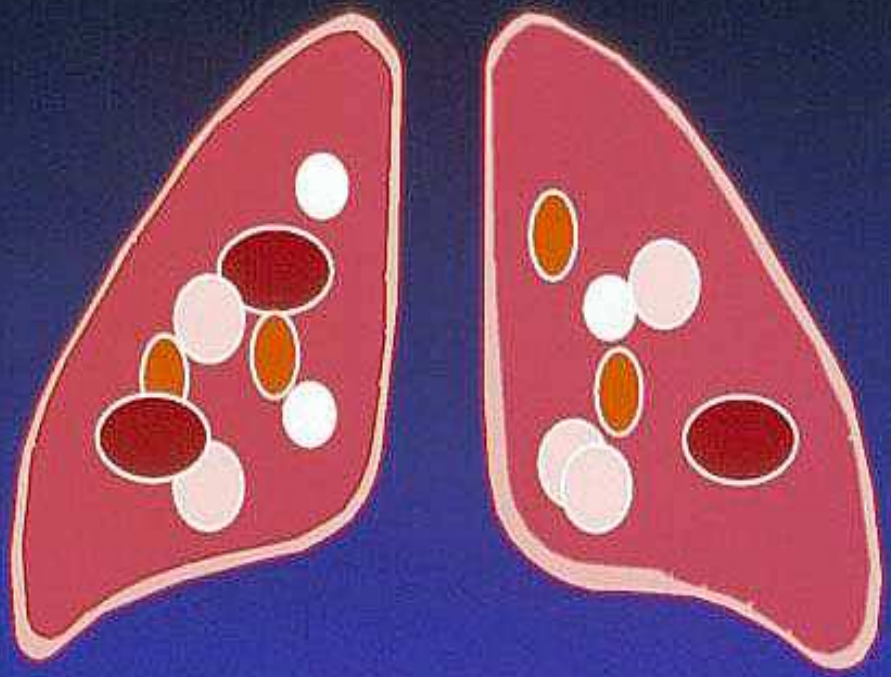


- Nosocomial Pneumonia is a multi-focal process involving both lungs.
- All stages of inflammation can be found throughout the lung and even in segments close to each other.
- The bacterial burden can vary substantially from segment to segment even with the same lobe.

Fàbregas N et al. Anesthesiology 1996; 84:760-771.



HISTOLOGIA DE NEUMONIA NOSOCOMIAL



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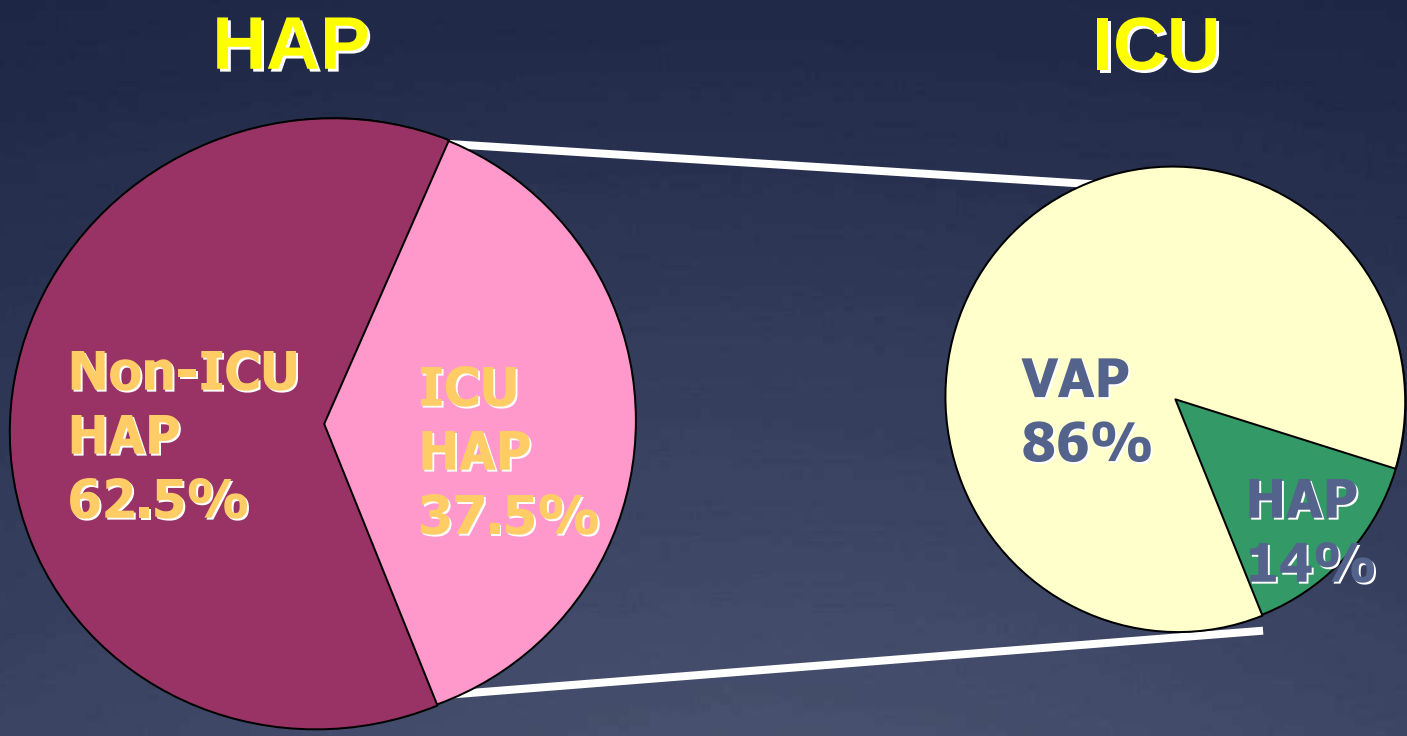
Fàbregas N et al. Anesthesiology 1996; 84:760-771.

Hospital Location & Relative Frequency of HAP & VAP



Kumpf G et al. J Clin Epidemiol 1998;54:495-502
Lizioli A et al. J Hosp Infect 2003;54:141-148
Richards MJ et al. Crit Care Med 1999;27:887-892

ΜΗ-ΔΙΑΣΩΛΗΝΩΜΕΝΟΙ ΜΕ HAP

1. Λίγες μελέτες για την HAP εκτός ΜΕΘ:
   1. Υψηλή συχνότητα μικροοργανισμών της κοινότητας και του περιβάλλοντος
   2. Χαμηλό ποσοστό πολυανθεκτικών μικροβίων (MDR)
   3. Καλύτερη πορεία από τη VAP
2. Πληροφορίες για μη-διασωληνωμένους ασθενείς με HAP στη ΜΕΘ είναι ελάχιστες

Sopena N. *Chest* 2005; 127: 213
Dorca J. *Am J Respir Crit Care Med* 1995; 151: 1491
Weber DJ. *Infect Control Hosp Epidemiol* 2007;28:825

Επίπτωση και Θνητότητα της HAP (12 Πανεπιστημιακά Ισπανικά Νοσοκομεία)

Επίπτωση

1.3 - 5.9 περιπτώσεις/1000 εισαγωγές

Μέση επίπτωση: 3.1+1.4/1000

Θνητότητα

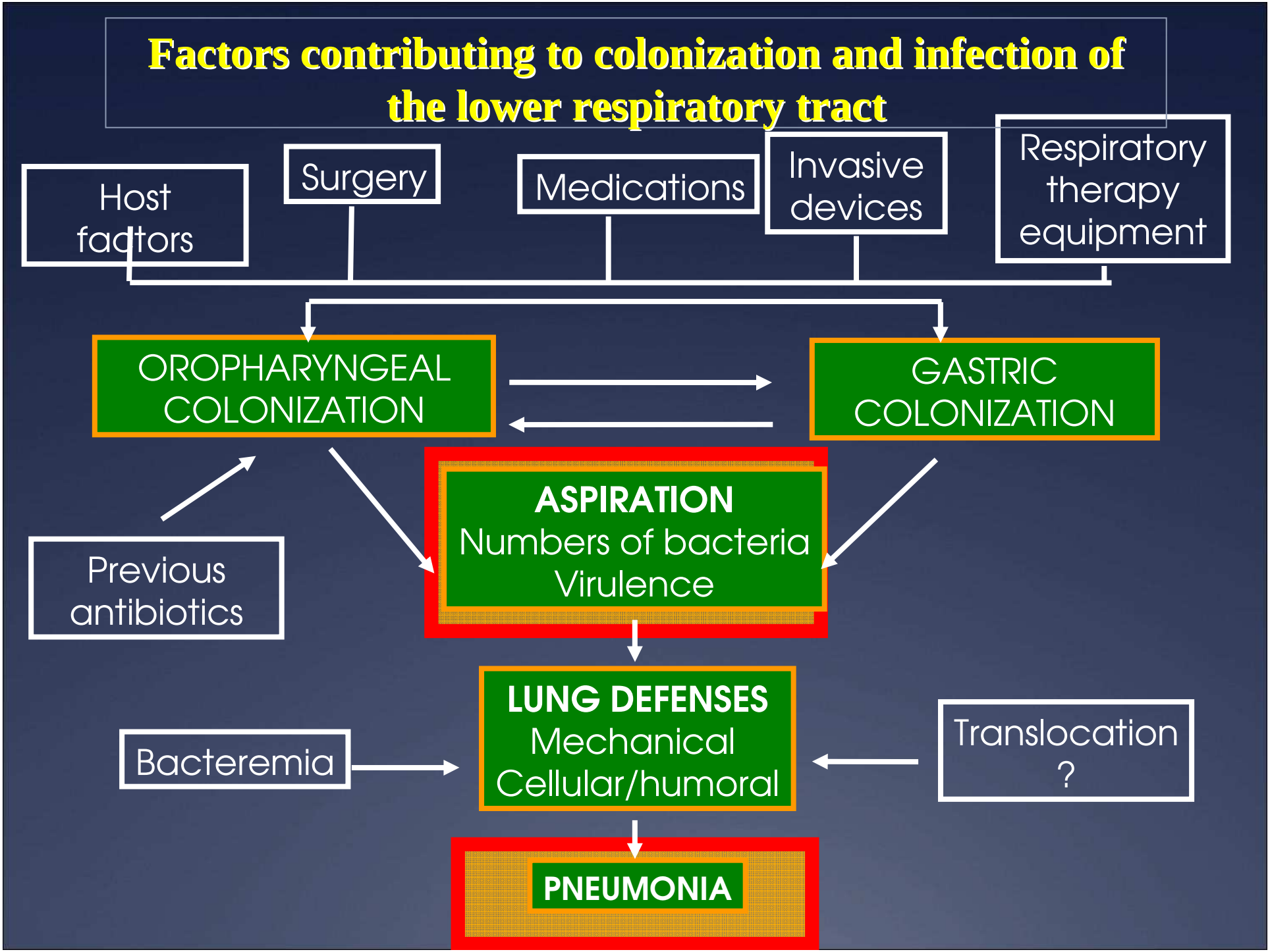
- Crude: 7.1 to 50%; μέση:26%
- Attributable: 0 to 38.5%; μέση:13.9%

Sopena N, Neunos 2000 study group Chest 2005; 127:213-219

ΠΝΕΥΜΟΝΙΑ ΣΤΗ ΜΕΘ

- Ασθενείς με VAP αναμένεται να έχουν σημαντική νοσηρότητα και θνητότητα
  - Παράγοντες κινδύνου για ειδικά παθογόνα
  - Βαρύτητα νόσου
  - Γρήγορη και κατάλληλη αγωγή
- Πληροφορίες για την HAP κυρίως από VAP

Sopena N. *Chest* 2005; 127: 213
Dorca J. *Am J Respir Crit Care Med* 1995; 151: 1491
Weber DJ. *Infect Control Hosp Epidemiol* 2007;28:825


Factors contributing to colonization and infection of the lower respiratory tract
Host factors
Surgery
Medications
Invasive devices
Respiratory therapy equipment
OROPHARYNGEAL COLONIZATION
GASTRIC COLONIZATION
Previous antibiotics
ASPIRATION
Numbers of bacteria
Virulence
LUNG DEFENSES
Mechanical
Cellular/humoral
Bacteremia
Translocation ?
PNEUMONIA

ΚΑΤΑΤΑΞΗ ΤΗΣ HAP

(American Thoracic Society. Am J Respir Crit Care Med 2005;171:388-416)

Α Ι Τ Ι Ο Λ Ο Γ Ι Α

	Πρώιμη HAP/VAP	Όψιμη HAP/VAP
Χρόνος	<5 μέρες από εισαγωγή ή διασωλήνωση	>5 μέρες από εισαγωγή ή διασωλήνωση
Μικροβιολογία	*S. pneumoniae* *H. influenzae* Methicillin-sensitive *S. aureus* Ευαίσθητα gram-negative βακτήρια	*P. aeruginosa* *Acinetobacter* Methicillin-resistant *S. aureus* Άλλοι multi-resistant αργανισμοί
Πρόγνωση	Θνητότητα μικρή	Μεγαλύτερη θνητότητα

ATS / IDSA. Am J Respir Crit Care Med 2005;171:388-416

Am J Respir Crit Care Med;171: 388-416

HAP, VAP ή HCAP

Οψιμης έναρξης (≥5μέρες) ή παράγοντες κινδύνου για MDR

ΟΧΙ

Περιορισμένο φάσμα

Ceftriaxone
ή
Fluoroquinolone
ή
Ampicillin / sulbactam
ή
Ertapenem

ΝΑΙ

Ευρύ φάσμα

Antipseudomonal cephalosporin
↓ή
Antipseudomonal carbapenem
ή
β-lactam/β-lactamase inhibitor
και
Antipseud fluoroquinolone ή aminoglyc
(MRSA – linezolid ή vancomycin)

1. J Trouillet, J. Chastre, A. Vuagnat, M-L. Joly-Guillou,D.Combaux, M.C. Domberet and C. Gibert
Ventilator-associated Pneumonia Caused by Potentially Drug-resistant Bacteria AM J RESPIR CRIT CARE MED 1998;157:531–539**.**

2. Ibrahim EH, Ward S, Sherman G, Kollef MH.
A comparative analysis of patients with early-onset vs late-onset nosocomial pneumonia in the ICU setting. Chest. 2000 May;117(5):1434-42

3. Singh N, Falestiny MN, Rogers P, Reed MJ, Pularski J, Norris R, Yu VL
Pulmonary infiltrates in the surgical ICU: prospective assessment of predictors of etiology and mortality. Chest. 1998 Oct;114(4):1129-36.

Microbiology of ventilator-associated pneumonia compared with that of hospital-acquired pneumonia.

Weber DJ, Rutala WA, Sickbert-Bennett EE, Samsa GP, Brown V, Niederman MS.

TABLE 2. Relative Frequency of Isolation of Selected Pathogens from Patients With Ventilator-Associated Pneumonia (VAP) and Nonventilated Patients With Hospital-Acquired Pneumonia (HAP)

	No. (%) of isolates		
Pathogen, by class	Patients with VAP[a]	Patients with HAP[b]	*P*
Gram-positive cocci	128 (32.00)	115 (42.59)	.0054
Staphylococcus aureus			
All	108 (27.00)	91 (33.70)	.070
Oxacillin-susceptible	37 (9.25)	36 (13.33)	.102
Oxacillin-resistant	71 (17.75)	55 (20.37)	.421
Streptococcus pneumoniae	8 (2.00)	15 (5.56)	.017
Coagulase-negative staphylococci	6 (1.50)	3 (1.11)	.745
Enterococcus species	4 (1.00)	4 (1.48)	.720
Other	2 (0.50)	2 (0.74)	1
Gram-negative bacilli	236 (59.00)	107 (39.63)	<.001
Enterobacteriaceae	59 (14.75)	44 (16.30)	.587
Escherichia coli	15 (3.75)	8 (2.96)	.669
Klebsiella pneumoniae	8 (2.00)	13 (4.81)	.045
Klebsiella species	0 (0.00)	2 (0.74)	.163
Enterobacter species	9 (2.25)	8 (2.96)	.621
Citrobacter species	3 (0.75)	2 (0.74)	1
Serratia marcescens	10 (2.50)	5 (1.85)	.791
Proteus species	2 (0.50)	1 (0.37)	1
Other	12 (3.00)	5 (1.85)	.456
Non-Enterobacteriaceae bacilli	160 (40.75)	53 (19.63)	<0.001
Pseudomonas aeruginosa	70 (17.50)	25 (9.26)	0.003
Acinetobacter species	31 (7.75)	9 (3.33)	0.020
Stenotrophomonas maltophilia	27 (6.75)	3 (1.11)	<0.001
Hemophilus influenzae	18 (4.50)	6 (2.22)	0.141
Hemophilus species	3 (0.75)	2 (0.74)	1
Moraxella catarrhalis	6 (1.50)	7 (2.59)	0.394
Other	8 (2.00)	1 (0.37)	0.092
Other gram-negative bacilli	14 (3.50)	10 (3.70)	1
Miscellaneous bacteria	5 (1.25)	3 (1.11)	1
Oropharyngeal flora	15 (3.75)	20 (7.41)	0.050
Viruses	0 (0.00)	5 (1.85)	0.010
Fungi	16 (4.00)	20 (7.41)	0.079
Total, all pathogens	400 (100)	270 (100)	

[a] Excludes patients for whom sputum culture was not performed ($N = 15$) or whose sputum sample did not yield a pathogen on culture ($N = 10$).
[b] Excludes patients for whom sputum culture was not performed ($N = 35$) or whose sputum sample did not yield a pathogen on culture ($N = 26$).

- 2000-2003: 556 ασθενείς
- 327 VAP cases - 261 HAP cases
- Conclusion: Correct the prediction of guideloines
- >26% of cases of early - onset VAP and >19% of early - onset cases of HAP were due to pathogens requiring treatment with broad - spectrum agents (ie, *P. aeruginosa, S. maltophilia,* or *Acinetobacter* species) or therapy active against MRSA

Infect Control Hosp Epidemiol. 2007 Jul;28(7):825-31. Epub 2007 May 17.

Intensive Care Med (2005) 31:1488–1494
DOI 10.1007/s00134-005-2697-y

ORIGINAL

Elpis Giantsou
Nikolaos Liratzopoulos
Eleni Efraimidou
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Spyros Zakynthinos
Konstantinos I. Manolas

Both early-onset and late-onset ventilator-associated pneumonia are caused mainly by potentially multiresistant bacteria

Table 2 Micro-organisms responsible for 408 episodes of ventilator associated pneumonia (*VAP*) confirmed by quantitative cultures of bronchoalveolar lavage (*early-onset* developing in less than 7 days of mechanical ventilation, *late-onset* developing in 7 days of mechanical ventilation or more, *MRSA* methicillin-resistant *Staphylococcus aureus*, *MSSA* methicillin-sensitive *Staphylococcus aureus*)

	Early-onset VAP (n=191)	Late-onset VAP (n=217)	p
Potentially multiresistant bacteria	219 (79%)	257 (85%)	0.06
Pseudomonas aeruginosa	116 (42%)	141 (47%)	0.26
MRSA	93 (33%)	90 (30%)	0.39
Acinetobacter baumannii	6 (2%)	12 (4%)	0.30
Stenotrophomonas maltophilia	4 (1%)	14 (5%)	0.04
Other bacteria	59 (21%)	45 (15%)	0.06
MSSA	15 (5%)	9 (3%)	0.21
Haemophilus influenzae	7 (3%)	5 (2%)	0.66
Escherichia coli	5 (2%)	9 (3%)	0.51
Morganella morganii	5 (2%)	7 (2%)	0.88
Enterococcus species	6 (2%)	4 (1%)	0.65
Streptococcus pneumoniae	6 (2%)	4 (1%)	0.65
Other cocci	15 (5%)	7 (2%)	0.08
Total number of bacteria	278 (100%)	302 (100%)	–

408 ασθενείς

- 191 πρώιμης<7 μέρες MV
- 217 όψιμης>7μέρες MV

BAL ποσοτικές καλ/γειες

ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, July 2009, p. 2714–2718 Vol. 53, No. 7
0066–4804/09/$08.00+0 doi:10.1128/AAC.01078-08

Early- and Late-Onset Pneumonia: Is This Still a Useful Classification?▽

Petra Gastmeier,[1,2]* Dorit Sohr,[2] Christine Geffers,[2] Henning Rüden,[2] Ralf-Peter Vonberg,[1] and Tobias Welte[3]

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ΠΡΟΤΕΙΝΟΥΝ ΕΥΡΕΩΣ ΦΑΣΜΑΤΟΣ ΑΝΤΙΒΙΟΤΙΚΑ ΣΕ ΥΨΗΛΕΣ ΔΟΣΕΙΣ ΚΑΙ ΜΕΤΑ ΑΠΟΚΛΙΜΑΚΩΣΗ

TABLE 3. Isolates per 100 pneumonia cases for the most frequent microorganisms, together with the order of frequency of the four most frequent pathogens[a]

Pathogen	No. of isolates per 100 pneumonia cases (order of frequency)					
	"Early-onset" pneumonia			"Late-onset" pneumonia		
	1–4 days	1–5 days	1–7 days	>4th day	>5th day	>7th day
S. aureus	25.7 (1st)	26.8 (1st)	26.9 (1st)	23.7 (1st)	23.0 (1st)	21.0 (1st)
MSSA	21.4	22.9	22.7	16.8	13.8	14.5
MRSA	4.3	4.0	4.3	6.9	6.5	6.5
P. aeruginosa	11.6 (2nd)	11.6 (2nd)	11.9 (2nd)	17.4 (2nd)	16.1 (2nd)	19.9 (2nd)
K. pneumoniae	10.8 (3rd)	10.7 (4th)	11.1 (3rd)	11.8 (3rd)	10.6 (3rd)	12.6 (3rd)
E. coli	10.0 (4th)	10.8 (3rd)	10.6 (4th)	10.1 (4th)	8.7 (4th)	10.1 (4th)
S. pneumoniae	9.3	8.9	8.3	5.1	4.2	4.3
Enterobacter spp.	6.4	6.7	7.5	8.8	7.9	9.4
Haemophilus spp.	6.9	6.9	6.7	3.9	3.1	2.9
Acinetobacter spp.	2.6	2.6	3.2	4.8	4.5	5.5
S. maltophilia	1.3	1.3	1.4	3.1	3.0	3.8

[a] From KISS, 1997 to 2004.

Clinical Infectious Diseases 2010; 50:945–952

MAJOR ARTICLE

Validation of the American Thoracic Society–Infectious Diseases Society of America Guidelines for Hospital-Acquired Pneumonia in the Intensive Care Unit

Miquel Ferrer,[1,3] Adamantia Liapikou,[1] Mauricio Valencia,[1] Mariano Esperatti,[1,3] Anna Theessen,[1] Jose Antonio Martinez,[2] Jose Mensa,[2] and Antoni Torres[1,3]

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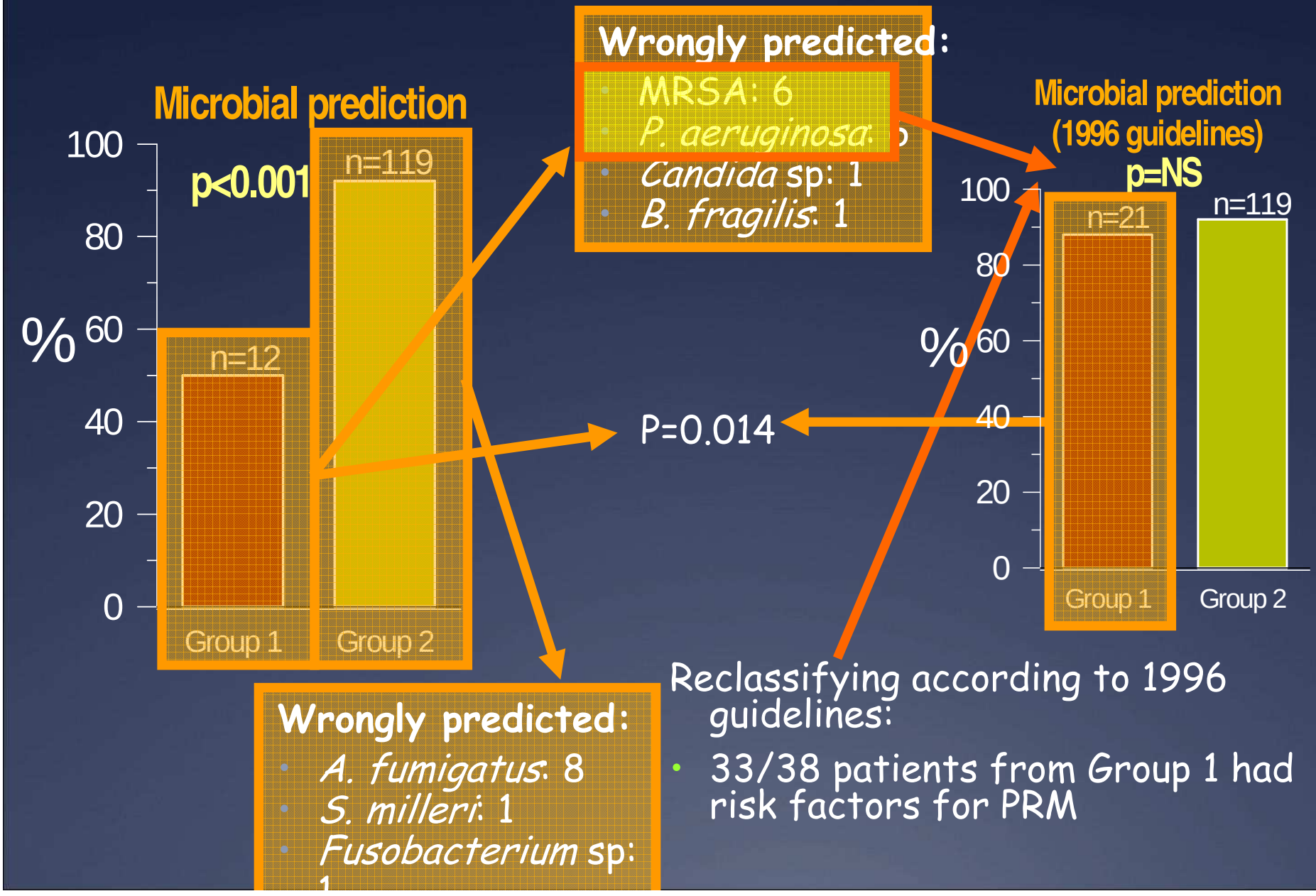
- Hospital Clínic y Facultat de Medicina,Universitat de Barcelona, Barcelona.

Microbial prediction



ΠΝΕΥΜΟΝΙΑ ΣΤΗ ΜΕΘ

ΜΕ ΕΠΕΜΒΑΤΙΚΟ (IV)

Ή

ΜΗ-ΕΠΕΜΒΑΤΙΚΟ ΑΕΡΙΣΜΟ (NIV)

Intensive Care Med (2010) 36:971–978
DOI 10.1007/s00134-010-1863-z

ORIGINAL

Anke Kohlenberg
Frank Schwab
Michael Behnke
Christine Geffers
Petra Gastmeier

Pneumonia associated with invasive and noninvasive ventilation: an analysis of the German nosocomial infection surveillance system database

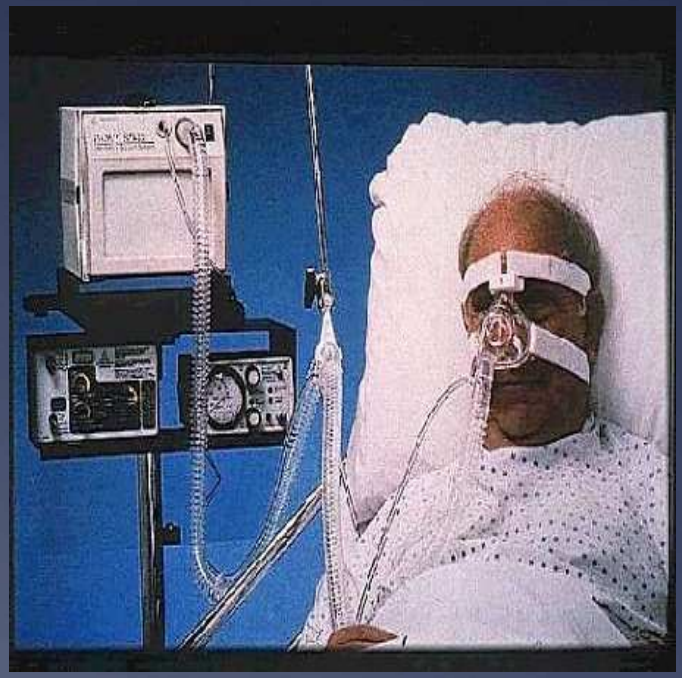
2005-2007:400 ΜΕΘ -779500 ασθενείς

6869 cases of HAP

5811 IMV

160 NIV

898 hospital pneumonia



German Nosocomial Surveillance System, KISS

Table 4 Selected pathogens associated with 6,869 cases of pneumonia reported from 400 ICUs between 2005 and 2007

	Pneumonia not associated with ventilation		Pneumonia associated with NIV		Pneumonia associated with IMV		All pneumonia cases		*P* value
	No.	Per 100 pathogens	No.	Per 100 pathogens	No.	Per 100 pathogens	No.	Per 100 pathogens	
Pneumonia cases total	898		160		5,811		6,869		
Pathogens total	722	100.0	137	100.0	6,789	100.0	7,648	100.0	
Gram-positive bacteria	196	27.1	42	30.7	1,783	26.3	2,021	26.4	0.418
Staphylococcus aureus	132	18.3	25	18.2	1,222	18.0	1,379	18.0	0.980
Thereof MRSA	49	6.8	5	3.6	443	6.5	497	6.5	0.379
Streptococcus spp.	21	2.9	6	4.4	102	1.5	129	1.7	**<0.001**
Gram-negative bacteria	386	53.5	76	55.5	4,009	59.1	4,471	58.5	**0.012**
Haemophilus spp.	21	2.9	0	0.0	194	2.9	215	2.8	0.132
Enterobacteriaceae	240	33.2	48	35.0	2,355	34.7	2,643	34.6	0.734
E. coli	83	11.5	17	12.4	665	9.8	765	10.0	0.224
Klebsiella spp.	75	10.4	14	10.2	690	10.2	779	10.2	0.982
Enterobacter spp.	39	5.4	9	6.6	450	6.6	498	6.5	0.446
Serratia spp.	14	1.9	3	2.2	187	2.8	204	2.7	0.408
Pseudomonas aeruginosa	86	11.9	25	18.2	1,067	15.7	1,178	15.4	**0.017**
Stenotrophomonas maltophilia	25	3.5	1	0.7	226	3.3	252	3.3	0.233
Acinetobacter spp.	12	1.7	1	0.7	152	2.2	165	2.2	0.305
Fungi	110	15.2	15	10.9	831	12.2	956	12.5	0.059
Candida spp.	81	11.2	13	9.5	634	9.3	728	9.5	0.262
Thereof *C.albicans*	59	8.2	8	5.8	523	7.7	590	7.7	0.641
Aspergillus spp.	5	0.7	0	0.0	84	1.2	89	1.2	0.189

Pathogens associated with pneumonia cases cannot always be interpreted as causative or the only causative pathogens, because up to four pathogens could be reported per pneumonia episode. Only the most common or most relevant pathogens are listed in the table

No number, *NIV* noninvasive ventilation, *IMV* invasive mechanical ventilation, *MRSA* methicillin-resistant *S. aureus*

Nosocomial Pneumonia in the Intensive Care Unit Acquired by Mechanically Ventilated versus Nonventilated Patients

Mariano Esperatti[1,3], Miquel Ferrer[1,3], Anna Theessen[1], Adamantia Liapikou[1], Mauricio Valencia[1], Lina Maria Saucedo[1], Elisabeth Zavala[2], Tobias Welte[4], and Antoni Torres[1,3]

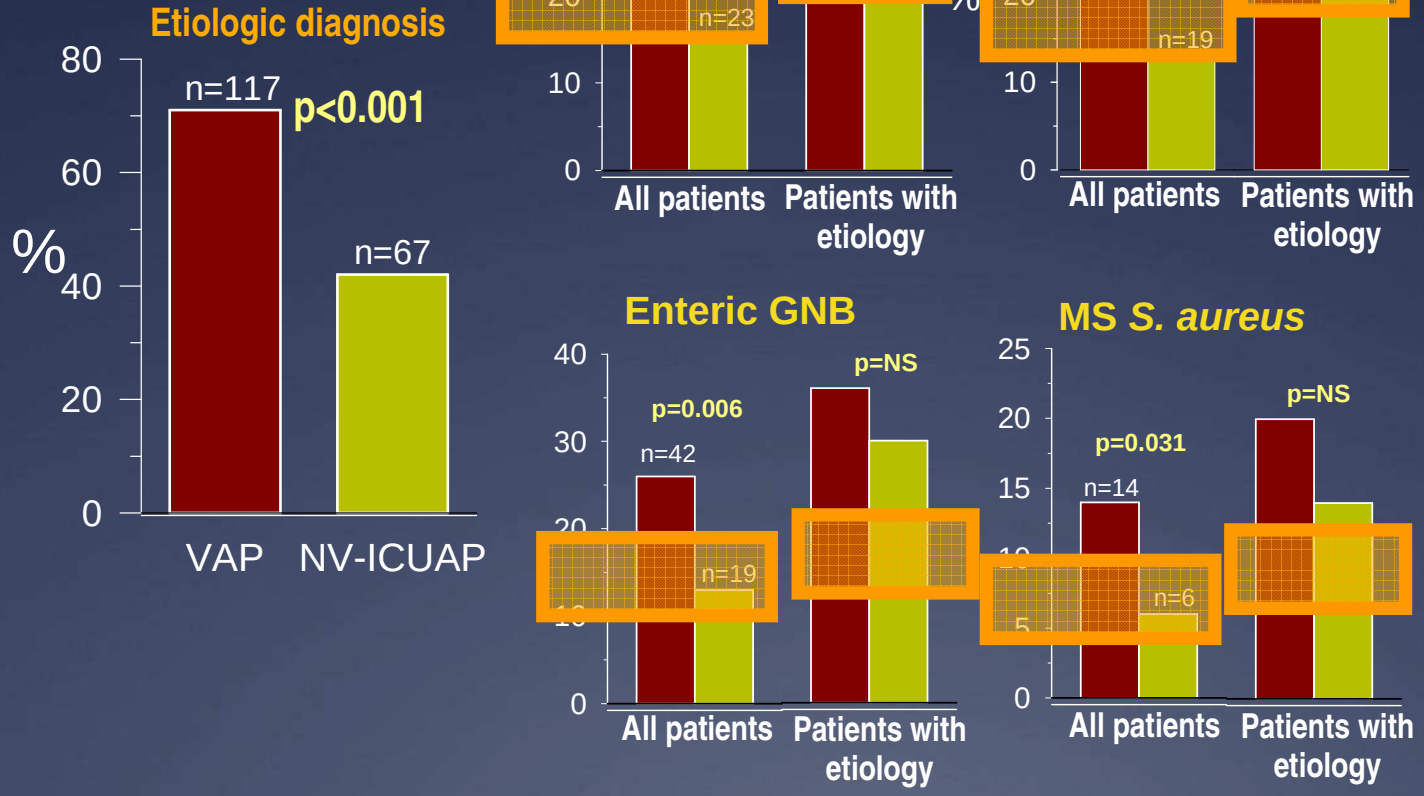
[1]Servei de Pneumologia, Institut Clínic del Tòrax, and [2]UCI Quirurgica, Hospital Clinic, IDIBAPS, Universitat de Barcelona, Barcelona, Spain; [3]Centro de Investigación Biomedica En Red- Enfermedades Respiratorias-Instituto de Salud Carlos III-Ministerio de Ciencia e Innovación, Spain; and [4]Department of Respiratory Medicine, Medizinische Hochschule, Hannover, Germany

RESEARCH GROUP
Applied Research in Respiratory Diseases

IDIBAPS Institut D'Investigacions Biomèdiques August Pi i Sunyer

We investigate to improve clinical CARE

Microbiologic findings



ΣΥΜΠΕΡΑΣΜΑΤΑ

Η HCAP είναι μία πνευμονία που πρέπει να επαναπροσδιοριστεί η αντιμετώπισή της

Η κατηγοριοποίηση της HAP έχει στόχο κατάλληλη θεραπεία μέσω σωστής μικροβιακής πρόγνωσης

Σημαντική η επιλογή του κατάλληλου αντιβιοτικού λαμβάνοντας υπόψιν τη μικροβιολογία της μονάδας ή του νοσοκομείου

Επανεξέταση των οδηγιών της HAP/VAP για μικροβιακή πρόγνωση

Determinants of prescription and choice of empirical therapy for hospital-acquired and ventilator-associated pneumonia

J. Rello, M. Ulldemolins, T. Lisboa, D. Koulenti, R. Mañez, I. Martin-Loeches, J.J. De Waele, C. Putensen, M. Guven, M. Deja, E. Diaz and the EU-VAP/CAP Study Group

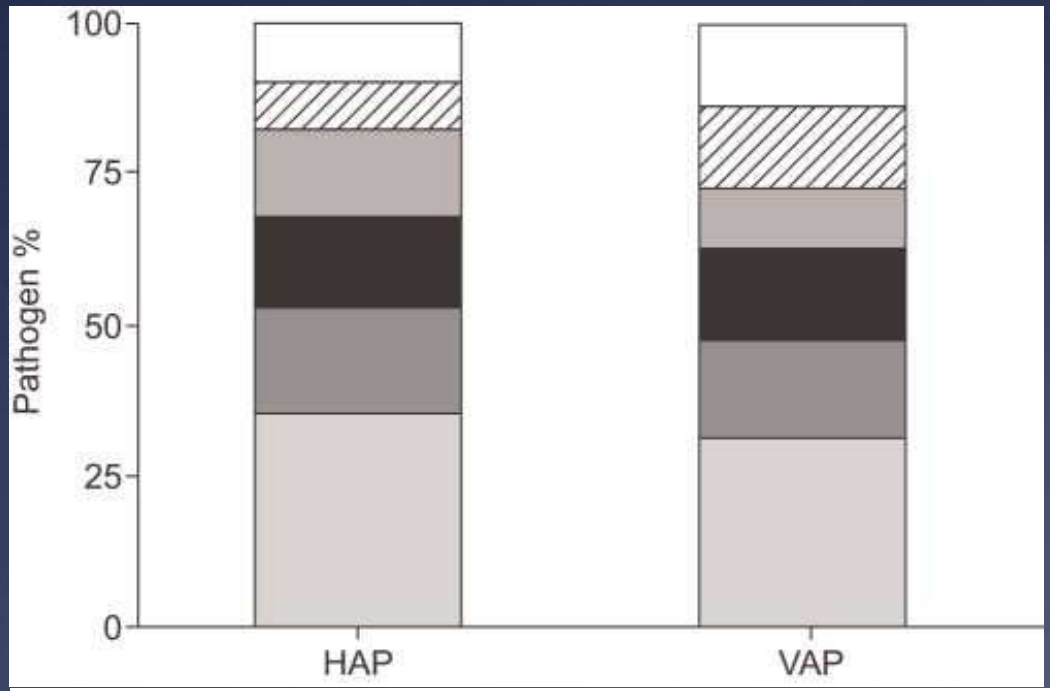


FIGURE 1. Most common aetiological pathogens found in hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) episodes. ▒: Enterobacteriaceae; ■: *Pseudomonas aeruginosa*; ■: *Acinetobacter baumanni*; ■: methicillin-resistant *Staphylococcus aureus*; ▨: methicillin-sensitive *S. aureus*; □: other.

27 ICU ΣΕ 9 ΕΥΡΩΠΑΙΚΕΣ ΧΩΡΕΣ
224 HAP-465 VAP

ΠΑΡΑΓΟΝΤΕΣ:
Βαρύτητα νόσου
Κατηγορία νόσου
Acinetobacter>10%

Eur Respir J 2011; 37: 1332–1339

ΕΥΧΑΡΙΣΤΩ

Patients' characteristics at admission

	VAP n=164	NV-ICUAP n=151	p
Age	62±16	65±12	---
Male/female	122/42	104/47	---
APACHE-II	17±6	15±5	<0.001
Previous admission	26 (16%)	58 (38%)	<0.001
Tracheostomy at admission	18 (11%)	7 (5%)	0.059
LOS before ICU admission	4±11	11±16	<0.001
Causes of ICU admission			<0.001
• Postoperative ARF	44 (27%)	55 (36%)	0.090
• Hypercapnic RF	14 (9%)	20 (13%)	---
• Septic shock	14 (9%)	16 (11%)	---
• Decreased consciousness	24 (17%)	4 (3%)	<0.001

Patients' characteristics at onset of pneumonia

	VAP n=164	NV-ICUAP n=151	p
Previous antibiotics	130 (80%)	91 (61%)	<0.001
Previous hospital stay	12±14	15±17	---
Previous ICU stay	8±8	5±6	<0.001
Bilateral chest X-ray	36 (22%)	34 (23%)	---
Pleural effusion	32 (20%)	34 (23%)	---
PaO_2/FiO_2	200±88	172±80	0.008
Leukocytes	14.5±7.5	15.2±7.0	---
C-reactive protein	15±9	17±11	0.060
SOFA score *	8.0±3.3	6.9±3.0	0.022

* *Sepsis-related Organ Failure Assessment*

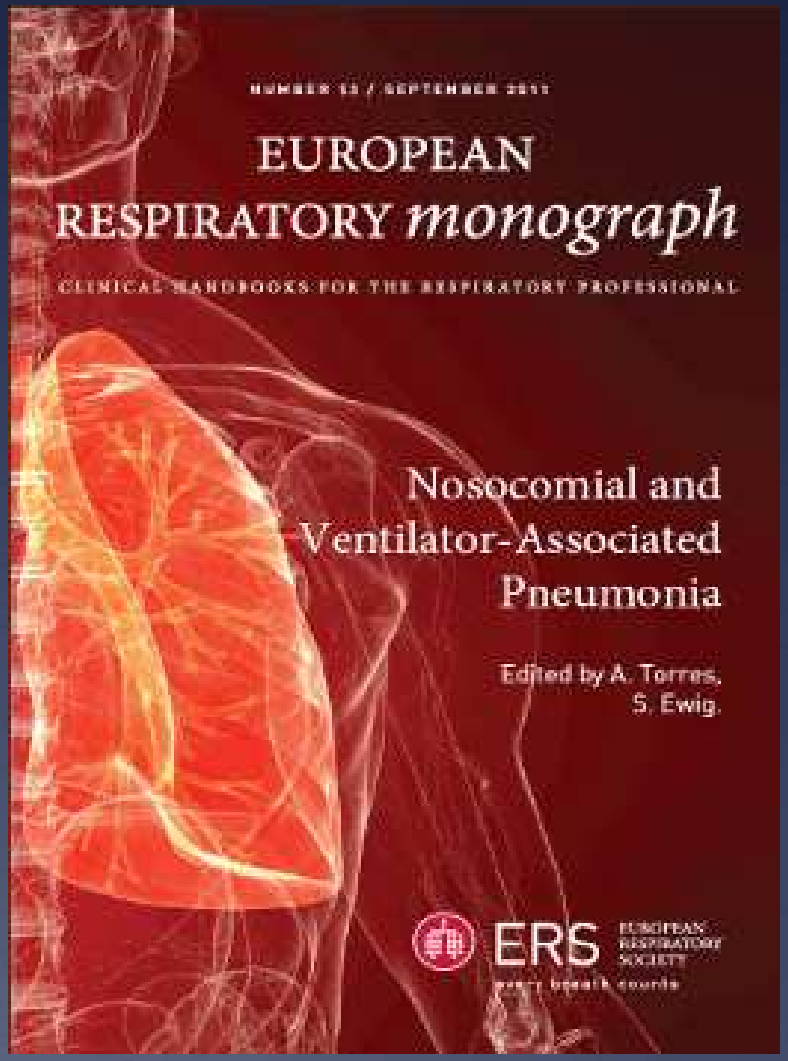
* The individual risk factors for nosocomial pneumonia include old age, the presence of underlying diseases such as neoplasm and chronic obstructive pulmonary disease (COPD), the severity of the underlying disease, malnutrition and depression .The serum albumin level is often used as a marker of nutritional status and was an independent predictor of nosocomial pneumonia in patients with stroke .
* Risk factors related to therapeutic man oeuvres are thoracic or upper abdominal surgery, the use of nasogastric tubes, immunosuppressive treatment, previous antibiotic treatment and the length of hospitalization

Most of the data available comes from overall studies that indistinctly include critically and non critically ill patients (incidence ratio per 100 patients of 0.5–2%) or have been obtained from studies undertaken in patients at greater risk, such as those who have undergone thoracic or abdominal surgery (incidence ratio per 100 patients of 3.8–17.5%), immunosuppressed patients (incidence ratio per 100 patients of 19.5–20%) or the elderly (incidence ratio per 100 patients of 0.7–1.7%). The few studies performed in patients from conventional hospitalization wards rates of incidence from 1.6 to 18 per 1,000 hospital admissions.

HAP in nonventilated patients

M. Sabrià[*,#] and N. Sopena[*,#]

Chapter 13



HAP in nonventilated patients

M. Sabrià[*,#] *and N. Sopena*[*,#]

Table 1. Categories of hospital-acquired pneumonia (HAP) in nonventilated patients

Severity	Risk factors	Chronology	Category
Severe			Severe HAP
Non-severe	Yes		HAP with risk factors
	No	Early-onset	Early-onset HAP
		Late-onset	Late-onset HAP

Nosocomial Pneumonia and Ventilator-Associated Pneumonia European Respiratory Society Monograph, Vol. 53. 2011. ISBN: 978-1-84984-015-6. DOI: 10.1183/1025448x.erm5310.

Θεραπεία της HAP

Severe HAP#	Severity criteria	Cefepime 2 g every 8 h + aminoglycoside (gentamicin 7 mg·kg^{-1}·day^{-1}) or quinolone (ciprofloxacin 400 mg every 8 h) *i.v.*
Early-onset HAP <5 days	Without risk factors and non-severe	β-lactam/β-lactamase inhibitor: amoxicillin/clavulanate 1–2 g every 8 h *i.v.* Third generation non-pseudomonal cephalosporin: ceftriaxone 2 g·day^{-1} *i.v./i.m.* or cefotaxime 2 g every 6–8 h *i.v.* Fluoroquinolones: levofloxacin 500 mg every 12–24 h *i.v.* or 750§ mg·day^{-1} *i.v.*
Late-onset HAP ⩾ 5 days	Without risk factors and non-severe	Antipseudomonal cephalosporin (including pneumococcus): cefepime 2 g every 8 h *i.v.* Fluoroquinolones: levofloxacin 500 mg every 12–24 h *i.v.* or 750§ mg·day^{-1} *i.v.*

Gram-negative bacilli	Chronic underlying disease	Antipseudomonal β-lactam ± aminoglycoside or quinolone (ciprofloxacin) Cefepime 1–2 g every 8–12 h *i.v.* Carbapenems[¶]: imipenem 500 mg every 6 h or 1 g every 8 h *i.v.*; or meropenem 1 g every 8 h *i.v.*; or ertapenem[+] 1 g·day^{-1} *i.v.*
P. aeruginosa and multi-resistant Gram-negative bacilli	Wide-spectrum antibiotics, severe underlying disease, ICU stay	Antipseudomonal β-lactam ± aminoglycoside or quinolone (ciprofloxacin) Cefepime 1–2 g every 8–12 h *i.v.* β-lactamic/β-lactamase inhibitor: piperacillin-tazobactam 4.5 g every 6 h *i.v.* Carbapenems[¶]: imipenem 500 mg every 6 h or 1 g every 8 h *i.v.*; or meropenem 1 g every 8 h *i.v.*
Legionella[#]	Hospital potable water colonisation and/or previous nosocomial Legionellosis	Levofloxacin 500 mg every 12–24 h *i.v.* or 750[§] mg every 24 h *i.v.* or azitromycin 500 mg·day^{-1} *i.v.*
Anaerobes	Gingivitis or periodontal disease, depressed consciousness, swallowing disorders and orotracheal manipulation	Carbapenems[¶]: imipenem 500 mg every 6 h or 1 g every 8 h *i.v.*; or meropenem 1 g every 8 h *i.v.*; or ertapenem[+] 1 g·day^{-1} *i.v.* β-lactam/β-lactamase inhibitor amoxicillin/clavulanate 2 g every 8 h *i.v.*[¶]; piperacillin-tazobactam 4.5 g every 6 h *i.v.* tazobactam 4.5 g every 6 h *i.v.*
MRSA	Risk factors for MRSA or high prevalence of MRSA	Vancomycin 15 mg·kg^{-1} every 12 h *i.v.* Linezolid 600 mg every 12 h *i.v.*
Aspergillus	Corticotherapy, neutropenia or transplantation	Amphotericyn B desoxicolate 1 mg·kg^{-1}·day^{-1} *i.v.* or amphotericyn liposomal 3–5 mg·kg^{-1}·day^{-1} *i.v.* Voriconazol 6 mg·kg^{-1} every 12 h *i.v.* (day 1) and 4 mg·kg^{-1} every 12 h *i.v.* (following days)