Adoption of HAP Treatment Guideline in Healthcare Associated Pneumonia: Con

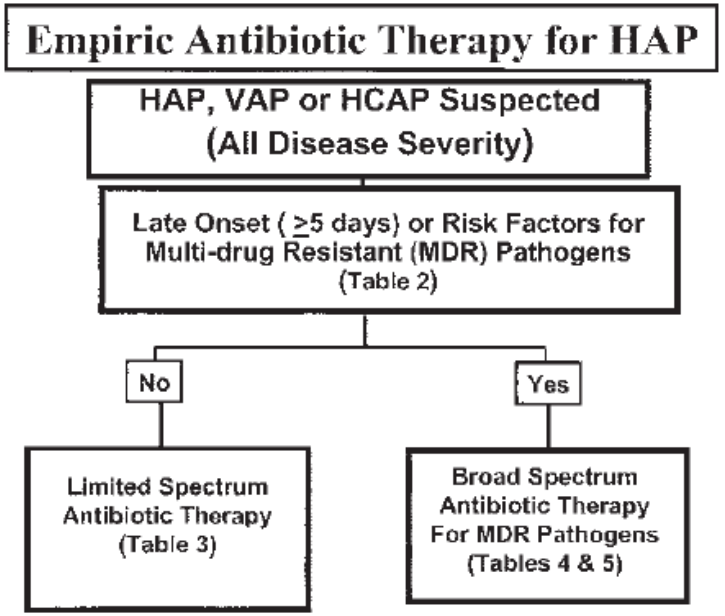
한림대학교성심병원
박성훈

American Thoracic Society Documents

Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia

HCAP is included in the spectrum of HAP and VAP, and patients with HCAP need therapy for MDR pathogens.

HAP, VAP, and HCAP are commonly caused by aerobic gram-negative bacilli, such as *P. aeruginosa, K. pneumoniae*, and *Acinetobacter* species, or by gram-positive cocci, such as *S. aureus*, much of which is MRSA; anaerobes are an uncommon cause of VAP (**Level II**) (9, 12, 28, 36–40, 42, 91).



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

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Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia

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Con

ORIGINAL ARTICLE 10.1111/j.1469-0691.2011.03602.x

Guidelines for the management of adult lower respiratory tract infections - Summary

M. Woodhead[1], F. Blasi[2], S. Ewig[3], J. Garau[4], G. Huchon[5], M. Ieven[6], A. Ortqvist[7], T. Schaberg[8], A. Torres[9], G. van der Heijden[10], R. Read[11] and T. J. M. Verheij[12] Joint Taskforce of the European Respiratory Society and European Society for Clinical Microbiology and Infectious Diseases

Since the publication of the 2005 guidelines the term health care-associated pneumonia (HCAP) has been put forward to capture groups of patients with pneumonia, some acquired outside hospital, expected to be caused by similar pathogens, but different from those usually found in community-acquired LRTI. In the opinion of the taskforce members the evidence base does not support the use of this term as being clinically relevant in Europe at the present time. HCAP is therefore not covered further in this document [2–17].

Woodhead et al Clin Microbiol Infect 2011;17:1-24

Main concerns in HCAP

- **Definition of HCAP**
- **Frequency of MDR pathogens**
- **The impact of MDR pathogens on outcomes.**

1.

What are the problems of HCAP criteria?

Table 1. Criteria for HCAP Patients According to the 2005 IDSA/ATS Guidelines

Criteria for HCAP (IDSA/ATS 2005 guidelines) [2]. Any one of the following:
Hospitalization for 2 days or more in the preceding 90 days
Resident of a nursing home or extended-care facility
Home infusion therapy (including antibiotics)[a]
Chronic dialysis within 30 days
Home wound care
Family member with multidrug-resistant pathogen

NOTE. HCAP, health care–associated pneumonia; IDSA/ATS, Infectious Diseases Society of America/American Thoracic Society.

[a] Also includes patients with long-term indwelling devices such as catheters.

Heterogeneous and arbitrary

Table 2 Heterogeneity of the populations included in unique studies of healthcare-associated pneumonia published since July 2004

Study	Design	Percentage with either *S. aureus* or enteric Gram negatives (some patients had both)	Limitations in the population studied
El Solh *et al.* [11] (NHAP)	Prospective, single center in the USA	59%	Only nursing home patients, all admitted to the ICU; excluded anyone admitted to the hospital in the preceding 6 months; excluded immune suppressed
Martinez- Maragon *et al.* [6] (NHAP)	Prospective, single center in Spain	67%	Only nursing home pneumonia. None admitted to ICU
Kollef *et al.* [3]	Retrospective, multicenter in the USA (all patients with positive cultures)	Almost all	Only patients with positive cultures; information from a large database. 49.6% from a nursing home. 24.1% mechanically ventilated
Carratala *et al.* [5]	Prospective, multicenter evaluation in Spain	6.4%	43.7% with hospitalization in the preceding 90 days. 25.4% from nursing home. 6.3% admitted to ICU, 3.2% mechanically ventilated
Micek *et al.* [2]	Retrospective, multicenter in the USA (all patients with positive cultures)	0%	Only included those with positive respiratory culture. Included immune suppressed, anyone hospitalized in the past 12 months (93.3% had recent hospitalization, including 69% in the past 90 days) Only 28.1% from nursing home 48.7% in ICU, 44.5% mechanically ventilated
El Solh *et al.* [12] (NHAP)	Prospective, single center in the USA – only severe (mechanically ventilated) pneumonia	>75%	All were mechanically ventilated. Excluded immune suppressed, antibiotic therapy in the preceding 72 h, and those with witnessed aspiration
Kothe *et al.* [8] (NHAP)	Prospective, multi center in Germany	21.1%	Only nursing home pneumonia evaluated, but excluded any patient with recent hospitalization in the preceding 28 days
Muruyama *et al.* [7]	Prospective, single center in rural Japan	8%	Only nursing home pneumonia. Exclude immune suppressed and hemodialysis patients. 8.5% admitted to ICU

NHAP, nursing home-acquired pneumonia; *S. aureus*, *Staphylococcus aureus*.

Too heterogeneous population!

Brito et al Curr Opin Infect Dis 2009;22;316

Table 1. Criteria for HCAP Patients According to the 2005 IDSA/ATS Guidelines

Criteria for HCAP (IDSA/ATS 2005 guidelines) [2]. Any one of the following:

Hospitalization for 2 days or more in the preceding 90 days
Resident of a nursing home or extended-care facility
Home infusion therapy (including antibiotics)[a]
Chronic dialysis within 30 days
Home wound care
Family member with multidrug-resistant pathogen

Weak evidence

NOTE. HCAP, health care–associated pneumonia; IDSA/ATS, Infectious Diseases Society of America/American Thoracic Society.

[a] Also includes patients with long-term indwelling devices such as catheters.

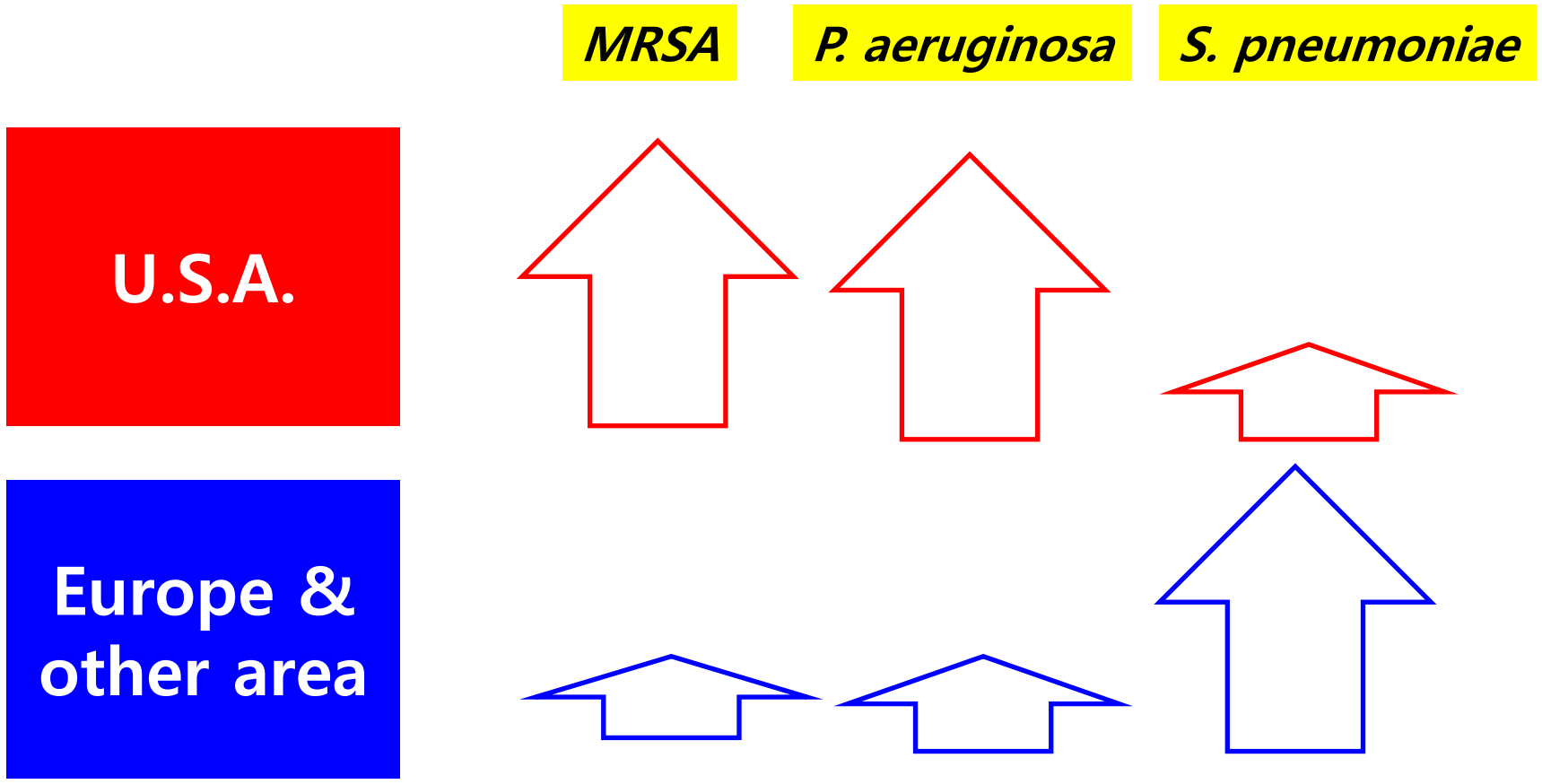
What are the problems of HCAP criteria?

- Few background studies
- Heterogeneity
- Weak evidence for several criteria
- Not clearly defined

2.

Are the frequencies of MDR organisms high in HCAP, similar to HAP?

Incidence of MDR Pathogens



Incidence of MDR Pathogens

USA | Spain | Spain | UK

Table 2 Studies Published on the Microbial Etiology of Healthcare-Acquired Pneumonia

Author	Micek et al[a]	Kollef et al[a]	El-Solh et al	El-Solh et al	Carratala et al[b]	Polverino et al	Lim
Year	2007	2005	2002	2001	2007	2008	2001
Reference	66	8	67	41	15	16	13
No. of patients	431	988	52[c]	104[c]	126	156[c]	40[c]
MSSA, %[d]	14	21	0	36	3	7	0
MRSA, %[d]	31	27	33	10	1	2	0
Enterobact., %[d]	20	16	24	23	5	10	0
P. aeruginosa, %[d]	26	25	14	7	3	3	0
S. pneumoniae, %[d]	10	6	5	13	52	57	80
H. influenzae, %[d]	4	6	0	3	23	3	0
Atypical, %[d]	NR	NR	2	0	3	8	27
Legionella, %[d]	0.2%	NR	5	0	5	2	0
Others, %[d]	NR	12	9	8	5	3	27%

Polverino et al. Semin Respir Crit Care Med 2009;30;239

Incidence of MDR Pathogens

Table 1 Unique studies of healthcare-associated pneumonia published since July 2004

Study	Design	Number of patients/ percentage with positive cultures	Inappropriate therapy	*S. pneumoniae*	*S. aureus*	*Gram negatives*	*H. influenzae*	Atypical pathogens
El Solh *et al.* [11] (NHAP)	Prospective, single-center study in the USA	98/68%		25%	31%	28%	2%	1 and 2% with influenza A
Martinez-Maragon *et al.* [6] (NHAP)	Prospective, single-center in Spain	25/24%	19% (treatment modifications of initial empirical antibiotic)	33%	50%	17%		
Kollef *et al.* [3]	Retrospective, multicenter in the USA (all patients with positive cultures)	988/100%		5.5%	46.7%	59.5%	5.8% (*Haemophilus* spp.)	
Carratala *et al.* [5]	Prospective, multicenter study in Spain	126/67.5%	5.6%	27.8%	2.4%	4%	11.9%	1.6%
Micek *et al.* [2]	Retrospective, single center in the USA (all patients with positive cultures)	431/100%	28.3%	10.4%	44.5%	25.5% (*P. aeruginosa*)	4.2% (*Haemophilus* spp.)	0.2% (*Legionella* spp.)
El Solh *et al.* [12] (NHAP)	Prospective, single center in the USA – only severe (mechanically ventilated) pneumonia	75/65%		14.3%	26.5%	>47%	48.1%	Not reported
Kothe *et al.* [8] (NHAP)	Prospective, multicenter in Germany	205		Not reported	2.3%	18.8%		
Muruyama *et al.* [7]	Prospective, single center in rural Japan	75/72%		33.3%	4%	4%		34.7% (*C. pneumoniae*)

C. pneumoniae, *Chlamydophila pneumoniae*; *H. influenzae*, *Haemophilus influenzae*; NHAP, nursing home-acquired pneumonia; *P. aeruginosa*, *Pseudomonas aeruginosa*; *S. aureus*, *Staphylococcus aureus*; *S. pneumoniae*, *Staphylococcus pneumoniae*.

Brito et al Curr Opin Infect Dis 2009;22;316

Recent studies (2011-2012)

	Ewig et al. (n = 518)	Chalmers et al. (n = 277)	Gracia-Vidal et al. (n = 485)	Grenier et al. (n = 226)	Umeki et al. (n = 79)
S. pneumonia	32.5%	49.4%	38.8%	32.0%	15.2%
H. influenzae	0.9%	14.6%	5.3%	15.0%	2.5%
M. cattarrhalis	0.9%	-	-	4.0%	1.3%
MSSA	10.3%	10.1%	1.0%	4.0%	3.8%
MRSA		2.2%	0.2%	2.0%	11.4%
P. Aeruginosa	3.4%	2.2%	1.4%	8.0%	1.3%
G(-) Bacilli	14.9%	7.8%	1.6%	12.9%	15.2%
Atypical pathogens	2.7%	6.7%	2.9%	0.9%	2.5%

Korean studies

	Park et al. (n = 167)	Jung et al. (n = 231)	Jeon et al. (n = 35)	Park et al. (n = 65)	Jeong et al. (n = 130)
S. pneumonia	13.2%	4.8%	6.7%	38.5%	15.2%
H. influenzae	1.2%	0.9%	3.3%	6.2%	7.0%
M. cattarrhalis	0.9%	-	-	-	-
MSSA	10.3%	1.7%	10.0%	12.3%	9.2%
MRSA		3.9%	30.0%	7.7%	10.0%
P. Aeruginosa	21.0%	4.3%	26.7%	13.8%	15.0%
G(-) Bacilli	35.3%	12.1%	26.7%	26.3%	21.5%
Atypical pathogens	3.0%	0.0%	0.0%	-	-

Are the frequencies of MDR organisms high in HCAP as in HAP?

No.

MDR pathogens are more frequent in HCAP than in CAP but relatively low.

3.

Can the HCAP criteria predict MDR pathogens?

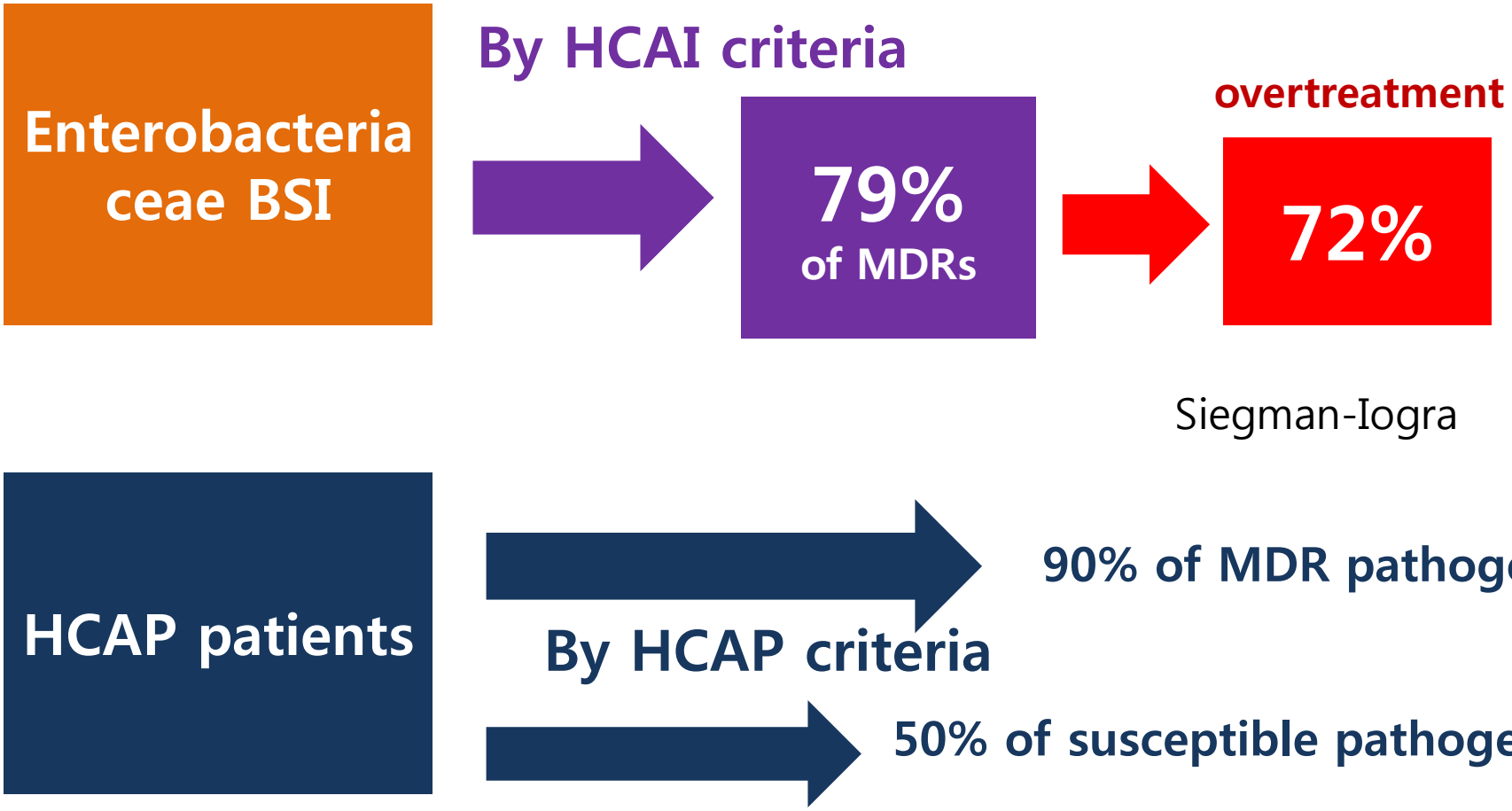
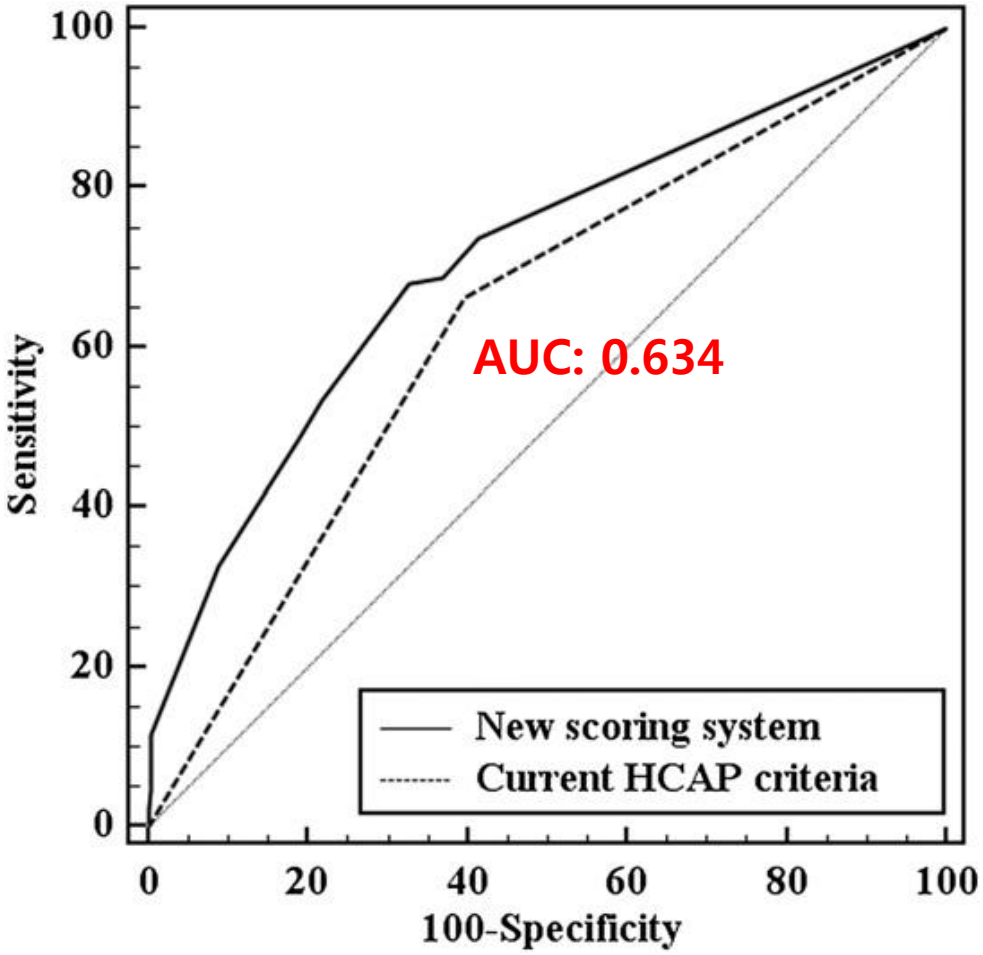

Enterobacteriaceae BSI
By HCAI criteria
79%
of MDRs
overtreatment
72%
Siegman-Iogra
HCAP patients
By HCAP criteria
90% of MDR pathogens
50% of susceptible pathogens
Micek

Table 1. Patient Characteristics[a]

Variable	Resistant Pathogen (n=289)	No Resistant Pathogen (n=350)	*P* Value
Demographics			
Age, mean (SD), y	57.8 (18.6)	59.7 (17.5)	.36
Male	58.8	53.3	.16
Elderly[b]	38.1	38.3	.95
Nonwhite	38.4	44.3	.13
HCAP risk factors			
Any HCAP risk factor	86.9	51.4	<.001
Nursing home resident	30.1	9.7	<.001
Recent hospitalization	82.0	47.4	<.001
Long-term hemodialysis	10.0	4.0	.002
Immunosuppression	35.3	25.7	.009
Severity of illness			
ICU admission	53.3	38.0	<.001
Need for mechanical ventilation	49.1	32.9	<.001

Specificity: 48.6%

Shorr et al. Arch Intern Med 2008;168;2205-2210



Park et al. Respiratory Medicine 2012;106;1311-1319

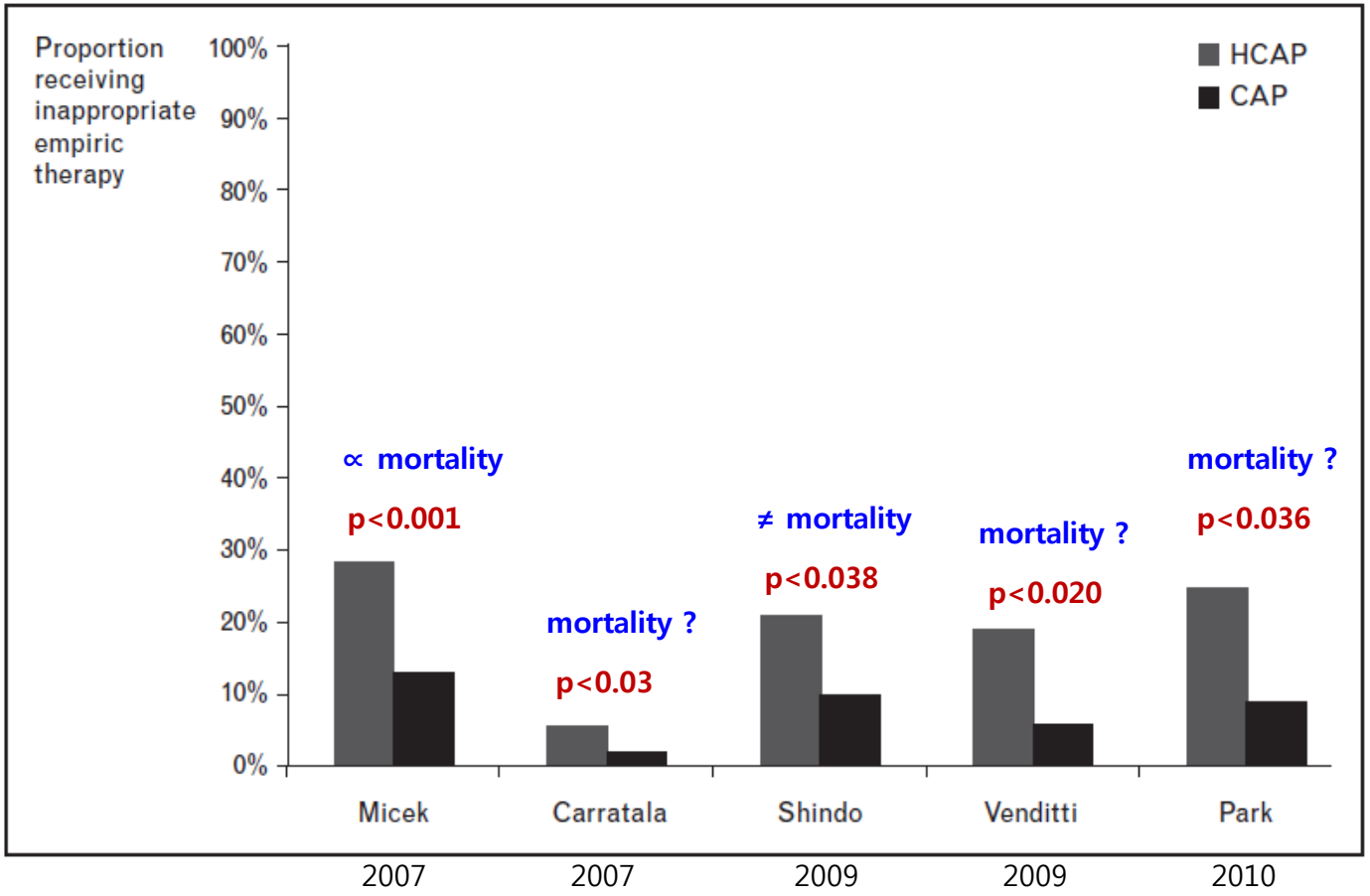
Can HCAP criteria predict MDR pathogens?

No.

4.

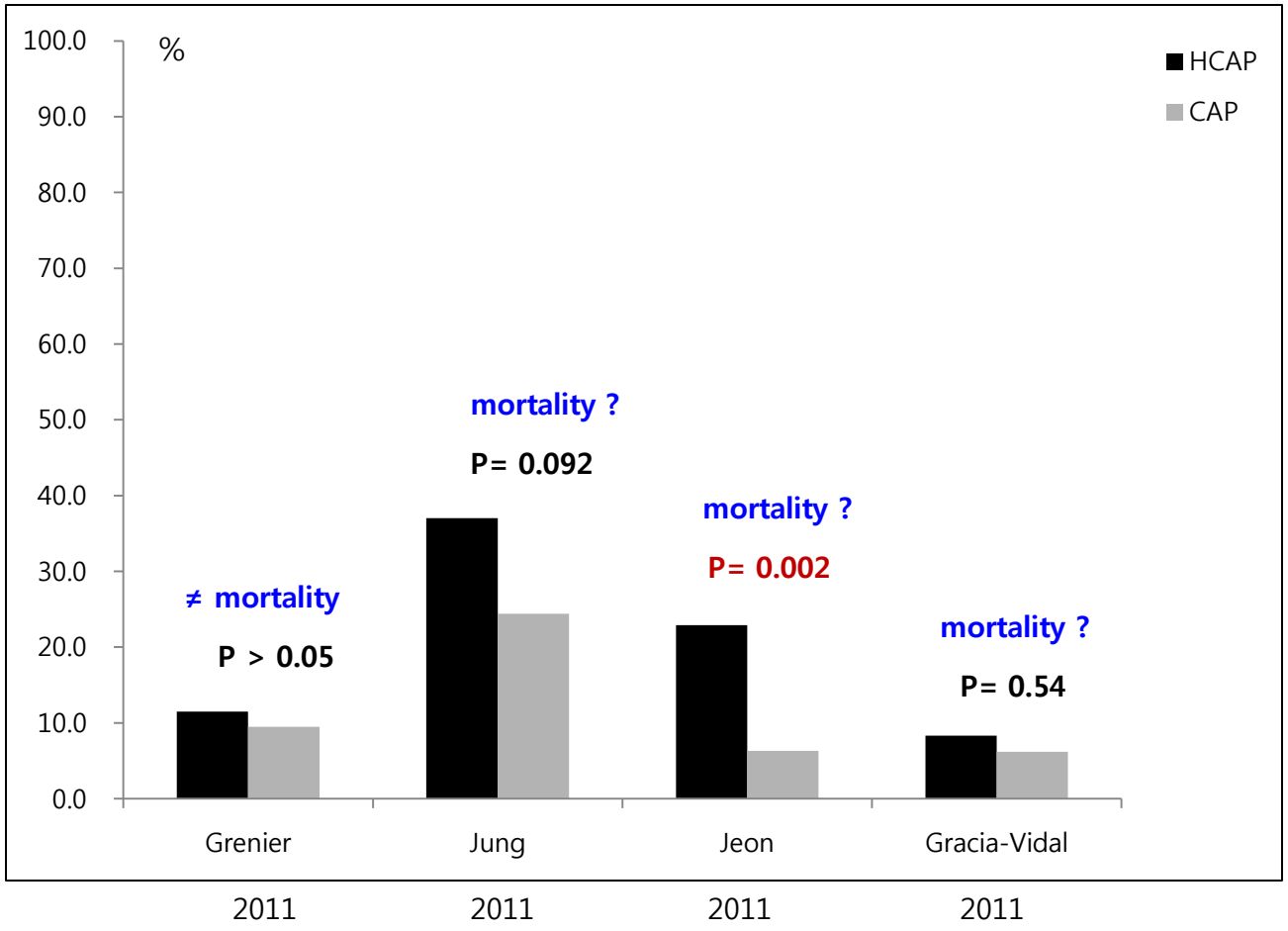
Is the rate of inappropriate antibiotic treatment high in HCAP patients?

Inappropriate Antibiotic Tx



Zilberberg et al. Curr Opin Pulm Dis 2011;11;142

Inappropriate Antibiotic Tx

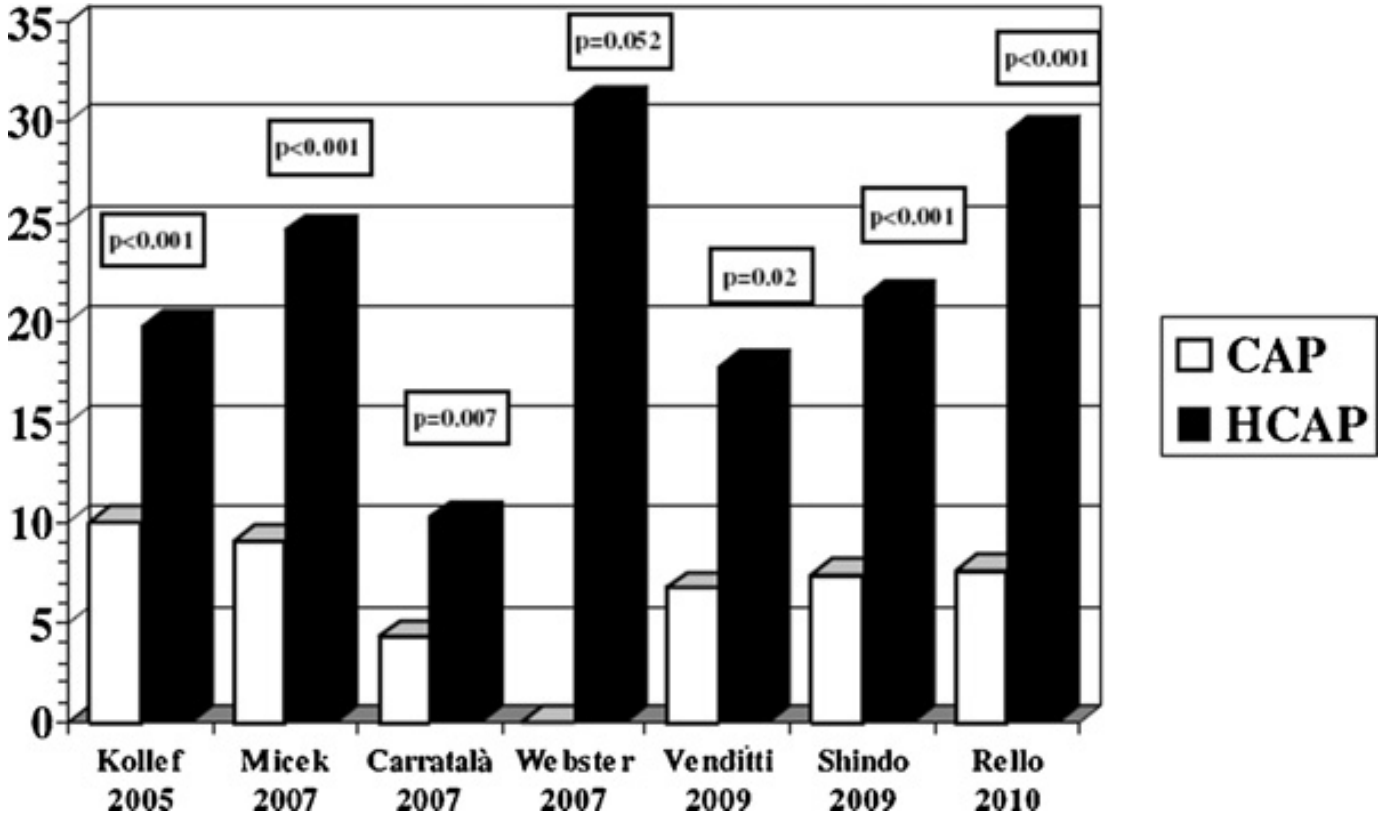


Is the rate of inappropriate antibiotic treatment high in HCAP patients

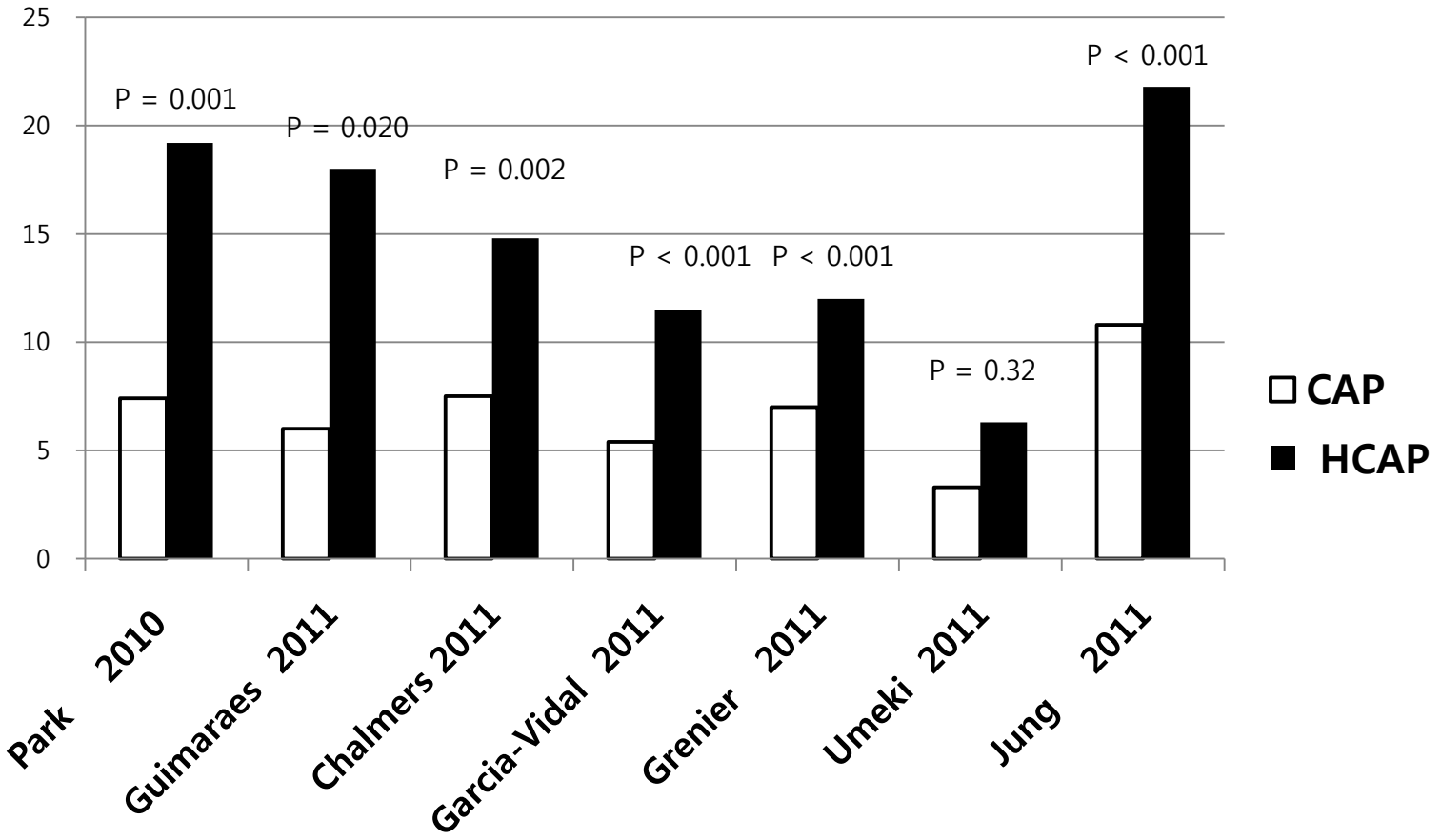
Still not sure.

5.

Mortality in HCAP patients is higher than in CAP patients?



Falcone et al Int J Infect Dis 2011;15;e545



Ewig et al. Curr Opin Infect Dis 2012;25;166

A prospective comparison of nursing home-acquired pneumonia with hospital-acquired pneumonia in non-intubated elderly

T. Maruyama [a], M.S. Niederman [f], T. Kobayashi [a], H. Kobayashi [a],

Table 4 Logistic regression analysis to compare prognosis between patients with HAP and NHAP

Prognostic factor	Coefficient	Standard error	Chi-square	*p* Value	Odds ratio	95% CI
Age years	0.123	0.032	15.161	<0.0001	1.131	1.063–1.204
Sex (M)	−0.880	0.496	3.142	0.0763	0.415	0.157–1.098
In-hospital mortality	−1.197	0.520	5.303	0.0213	0.302	0.109–0.837

HAP vs. NHAP

Maruyama et al Respiratory Medicine 2008;1021287

Mortality in HCAP patients is higher than in CAP patients?

Yes,

but it is relatively low, compared to HAP

6.

Then, the main cause of high mortality is the high MDR rates in HCAP?

Clinical outcomes of health-care-associated infections and antimicrobial resistance in patients admitted to European intensive-care units: a cohort study

(N = 119,699)

Marie-Laurence Lambert, Carl Suetens, Anne Savey, Mercedes Palomar, Michael Hiesmayr, Ingrid Morales, Antonella Agodi, Uwe Frank,

	Hazard ratio for ICU deaths (95% CI)		Hazard ratio for ICU discharge, dead or alive (95% CI)	
	Time-adjusted	Fully adjusted	Time-adjusted	Fully adjusted
Exposure				
Acinetobacter baumannii (ceftazidime sensitive)	4·3 (2·6–7·1)	2·2 (1·3–3·6)	0·58 (0·42–0·80)	0·65 (0·46–0·92)
Acinetobacter baumannii (ceftazidime resistant)	3·1 (2·2–4·3)	2·2 (1·6–3·0)	0·82 (0·68–0·99)	0·92 (0·76–1·11)
Acinetobacter baumannii (unknown)	8·7 (7·1–10·6)	3·3 (2·7–4·1)	0·72 (0·64–0·82)	0·77 (0·68–0·87)
Escherichia coli (C3G sensitive)	3·4 (2·9–4·1)	1·7 (1·5–2·1)	0·69 (0·62–0·76)	0·83 (0·75–0·92)
Escherichia coli (C3G resistant)	6·1 (4·1–9·2)	2·5 (1·6–3·8)	0·71 (0·53–0·95)	0·81 (0·60–1·09)
All four sensitive microorganisms	4·4 (4·1–4·8)	2·3 (2·1–2·5)	0·67 (0·64- 0·70)	0·87 (0·83–0·91)
All four resistant microorganisms	5·5 (4·9–6·2)	2·8 (2·5–3·1)	0·70 (0·66–0·75)	0·91 (0·85–0·97)
Ratios of hazard ratios: resistant vs sensitive				
Acinetobacter baumannii	0·7 (0·4–1·3)	1·0 (0·6–1·8)	1·43 (0·98–2·08)	1·41 (0·95–2·09)
Escherichia coli	1·8 (1·2–2·8)	1·4 (0·9–2·3)	1·03 (0·76–1·40)	0·97 (0·71–1·34)
Pseudomonas aeruginosa	1·2 (1·0–1·5)	1·2 (1·0–1·5)*	1·00 (0·88–1·13)	0·96 (0·84–1·09)
Staphylococcus aureus	1·6 (1·3–1·9)	1·3 (1·0–1·6)*	1·03 (0·92–1·15)	1·03 (0·92–1·10)
All four microorganisms combined	1·3 (1·1–1·4)	1·2 (1·1–1·4)	1·05 (0·97–1·13)	1·05 (0·97–1·13)

Interpretation Health-care-associated bloodstream infections and pneumonia greatly increase mortality and pneumonia increase length of stay in intensive-care units; the additional effect of the most common antimicrobial resistance patterns is comparatively low.

Lambert et al Lancet Infect Dis 2011;11;30

EDITOR'S CHOICE

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 3 Severity of pneumonia at admission

Table 6 Short-term and long-term mortality according to underlying aetiologies

Pathogen	Short-term mortality: Patients with CAP≥65 years (n=2569)	Short-term mortality: Patients with NHAP≥65 years (n=518)	p Value	Long-term mortality: Patients with CAP≥65 years (n=2569)	Long-term mortality: Patients with NHAP≥65 years (n=518)	p Value
Streptococcus pneumonia, n (%)	17/244 (7.0)	8/29 (27.6)	<0.001	99/244 (11.9)	10/29 (34.5)	0.001
Mycoplasma pneumonia, n (%)	2/34 (5.9)	0/0	NC	5/34 (14.7)	0/0	NC
Legionella spp., n (%)	5/95 (5.3)	2/12 (16.7)	0.132	13/95 (13.7)	4/12 (33.3)	0.079
Haemophilus influenza, n (%)	1/29 (3.4)	0/1 (0.0)	0.850	1/29 (3.4)	0/1 (0.0)	0.850
Enterobacteriaceae, n (%)	7/67 (10.4)	4/11 (36.4)	0.022	11/67 (16.4)	5/11 (45.5)	0.027
Pseudomonas spp., n (%)	2/22 (9.1)	1/3 (33.3)	0.225	2/22 (9.1)	1/3 (33.3)	0.225
*Staphylococcus aureus**, n (%)	2/17 (11.8)	4/10 (40.0)	0.088	6/17 (35.3)	8/10 (80.0)	0.025
Moraxella catarrhalis, n (%)	1/8 (12.5)	0/1 (0.0)	0.708	2/8 (25.0)	1/1 (100.0)	0.134
Influenza A, n (%)	5/55 (9.1)	1/8 (12.5)	0.759	6/55 (10.9)	2/8 (25.0)	0.263

*n=1 accounted for methicillin-resistant *S aureus*.
CAP, community-acquired pneumonia; NC, not calculable; NHAP, nursing-home-acquired pneumonia.

1-mo mortality 7.2% vs. 26.6% P < 0.001

Ewig et al Thorax 2012;67;132

Epidemiology, Antibiotic Therapy, and Clinical Outcomes in Health Care–Associated Pneumonia: A UK Cohort Study (N = 1,348)

James D. Chalmers,[1] Joanne K. Taylor,[1] Aran Singanayagam,[2] Gillian B. Fleming,[1] Ahsan R. Akram,[2] Pallavi Mandal,[2] Gourab Choudhury,[2] and Adam T. Hill[1,2]

Table 3. Demographic Comparison of Patients With CAP and Those With HCAP

The univariate odds ratio (OR) for HCAP and 30-day mortality was 2.15 (1.44–3.22; $P = .002$), but this reduced to a nonsignificant association (OR 1.29 [0.83–2.01]; $P = .3$) after adjustment for baseline PSI, comorbidities, and antibiotic therapy. In the fully adjusted model, taking account of risk factors for aspiration and premorbid functional status, this trend disappeared entirely (OR 0.97 [0.61–1.55]; $P = .9$). The Hosner-Lemeshow goodness-of-fit test was $P > .05$ for both models.

Cerebrovascular disease	10.1%	18.8%	.0001

Conclusions. HCAP is common in the United Kingdom and is associated with a high mortality. This increased mortality was primarily related to underlying patient-related factors rather than the presence of antibiotic-resistant pathogens. This study did not establish a clear indication to change prescribing practices in a UK cohort.

Functional status, mean (SD)	1.4 (1.13)	2.4 (1.44)	<.0001

Chalmers et al. Clin Infect Dis 2011;53;107

Then, the main cause of high mortality is the high MDR rates in HCAP?

Maybe not.

Age
Corbomidities
Functional status

7.

Can the guideline-concordant HCAP regimens improve treatment outcomes?

HCAP guidelines in HCAP patients…

What if, CAP guideline for HCAP patients ?

Guideline-concordant therapy and outcomes in healthcare-associated pneumonia

R.T. Attridge*,#,¶, C.R. Frei#,¶, M.I. Restrepo+,§,ƒ, K.A. Lawson#, L. Ryan#,¶,

N = 15,071
Non critically ill HCAP

Risk factors	OR (95% CI)	p-value
Sex	0.96 (0.62–1.48)	0.84
Race	1.11 (0.99–1.24)	0.08
Hispanic ethnicity	0.84 (0.62–1.14)	0.26
HCAP risk factors		
Hospital admission within 90 days	**2.49 (2.12–2.94)**	**<0.001**
Nursing home admission within 90 days	0.84 (0.56–1.26)	0.40
Haemodialysis	1.13 (0.98–1.31)	0.10
Outpatient *i.v.* antibiotics within 90 days	1.05 (0.87–1.27)	0.63
Comorbid conditions		
Myocardial infarction	0.94 (0.77–1.15)	0.57
Heart failure	1.03 (0.90–1.17)	0.69
Cerebrovascular disease	**1.20 (1.05–1.37)**	**0.01**
HIV/AIDS	1.12 (0.39–3.28)	0.83
Substance abuse or dependence		

TABLE 5 Risk factors for 30-day mortality in guideline-concordant healthcare-associated and community-acquired pneumonia patients

Substance abuse or dependence		
Tobacco use	**0.73 (0.64–0.83)**	**<0.001**
Alcohol abuse	1.11 (0.85–1.44)	0.46
Medication use by class		
Cardiovascular medications	**0.67 (0.58–0.76)**	**<0.001**
Antidiabetic medications	0.89 (0.73–1.08)	0.23
Inhaled corticosteroids	**0.70 (0.59–0.82)**	**<0.001**
Systemic corticosteroids	1.02 (0.88–1.17)	0.83
Pulmonary medications	1.04 (0.89–1.20)	0.65
Noninvasive mechanical ventilation	**1.75 (1.12–2.74)**	**0.01**
Organ failure		
GC-HCAP *versus* GC-CAP	**2.18 (1.86–2.55)**	**<0.001**

In nonsevere HCAP patients, GC-HCAP therapy is not associated with improved survival compared with GC-CAP therapy.

Attridge et al. Eur Respir J 2011;38;878

J Antimicrob Chemother 2011; **66**: 1617–1624
doi:10.1093/jac/dkr176 Advance Access publication 17 May 2011

Antimicrobial Chemotherapy

Impact of guideline-consistent therapy on outcome of patients with healthcare-associated and community-acquired pneumonia

Cynthia Grenier, Jacques Pépin, Vincent Nault, Jessika Howson, Xavier Fournier, Marie-Sol Poirier, Jérôme Cabana,

Table 5. Independent correlates for all-cause 30 day mortality among patients with CAP ($n=2646$)[a]

Variable	AOR (95% CI)	*P* value
(>30 breaths/min)		
Multilobar pneumonia	1.6 (1.1–2.2)	0.008
Bacteraemia	3.3 (2.1–5.3)	<0.001
Concordance with CAP guidelines	0.6 (0.4–0.8)	<0.001

Among patients with HCAP, 30 day mortality was similar whether an aetiological agent was demonstrated [21/209 (10%)] or not [47/354 (13%)] ($P=0.3$) and whether or not empirical treatment was concordant with guidelines [6/35 (17%)] versus 18/148 (12%) if discordant; $P=0.4$]. Adjustment for potential confounding factors did not alter this conclusion

Effect of Antibiotic Guidelines on Outcomes of Hospitalized Patients with Nursing Home–Acquired Pneumonia

Ali A. El Solh, MD, MPH,[*†‡] *Morohunfolu E. Akinnusi, MD,*[†] *Ziad Alfarah, MD,*[†] *and Anil Patel, MD*[‡]

334 NHAP

Table 3. Clinical Endpoints for Guideline-Concordant and Guideline-Discordant Therapy

Hospital mortality, n (%)	34 (13.2)	13 (17.1)	.49
30-day mortality, n (%)	39 (15.1)	17 (22.4)	.19

Table 4. Determinants of Time to Clinical Stability

Variable	Coefficient	Standard Error	*P*-Value
Age	0.39	0.25	.12
Sex	5.3	6.24	.39
Activities of daily living	1.26	0.69	.07
2003 community-acquired pneumonia guideline	6.12	5.98	.33
Pneumonia Severity Index	0.27	0.09	.006
Multilobar disease	18.4	6.48	.005

El-Solh et al. J Am Geriatr Soc 2009;57;1035

Then, the guideline-concordant HCAP regimens can improve treatment outcomes?

HCAP guidelines in HCAP patients…

Not always.

Overtreament
Emergence of
MDRs

What if CAP guideline for HCAP patients ?

Can be possible!

but after the assessment of individual MDR risks .

8.

All the HCAP criteria have the same weight?

Different Weight of HCAP criteria

- Nursing home-acquired pneumonia
- Prior hospitalization

  - Chemotherapy
  - Home IV and wound care
  - Chronic dialysis

    - Family members with MDRs

RESEARCH ARTICLE Open Access

Healthcare-associated pneumonia among hospitalized patients in a Korean tertiary hospital

Ji Ye Jung*, Moo Suk Park, Young Sam Kim, Byung Hoon Park, Se Kyu Kim, Joon Chang, Young Ae Kang

N = 527 (HCAP or CAP)

Table 5 Multivariate Analysis of Risk Factors for Occurrence of PDR Pathogens

Risk Factors	Odds Ratio	95% CI	*P-value*
Gender, female	1.50	0.75 - 3.01	0.256
Age	1.00	0.98 - 1.02	0.964
Tube feeding	14.94	4.62 - 48.31	<0.001
Residence in a nursing home or extended care facility	1.90	0.53 - 6.86	0.327
Intravenous chemotherapy within 30 days	0.62	0.22 - 1.77	0.373
Attended a hemodialysis clinic	2.81	0.86 - 9.19	0.087
Hospitalized in an acute care hospital for two or more days within 90 days of the infection	2.68	1.32 - 5.46	0.007

Jung et al. BMC Infectious Disease 2011;11;61

Available online at www.sciencedirect.com

Journal of Hospital Infection

Nursing home r ed mortality in healthcare-asso

N = 269

Predictors of in-hospital mortality

	Non-survivors (N = 25)	Survivors (N = 244)	P-value
Male sex	15 (60%)	150 (61%)	NS
Age (years), mean (range)	78 (67–86)	71 (55–81)	0.01
Comorbidity			
COPD	9 (36%)	63 (26%)	NS
Diabetes	6 (24%)	42 (17%)	NS
CHF	3 (12%)	22 (9%)	NS
Corticosteroid therapy	2 (8%)	36 (15%)	NS
Malignancy	6 (24%)	38 (16%)	NS
Dementia	2 (8%)	11 (5%)	NS
Neurological disease	3 (12%)	15 (6%)	NS
HCAP	15 (60%)	98 (40%)	NS
Separate HCAP risk category			
Haemodialysis	0 (%)	5 (2%)	NS
Intravenous antibiotics, chemotherapy or wound care	2 (8%)	25 (10%)	NS
Day clinics	1 (4%)	22 (9%)	NS
Prior hospitalisation	9 (36%)	65 (27%)	NS
Nursing home residence	8 (32%)	25 (10%)	0.005
Pneumonia severity (CURB-65 score) mean (range)	2 (2–3)	2 (0–2)	0.001
Pathogen resistant to second generation β-lactam	3 (12%)	7 (3%)	NS
Pathogen resistant to fluoroquinolone	2 (8%)	4 (2%)	NS
Antibiotic therapy prior to admission	7 (28%)	68 (28%)	NS
ED admission during daytime hours (08:00–10:00)	19 (76%)	146 (60%)	NS
Combination antibiotic therapy	2 (8%)	11 (4.5%)	NS
Pseudomonas coverage	10 (40%)	66 (26%)	NS
MRSA coverage	2 (8%)	4 (2%)	NS
Atypical coverage	7 (28%)	62 (25%)	NS
ICU admission from ED	8 (32%)	20 (8%)	0.002
ICU admission from hospital ward	6 (24%)	9 (4%)	0.001

Hospital Infection 2011;77;138

Prediction of Infection Due to Antibiotic-Resistant Bacteria by Select Risk Factors for Health Care–Associated Pneumonia

N = 639

Table 2. Independent Variables Associated With Resistant Infection[a]

Variable	Adjusted OR (95% CI)	*P* Value
Recent hospitalization	4.21 (2.89-6.15)	<.001
Nursing home resident	2.75 (1.74-4.33)	<.001
Long-term hemodialysis	2.11 (1.03-4.31)	.04
ICU admission	1.62 (1.14-2.28)	.007

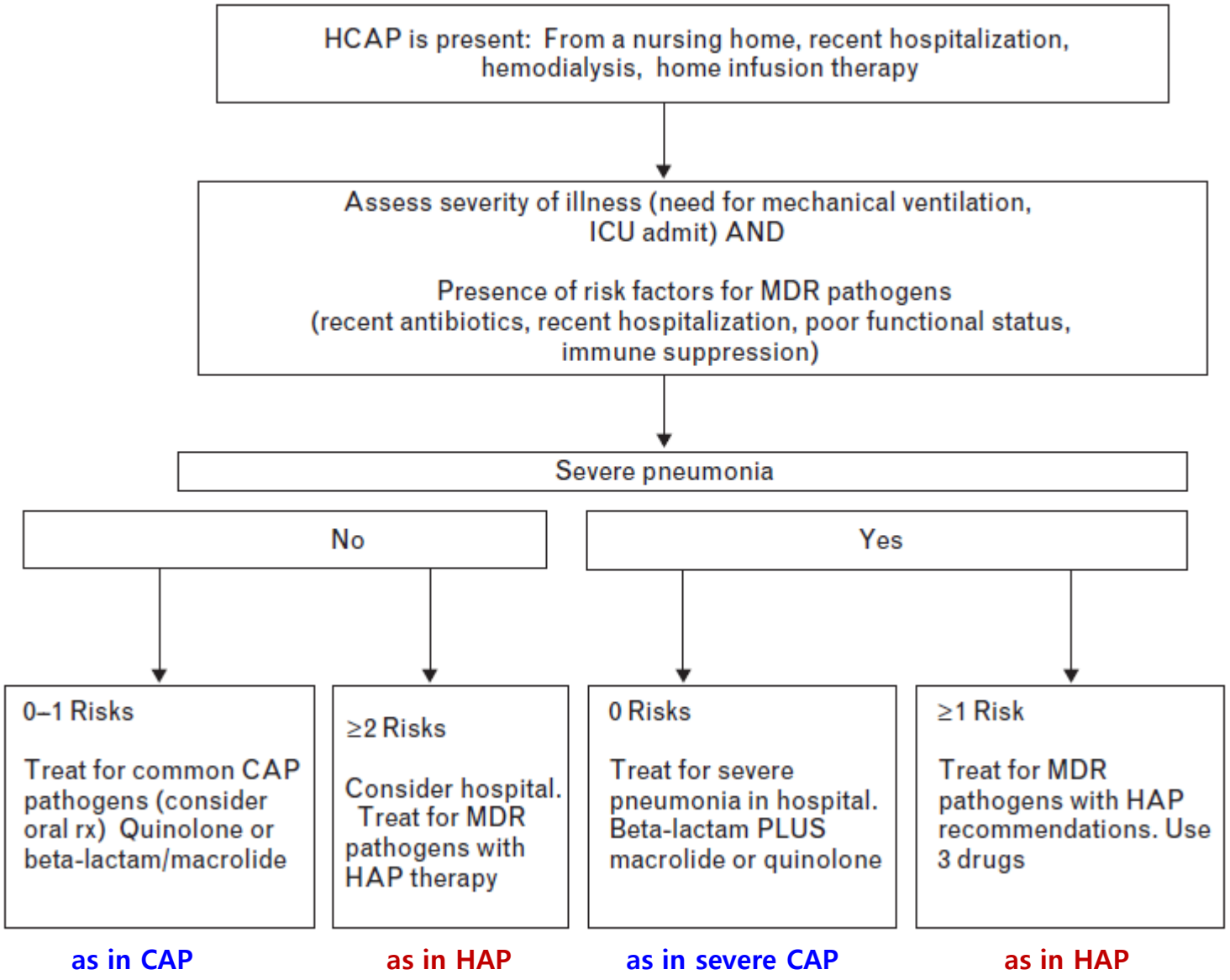
Shorr et al Arch Internal Med 2008;168;2205

All the HCAP criteria have the same weight?

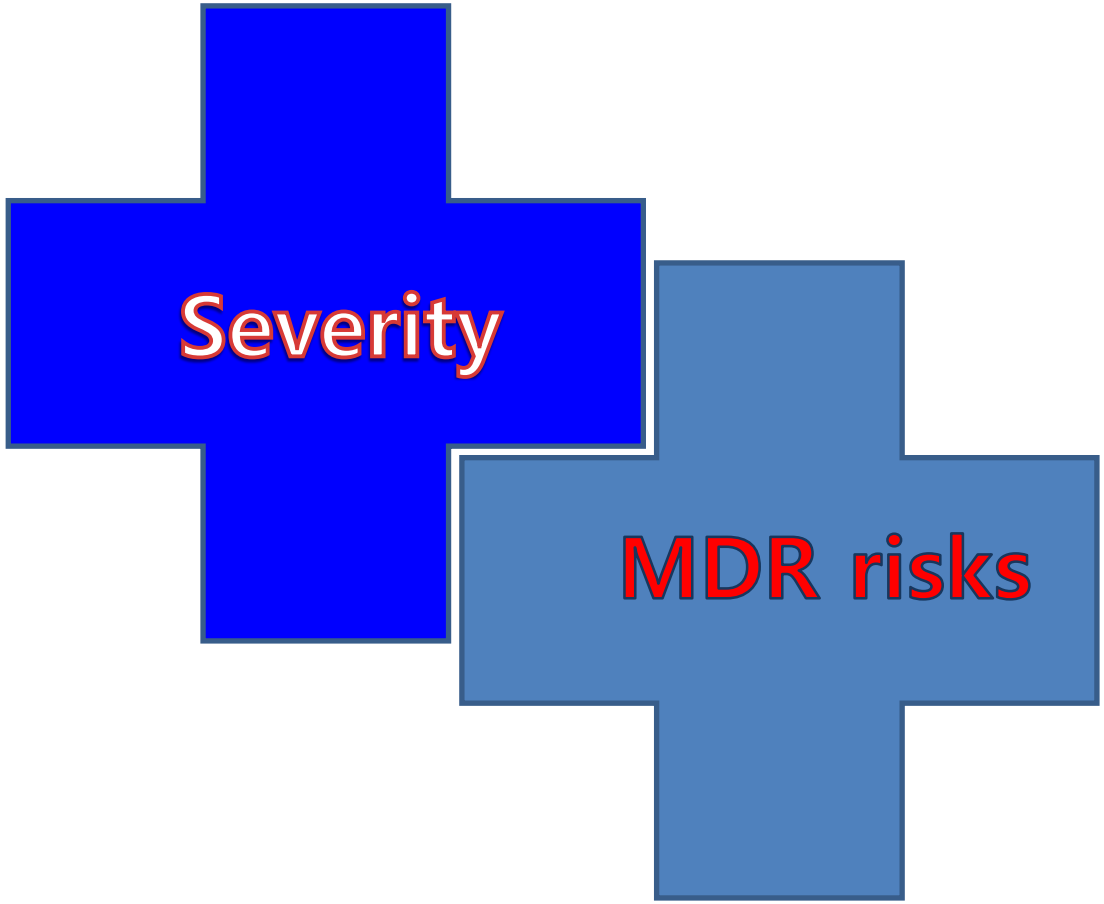
No.

Recent hospitalization & NHAP >> Other criteria

So, what is the best approach in HCAP patients?



Brito et al Curr Opin Infect Dis 2009;22;316


Severity
MDR risks

Conclusions

- HCAP criteria are heterogeneous and arbitrary.
- HCAP is associated with a high incidence of MDR pathogens and a high rate of mortality, but these rates are relatively low compared to HAP.
- Currently, MDR pathogens can not explain the excess mortality in HCAP patients.
- Individualized approach may be needed considering pneumonia severity and MDR risks.

THANK YOU.

Epidemiology, Antibiotic Therapy, and Clinical Outcomes in Health Care–Associated Pneumonia: A UK Cohort Study

James D. Chalmers,[1] Joanne K. Taylor,[1] Aran Singanayagam,[2] Gillian B. Fleming,[1] Ahsan R. Akram,[2] Pallavi Mandal,[2] Gourab Choudhury,[2] and Adam T. Hill[1,2]

N = 1,348 (UK, 2005-2009)

In a sensitivity analysis, among patients only treated according to CAP guidelines, HCAP was not associated with an increase in 30-day mortality (AOR 0.93 [0.57–1.50]; $P = .8$).

Chalmers et al. Clin Infect Dis 2011;53;107

MDR Pathogens: NHAP vs. HAP

Table 3 Causative microorganisms

	All patients $n = 108$ (%)	HAP $n = 33$ (%)	NHAP $n = 75$ (%)	p Value[a]	p Value[b]
Bacterial pathogens	49 (45.4)	21 (63.6)	28 (37.3)	0.0114	0.0577
Streptococcus pneumonia	29 (26.9)	4 (12.1)	25 (33.3)	0.0332	0.031
Staphylococcus aureus	12 (11.1)	9 (27.2)	3 (4.0)	0.001	0.0064
Enterobacteriaceae	10 (9.3)	7 (21.2)	3 (4.0)	0.0085	0.0252
Pseudomonas aeruginosa	5 (4.6)	4 (12.1)	1 (1.3)	0.0297	0.0754
Acinetobacter sp	2 (1.9)	2 (6.0)	0	0.0914	0.9952
Haemophilus influenzae	1 (0.9)	1 (3.0)	0	0.3056	–
Moraxella catarrhalis	2 (1.9)	0	2 (2.7)	>0.9999	0.9966
Anaerobes	0	0	0	–	–
Others	6 (5.6)	3 (9.0)	3 (4.0)	–	–
Atypical pathogens	38 (35.2)	10 (30.3)	28 (37.3)	0.4810	0.7301
Chlamydophila pneumoniae	35 (32.4)	9 (27.3)	26 (34.7)	0.495	0.7299
Chlamydophila psittaci	0	0	0	–	–
Mycoplasma pneumoniae	10 (9.3)	3 (9.0)	7 (9.3)	>0.9999	0.8114
Legionella pneumophila	0	0	0	–	–
Viral pathogens	28 (25.9)	7 (21.2)	21 (28.0)	0.4584	0.3748
Cytomegalovirus	9 (8.3)	3 (9.0)	6 (8.0)	>0.9999	0.8618
Influenza virus	12 (11.1)	1 (3.0)	11 (14.7)	0.1009	0.0477
Respiratory syncytial virus	5 (4.6)	2 (6.0)	3 (4.0)	0.6402	0.2044
Parainfluenza virus 3	4 (3.7)	1 (3.0)	3 (4.0)	>0.9999	0.4615
Adeno virus	0	0	0	–	–
Tuberculosis	0	0	0	–	–
Fungal pathogens	3 (2.8)	1 (3.0)	2 (2.7)	>0.9999	0.7854

Maruyama et al Respiratory Medicine 2008;102:1287

Incidence of MDR Pathogens

USA

	Micek *et al.* ($n=639$) [6]		Carratala *et al.* ($n=727$)[a] [11]		Kollef *et al.* ($n=4543$) [3]		Shindo *et al.* ($n=371$)[b] [13•]	
	CAP ($n=208$) (%)	HCAP ($n=431$) (%)	CAP ($n=601$) (%)	HCAP ($n=126$) (%)	CAP ($n=2221$) (%)	HCAP ($n=988$) (%)	CAP ($n=230$) (%)	HCAP ($n=141$) (%)
S. pneumoniae	40.9	10.4	33.9	27.8	16.6	5.5	19	13
P. aeruginosa	4.8	25.5	0.5	1.6	17	25	1.7	5.7
MRSA	12	30.6	0	0.8	8.9	26.5	0.9	3.5
Legionella	3.4	0.2	8.8	2.4	–	–	0.4	0
MSSA	13.5	13.9	0	1.6	17	21	5.2	6.4

Spain

Japan

Lujan et al. Curr Opin Crit Care 2009;15;419