



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

Εθνικό και Καποδιστριακό
Πανεπιστήμιο Αθηνών

ΠΜΣ Μονάδες Εντατικής Θεραπείας
Αναπνευστική Ανεπάρκεια – Μηχανικός αερισμός

Πνευμονία της κοινότητας

Κυριακούδη Άννα
Εντατικολόγος / Πνευμονολόγος
Επιμελήτρια Β' ΜΕΘ Α' ΠΠ
ΝΝΘΑ «Η ΣΩΤΗΡΙΑ»

Ορισμός

- Οξεία φλεγμονή του πνευμονικού παρεγχύματος, σε ασθενείς που δεν έχουν νοσηλευτεί ή έρθει σε επαφή με το σύστημα υγείας τις προηγούμενες 90 ημέρες.
- Health Care Associated Pneumonia
- Inhospital pneumonia (VAP)

Επιδημιολογία

Incidence of CAP in Europe

Literature review in >15 years, 60 studies

(All incidences reported as per 1000 person-years)

Overall annual CAP incidence: 1.07 (1.04–1.23)/1000 person-years

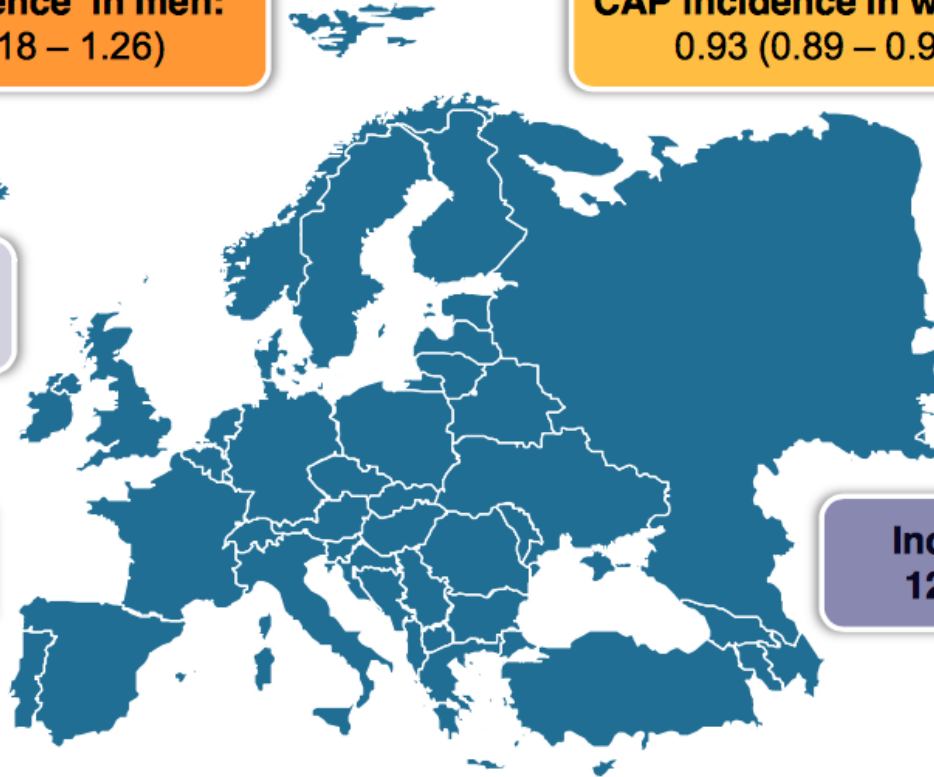
CAP incidence in men:
1.22 (1.18 – 1.26)

CAP incidence in women:
0.93 (0.89 – 0.96)

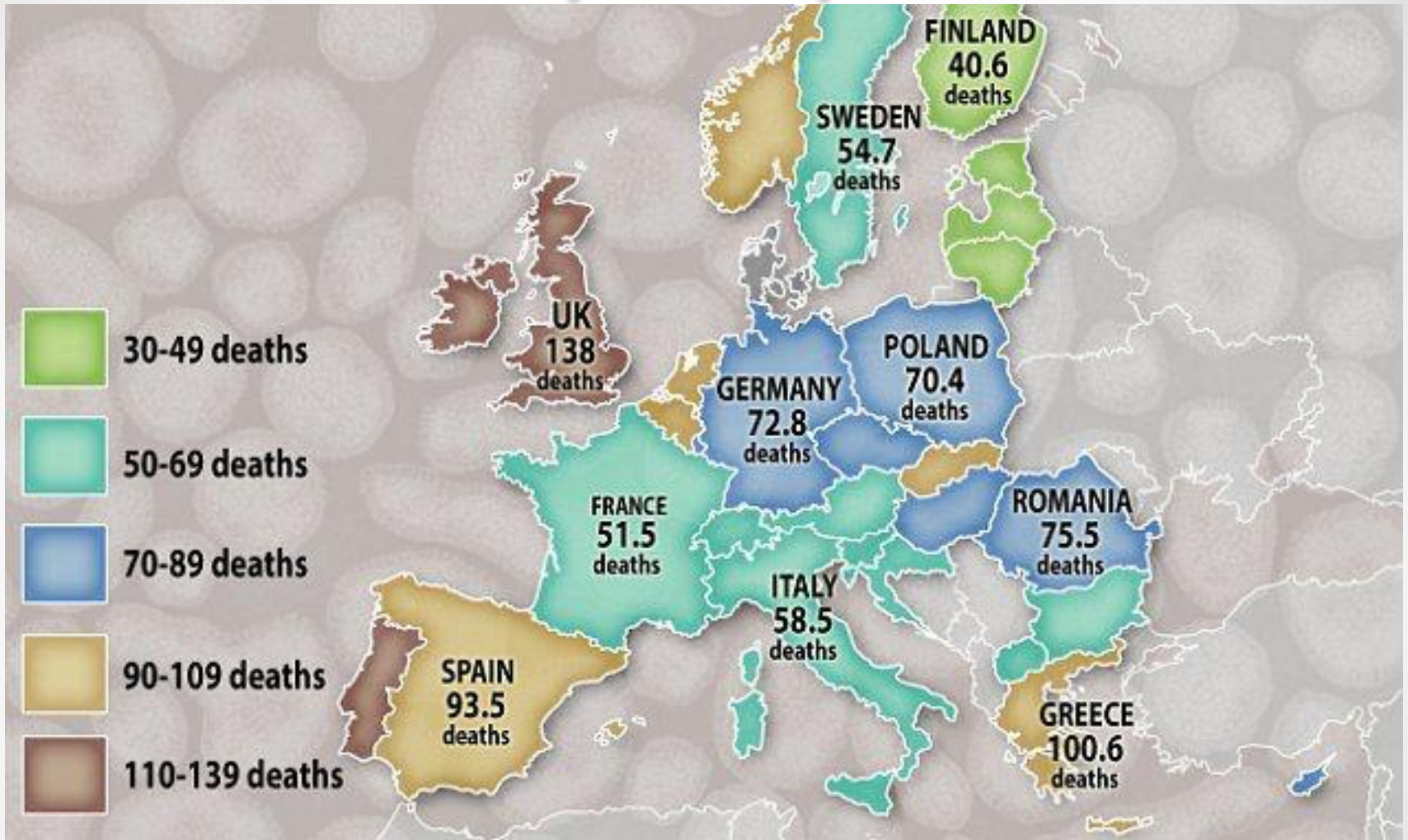
Incidence in >65 Years:
14.0 (12.7 – 15.3)

Incidence in COPD:
22.4 (21.7 – 23.2)

Incidence in HIV:
12.0 (9.9 – 14.0)



Θνητότητα



Deaths from flu and pneumonia/ 100.000 people

Παράγοντες κινδύνου

Immunocompetent at risk

- ▶ Age
- ▶ Lifestyle
 - Alcoholism
 - Smoking
- ▶ Underlying diseases
 - Chronic heart disease
 - Chronic renal disease
 - Chronic liver disease
 - Chronic respiratory disease
 - Metabolic disease
 - CNS disease
- ▶ Prior IPD
- ▶ Previous pneumonia
- ▶ Other
 - Aspiration
 - Concomitant treatment

Immunocompromised at risk

- ▶ Immunosuppression
 - Autoimmune diseases receiving steroid or immunosuppressive therapy or biological therapy
 - Cancer with immunosuppressive treatment
 - Waiting list for solid-organ transplantation (with or without immunosuppressive treatment)
 - Other immunosuppression
- ▶ Immunocompromised
 - Asplenia/splenic dysfunction
 - Primary immunodeficiencies
- ▶ HIV

CNS, central nervous system; IPD invasive pneumococcal disease.

TYPICAL PATHOGENS	ATYPICAL PATHOGENS	
<i>Streptococcus pneumoniae</i>	<i>Mycoplasma pneumoniae</i>	
<i>Haemophilus Influenzae</i>	<i>Chlamydia pneumoniae</i>	
<i>Moxarella Cataralis</i>	<i>Legionella pneumophila</i>	
<i>Staphylococcus Aureus</i>	<i>Chlamydophila psittaci</i>	
<i>Klebsiella pneumoniae</i> (in alcoholism, diabetes melitus)	<i>Coxiella Burneti</i> (Q fever)	
<i>Pseudomonas aeruginosa</i> (in brochiectasis)	Viruses	
	Influenza A,B	Parainfluenza
	Respiratory syncytial virus	Rinovirus
	Adenovirus	Coxsackie
	Ebstein-Barr virus	Coronavirus (MERS-CoV, SARS)
	Cytomegalovirus	Herpes Simplex virus

Table 1: Causes of CAP: Typical and atypical pathogens

Most common etiologies of CAP admitted in ICU

S.pneumoniae

Staphylococcus aureus

Legionella species

Gram negative bacilli

H.influenzae

Seasonal outbreak of influenza viruses

Table 2: Most common causes of CAP admitted in ICU

Συσχέτιση παθογόνων με επιδημιολογικούς παράγοντες και παράγοντες κινδύνου

Condition	Commonly encountered pathogen(s)
Alcoholism	<i>Streptococcus pneumoniae</i> , oral anaerobes, <i>Klebsiella pneumoniae</i> , <i>Acinetobacter</i> species, <i>Mycobacterium tuberculosis</i>
COPD and/or smoking	<i>Haemophilus influenzae</i> , <i>Pseudomonas aeruginosa</i> , <i>Legionella</i> species, <i>S. pneumoniae</i> , <i>Moraxella cararrhalsis</i> , <i>Chlamydophila pneumoniae</i>
Aspiration	Gram-negative enteric pathogens, oral anaerobes
Lung abscess	CA-MRSA, oral anaerobes, endemic fungal pneumonia, <i>M. tuberculosis</i> , atypical mycobacteria
Exposure to bat or bird droppings	<i>Histoplasma capsulatum</i>
Exposure to birds	<i>Chlamydophila psittaci</i> (if poultry: avian influenza)
Exposure to rabbits	<i>Francisella tularensis</i>
Exposure to farm animals or parturient cats	<i>Coxiella burnetti</i> (Q fever)
HIV infection (early)	<i>S. pneumoniae</i> , <i>H. influenzae</i> , <i>M. tuberculosis</i>
HIV infection (late)	The pathogens listed for early infection plus <i>Pneumocystis jirovecii</i> , <i>Cryptococcus</i> , <i>Histoplasma</i> , <i>Aspergillus</i> , atypical mycobacteria (especially <i>Mycobacterium kansasii</i>), <i>P. aeruginosa</i> , <i>H. influenzae</i>
Hotel or cruise ship stay in previous 2 weeks	<i>Legionella</i> species
Travel to or residence in southwestern United States	<i>Coccidioides</i> species, <i>Hantavirus</i>
Travel to or residence in Southeast and East Asia	<i>Burkholderia pseudomallei</i> , avian influenza, SARS
Influenza active in community	Influenza, <i>S. pneumoniae</i> , <i>Staphylococcus aureus</i> , <i>H. influenzae</i>
Cough >2 weeks with whoop or posttussive vomiting	<i>Bordetella pertussis</i>
Structural lung disease (e.g., bronchiectasis)	<i>Pseudomonas aeruginosa</i> , <i>Burkholderia cepacia</i> , <i>S. aureus</i>
Injection drug use	<i>S. aureus</i> , anaerobes, <i>M. tuberculosis</i> , <i>S. pneumoniae</i>
Endobronchial obstruction	Anaerobes, <i>S. pneumoniae</i> , <i>H. influenzae</i> , <i>S. aureus</i>
In context of bioterrorism	<i>Bacillus anthracis</i> (anthrax), <i>Yersinia pestis</i> (plague), <i>Francisella tularensis</i> (tularemia)

NOTE. CA-MRSA, community-acquired methicillin-resistant *Staphylococcus aureus*; COPD, chronic obstructive pulmonary disease; SARS, severe acute respiratory syndrome.

Παθοφυσιολογία

- Εισβολή και ανάπτυξη των μικροοργανισμών στο πνευμονικό παρέγχυμα
 - Εισπνοής (ιοί και άτυπα βακτήρια)
 - Εισρόφηση των στοματοφαρυγγικών εκκρίσεων στη τραχεία
 - Αιματογενή διασπορά από εντοπισμένη εστία λοίμωξης (ενδοκαρδίτιδα δε)
 - Άμεση επέκταση από γειτονικές λοιμώδεις εστίες (από λεμφαδένες σε TBC)
- Διαταραχή της άμυνας του ξενιστή

Typical symptoms

- fever
- Cough
- Sputum production
- Shortness of breathing
- Chest pain

Atypical symptoms

- Headache
- Abdominal pain
- Vomiting
- Diarrhea

Chest examination

- Audible rales

Laboratory findings

- Leukocytosis with leftward shift or leukopenia
- Elevated inflammatory biomarkers

Figure 1: Symptoms and signs of CAP

Elderly

- Altered consciousness
- Gastrointestinal discomfort
- Fever (+/-)

Legionella

- headache
- Confusion
- Diarrhoea
- Hyponatremia

Mycoplasma

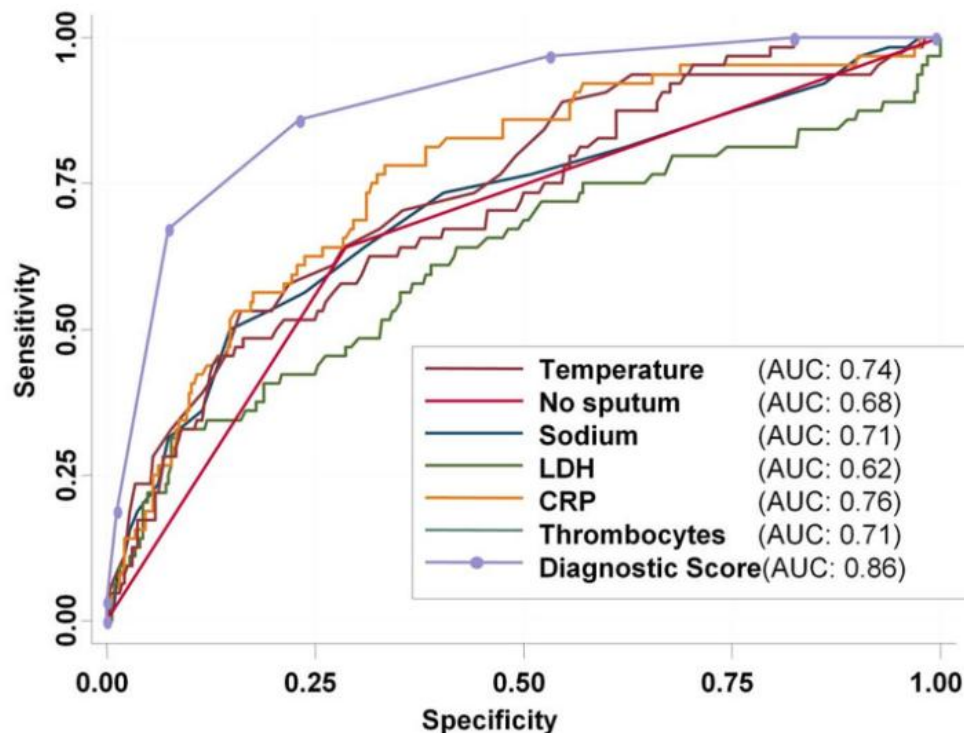
- Upper respiratory involvement
- Skin changes
- Haemolytic anemia

Chest **2014**; 145: 290–96.
Clin Microbiol Infect **2006**; 12 (suppl 3): 12–24

Association of clinical and laboratory parameters and *Legionella* etiology

	OR (95%CI)	p	AUC (95%CI)
Continuous values	Univariate analysis		
c-reactive protein (per deciles)	1.53 (1.30-1.80)	<0.001	0.78 (0.70-0.86)
sodium level (per deciles)	0.68 (0.57-0.80)	<0.001	0.75 (0.67-0.83)
temperature (per deciles)	1.34 (1.17-1.54)	<0.001	0.71 (0.62-0.80)
platelet count (per deciles)	0.88 (0.79-0.99)	0.041	0.60 (0.52-0.67)
lactate dehydrogenate (per deciles)	1.52 (1.30-1.79)	<0.001	0.77 (0.70-0.85)
dry coughs	0.61 (0.23-1.26)	0.179	0.45 (0.37-0.52)

Am J Med 2014 ;127(10):1010.e11-9.



BMC Pulmonary Medicine 2009, 9:4

Diagnostic investigations

- Laboratory evaluation
- Microbiological evaluation
- Imaging

Laboratory evaluation

- Γενική αίματος (δείκτες φλεγμονής)
- Βιοχημικός έλεγχος (βλάβες σε άλλα όργανα)
- Βιοδείκτες (CRP, PCT)
 - PCT >0,5 χορήγηση AB
 - PCT <0.1 διακοπή AB

Cochrane Database Syst Rev **2012**; 9: CD007498

Microbiological evaluation

	Outpatient	Inpatient, low severity	Inpatient, no ICU, moderate severity	Inpatient, ICU, high severity
Sputum culture	None routinely	Yes	Yes	Yes
Blood culture	None routinely	None routinely	Yes	Yes
Legionella urinary antigen	None routinely	None routinely	Yes	Yes
Pneumococcal urinary antigen	None routinely	None routinely	Yes	Yes
Invasive respiratory tract sample culture	None routinely	None routinely	None routinely	Yes
Others	None routinely	None routinely	None routinely	Yes*

The Lancet. 2015;386(9998):1097-108

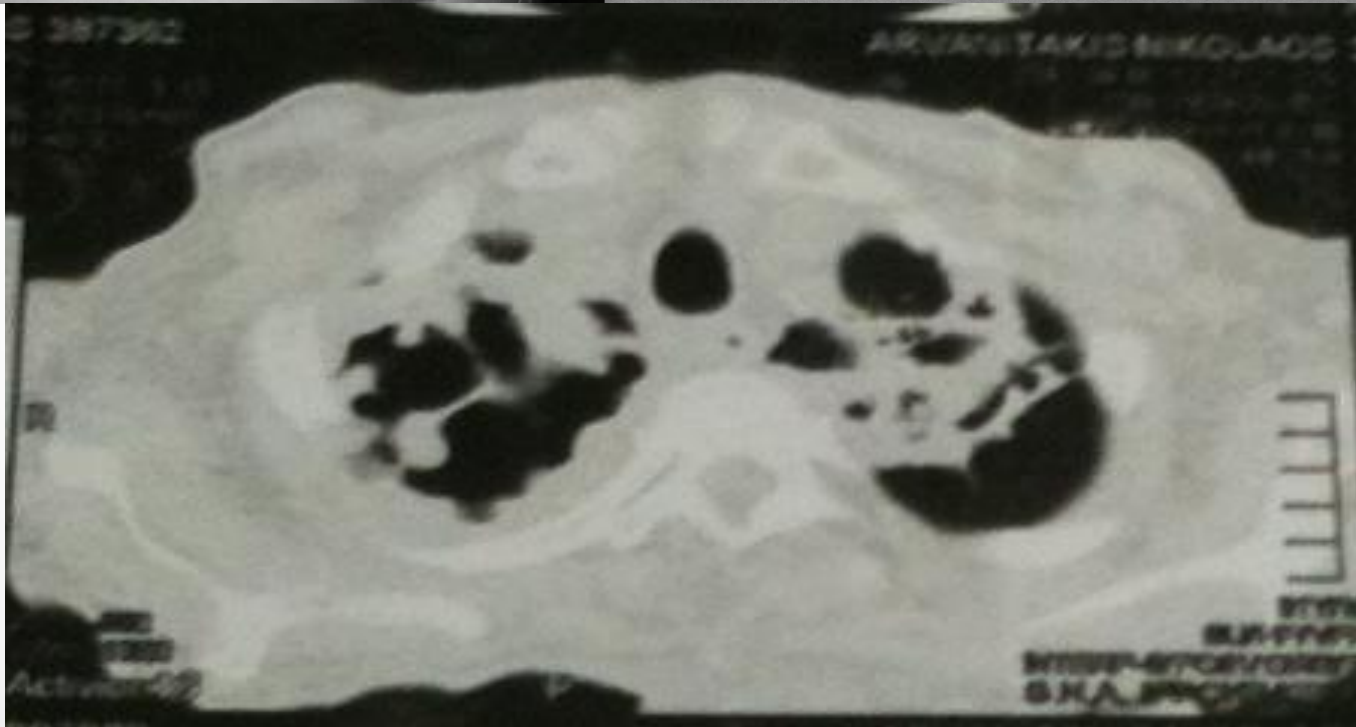
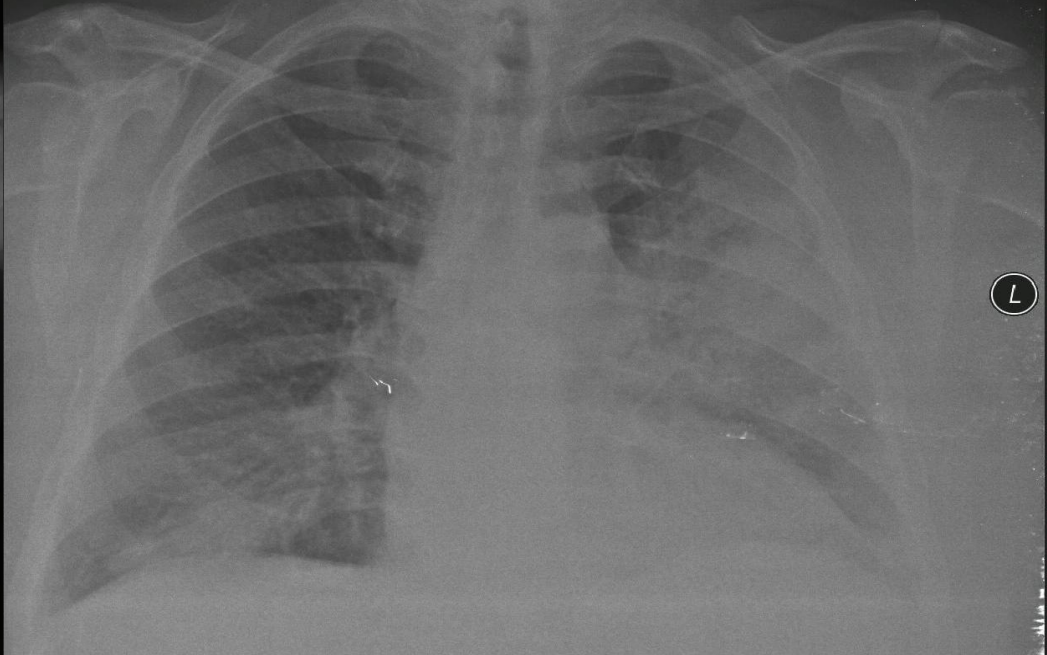
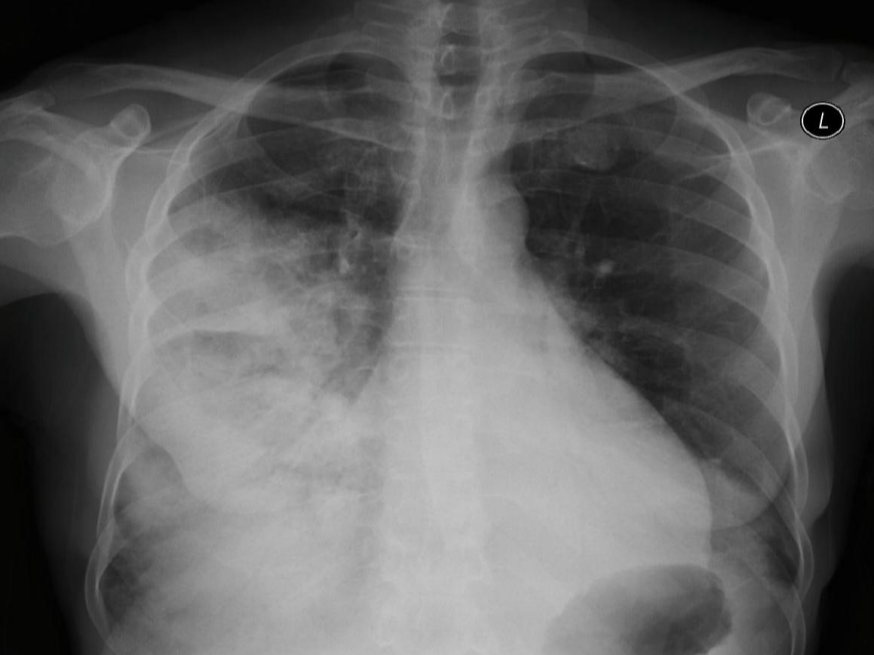


Sensitivity: 74.0% (95% CI, 66/6% - 82.3%)
Specificity was 97.2% (95% CI, 92.5% -99.8%)

J Clin Microbiol. **2013**;51:2303–2310

Sensitivity:0.74 (95% CI, 0.68 to 0.81)
Specificity was 0.991 (95% CI, 0.984 to 0.997)

Chest **2009 Dec**;136(6):1576-1585



Acute management

- Site of care
 - 1) *Does the patient need to be admitted in the hospital?*
 - 2) *Should they be treated in intensive care?*
- Antibiotics
- Adjunctive therapies
- Respiratory support

CURB 65 score

CURB 65 score	
Symptoms	Score
C onfusion	1
Blood U rea Nitrogen >7	1
R espiratory Rate >30	1
B lood pressure (Systolic <90mmHg or diastolic <60mmHg)	1
A ge >65	1

CURB-65 >2 = severe CAP,
CURB-65 >3 = ICU admission

Pneumonia Severity Index (PSI)

Demographics

- Age (1 point per year)
Male Yr
- Female Yr -10
- Nursing home residency +10

Co-morbidities

- Neoplasia +30
- Liver disease +20
- CHF +10
- Cerebrovascular disease +10
- Renal disease +10

Physical exam / vital signs

- Mental confusion +20
- Respiratory rate +20
- SBP +20
- Temperature +15
- Tachycardia +15

Laboratory / imaging

- Arterial pH +30
- BUN +20
- Sodium +20
- Glucose +10
- Hematocrit +10
- Pleural effusion +10
- Oxygenation +10



Risk class (Points)	Mortality (%)	Recommended site of care
I (<50)	0.1	Outpatient
II (51–70)	0.6	Outpatient
III (71–90)	2.8	Outpatient or brief inpatient
IV (91–130)	8.2	Inpatient
V (>130)	29.2	Inpatient

Εισαγωγή στο νοσοκομείο

- PSI score class III
- PSI class IV, V
- CURB-65>2, (CURB-65 >3 ICU admission)
- Όλοι ασθενείς με $\text{SatO}_2 < 90\%$ ή $\text{PaO}_2 < 60\text{mmHg}$ ή αιμοδυναμική αστάθεια
- CAP από high risk pathogens

**Septic shock/
vasopressors**

**Respiratory failure/
intubation
+
mechanical
ventilation**

**ICU
admission**

Minor criteria

- Respiratory rate >30 Breaths/min
- PaO₂/FIO₂ ≤ 250
- Multilobar infiltrates
- Confusion/ alteration of mental status
- Uremia
- Leukopenia
- Trombocytopenia
- Hypothermia
- Hypotension required fluid recuscitation

Major criteria

- Invasive mechanical ventilation
- Septic shock with vasopressors needs

Figure 7: Criteria for severity of CAP

SMART COP score

s

- Systolic blood pressure <90 mmHg (1 point)

m

- Multilobar CRX involvement (1 point)

a

- Albumin <3,5 mg/dl (1 point)

r

- Respiratory Rate >30/min (1 point)

t

- Tachycardia >125/min (1 point)

c

- Confusion (1 point)

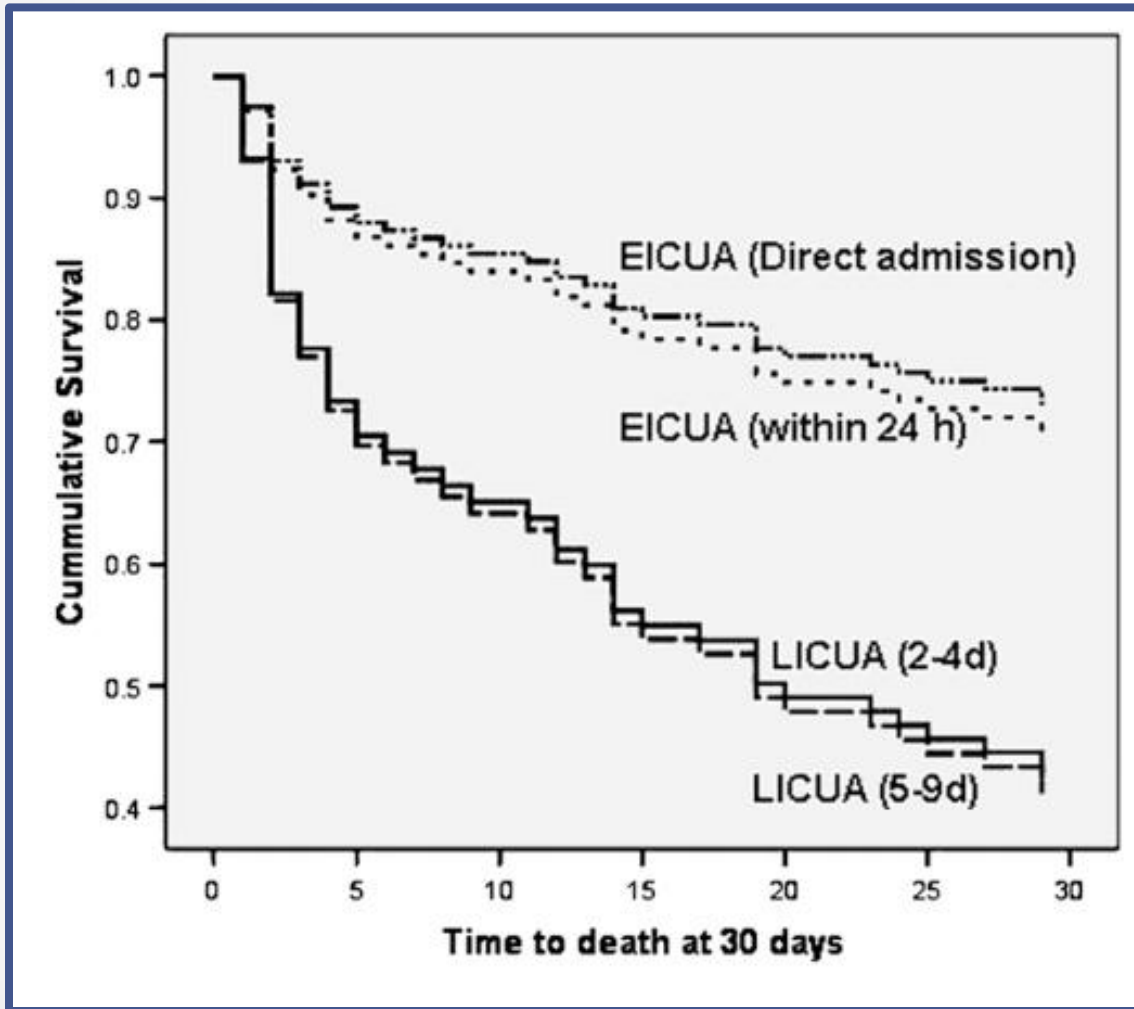
o

- Oxygen saturation <90%
- or PaO₂ <60mmHg
- or PaO₂/FiO₂ <250 (2 points)

p

- pH <7.35 (2 points)

Smart-cop >3 intensive respiratory or vasopressor support



EICUA= Early ICU admission
LICUA= Late ICU admission

CAP

Severity assessment
(clinical judgment supported by severity scores)

Low risk

CURB-65=0, 1
PSI=I, II, III

Outpatient
Inpatient
(admitted for social reasons)

Antibiotic
Monotherapy in patients
without comorbidities
or risk factors

Moderate risk

CURB-65=2
PSI=IV, V

Inpatient, no ICU

Microbiological tests

Antibiotic
Combination antibiotics
or quinolone

High risk

CURB-65=3, 4
PSI=IV, V
Severe CAP criteria:
≥3 minor, or ≥1 major criteria

Inpatient, ICU

Microbiological tests

Antibiotic
Combination antibiotics
(β-lactam plus macrolide*
or β-lactam plus quinolone)

Γενικά μέτρα αντιμετώπισης

- Οξυγονοθεραπεία
- Χορήγηση IV υγρών
- Monitoring:
 - Θερμοκρασία
 - Σφύξεις
 - ΑΠ
 - Συχνότητα αναπνοών
 - SatO₂
 - Επίπεδο συνείδησης

	American (IDSA/ATS) ³		British (NICE/BTS) ^{4,6}		European ⁵	
	Preferred	Alternative	Preferred	Alternative	Preferred	Alternative
Outpatient without comorbidities; low severity	Macrolide	Doxycycline	Amoxicillin	Macrolide or tetracycline	Amoxicillin or tetracycline	Macrolide
Outpatient with comorbidities or high rate bacterial resistance	β -lactam plus macrolide	Respiratory fluoroquinolone			Respiratory fluoroquinolone	
Inpatient not in ICU; moderate severity	β -lactam* plus macrolide	Respiratory fluoroquinolone	Amoxicillin plus macrolide	Respiratory fluoroquinolone†	Aminopenicillin with or without macrolide	Respiratory fluoroquinolone
Inpatient in ICU; high severity	β -lactam‡ plus macrolide	β -lactam‡ plus respiratory fluoroquinolone	β -lactamase stable β -lactams¶ plus macrolide	Respiratory fluoroquinolone†	Third-generation cephalosporin§ plus macrolide	Respiratory fluoroquinolone with or without a third-generation cephalosporin§

Local or adapted guidelines should be used to adapt for different epidemiology. IDS=Infectious Diseases Society of America. ATS=American Thoracic Society. NICE=National Institute for Health and Care Excellence. BTS=British Thoracic Society. ICU=intensive care unit. *Preferred β -lactam drugs include cefotaxime, ceftriaxone, and ampicillin. †Respiratory fluoroquinolone limited to situations in which other options cannot be prescribed or are ineffective (eg, hepatotoxicity, skin reactions, cardiac arrhythmias, and tendon rupture). ‡Preferred β -lactam drugs include cefotaxime, ceftriaxone, or ampicillin-sulbactam. ¶ β -lactamase-stable β -lactams include co-amoxiclav, cefotaxime, ceftaroline fosamil, ceftriaxone, cefuroxime, and piperacillin-tazobactam. §Third-generation cephalosporin (eg, cefotaxime, ceftriaxone).

Εμπειρική αντιμικροβιακή αγωγή (σε ειδικές καταστάσεις)

If pseudomonas

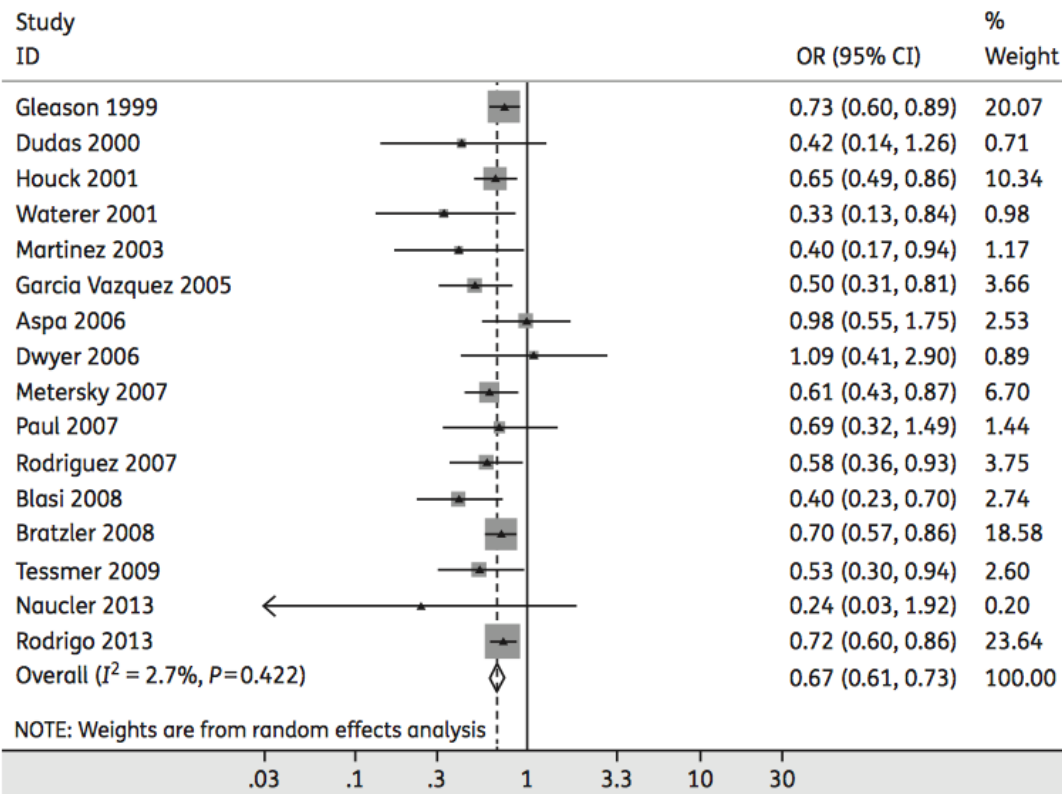
- Antipseudomonas b-lactam + Cipro or Levofloxacin
- Antipseudomonas b-lactam + aminoglycoside +Azithromycin

If MRSA

- Vancomycine or Linezolid

β-Lactam/macrolide dual therapy versus β-lactam monotherapy for the treatment of community-acquired pneumonia in adults: a systematic review and meta-analysis

Wei Nie†, Bing Li† and Qingyu Xiu*



Single versus combination antibiotic therapy in adults hospitalised with community acquired pneumonia

Chamira Rodrigo,¹ Tricia M Mckeever,² Mark Woodhead,³ Wei Shen Lim,¹ on behalf of the British Thoracic Society


Outcome measures	Total (n=5240)	β -lactam therapy (n=2001)	β -lactam/ macrolide combination therapy (n=3239)	Adjusted OR (95% CI)	p Value
30 day IP death rate	1281 (24.4)	536 (26.8)	745 (23.0)	0.72 (0.60 to 0.85)*	<0.001
ICU admission	419 (8)	136 (6.8)	282 (8.7)	0.94 (0.72 to 1.22)†	0.635
Need for MV	151 (2.9)	58 (2.9)	93 (2.9)	0.99 (0.71 to 1.38)†	0.508
Need for INS	130 (2.5)	42 (2.1)	88 (2.7)	0.87 (0.55 to 1.38)†	0.544
30-day IP death rate stratified by pneumonia severity					
Low severity (CURB65=0–1)	201/2247 (8.9)	95/908 (10.5)	106/1339 (7.9)	0.80 (0.56 to 1.16)‡	0.238
Moderate severity (CURB65=2)	370/1480 (25)	171/561 (30.5)	199/919 (21.7)	0.54 (0.41 to 0.72)‡	<0.001
High severity (CURB65 \geq 3)	710/1513 (46.9)	270/532 (50.8)	440/981 (44.9)	0.76 (0.60 to 0.96)‡	0.025

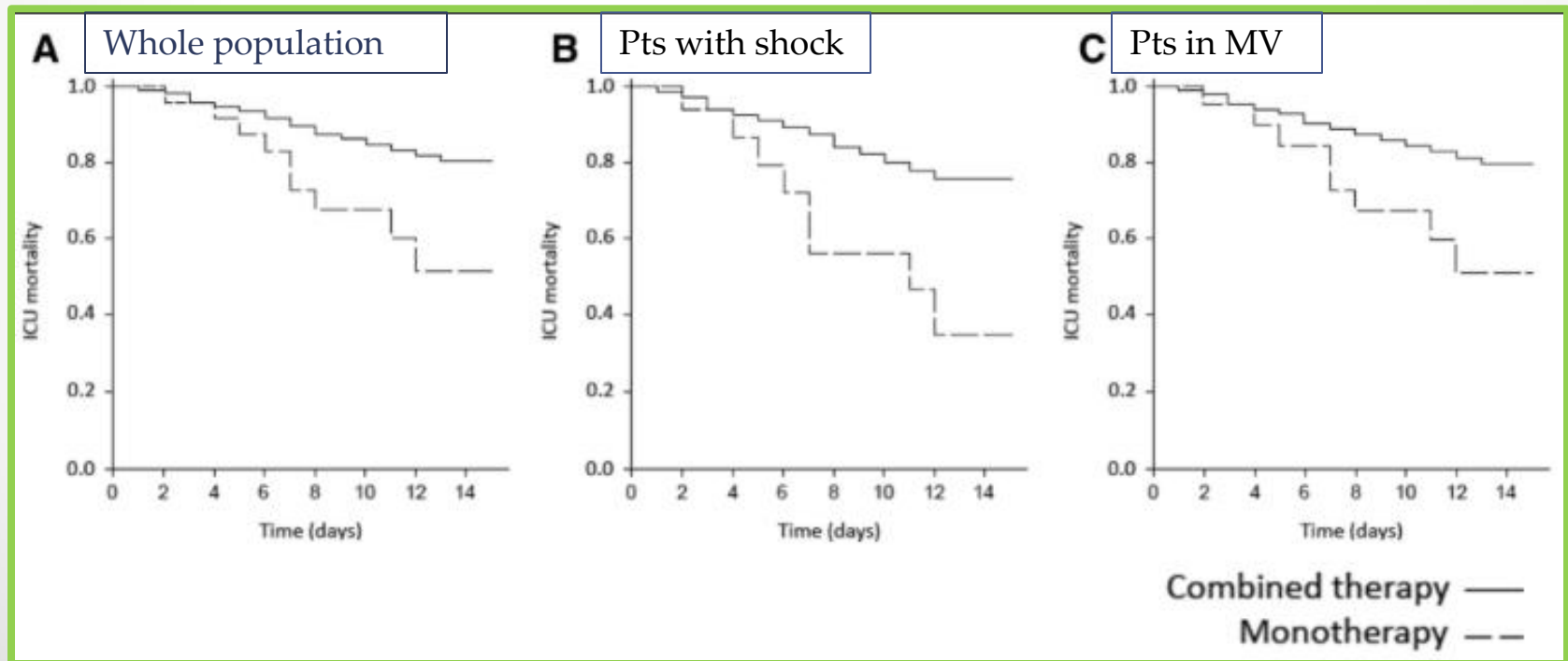
RESEARCH

Open Access

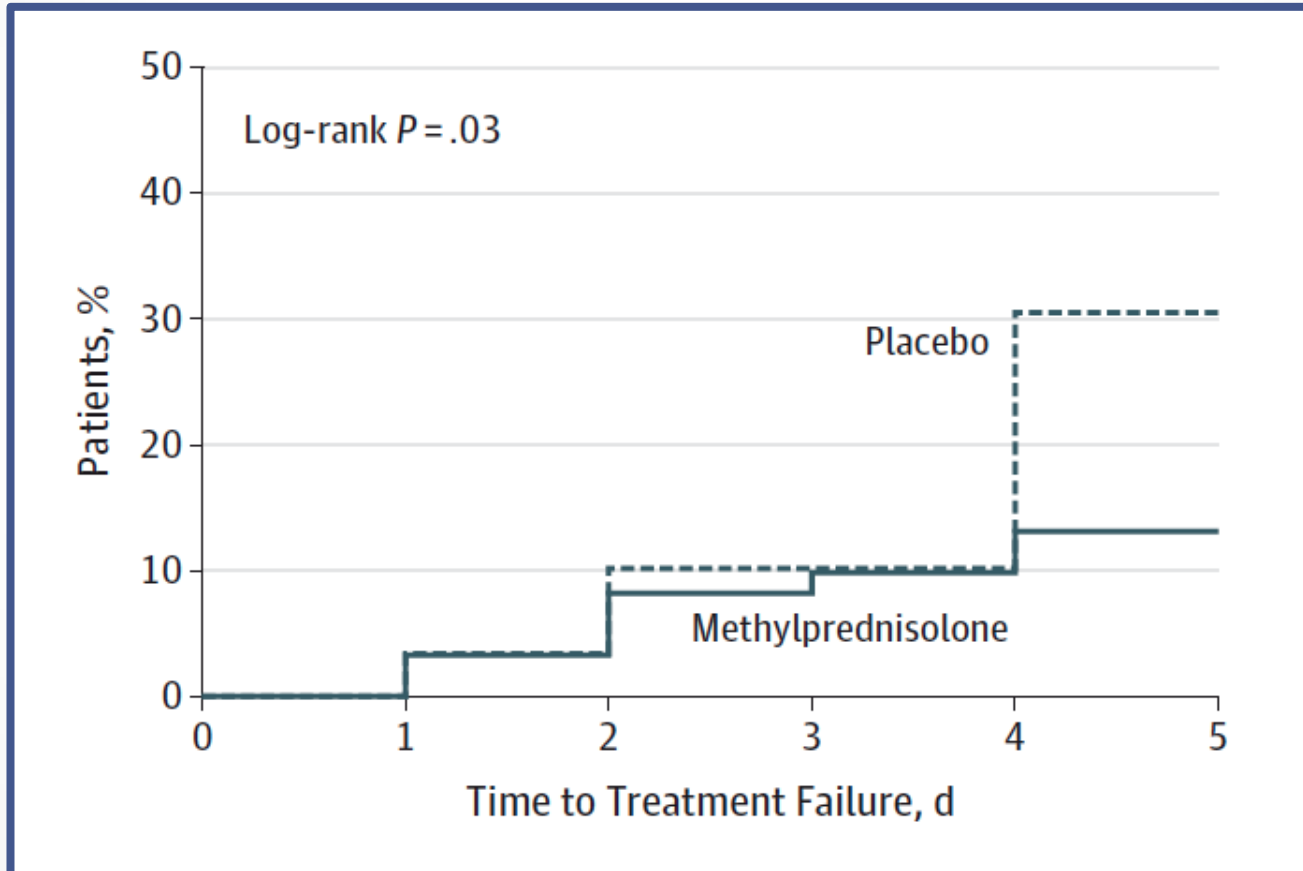


Improvement of antibiotic therapy and ICU survival in severe non-pneumococcal community-acquired pneumonia: a matched case-control study

Simone Gattarello^{1,2*} , Leonel Lagunes^{1,2}, Loreto Vidaur^{3,4}, Jordi Solé-Violán^{3,5}, Rafael Zaragoza⁶, Jordi Vallés^{3,7}, Antoni Torres^{3,8}, Rafael Sierra⁹, Rosa Sebastian⁴ and Jordi Rello^{1,2,3}



Adjunctive therapy - Corticosteroids



JAMA. 2015;313(7):677-686.

- 17 RCTs (2264 pts)
- Corticosteroids significantly reduced mortality in severe CAP (RR:0.58 95%CI:0.4-0.8) but not in non-severe CAP
- Early clinical failure rates were significantly reduced with corticosteroids in severe CAP vs non-severe CAP (RR:0.32 95%CI:0.15-0.7) vs (RR:0.68 95%CI:0.56-0.83)
- Corticosteroids reduced
 - Clinical cure
 - Length of hospital and ICU stay
 - Development of resp.failure, shock
 - Rates of pneumonia complications

Respiratory support

- NIV in severe CAP was associated with better survival
- NIV:
 - Reduce need for endotracheal intubation
 - ICU mortality
 - Length of ICU stay
- If NIV failed, avoid delayed intubation

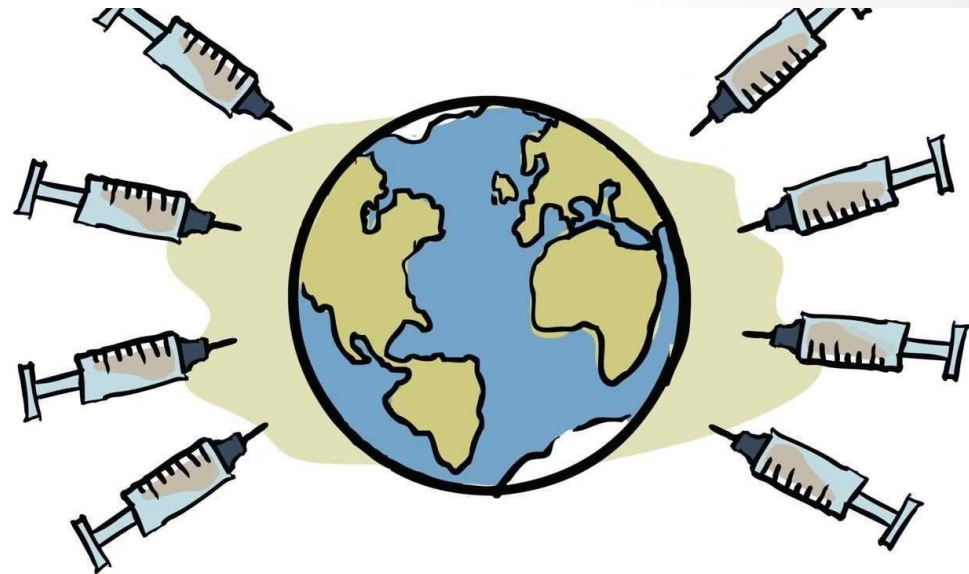
Intensive Care Med **2012**; 38: 458–66
Cochrane Database Syst Rev **2012**; 3: CD006607

Επιπλοκές της πνευμονίας

- Πλευριτική συλλογή
- Απόστημα
- Νεκρωτική πνευμονία
- Σηπτική καταπληξία
- ARDS
- Καρδιολογικά συμβάματα (οξύ στεφανιαίο συνδρο, αρρυθμίες, επιδείνωση Κ.Α)

Πρόληψη

- Διακοπή καπνίσματος
- Εμβολιασμός
 - Αντιγριπικό
 - Αντι-πνευμονιοκόκκου





Υγιεινή
χερῶν

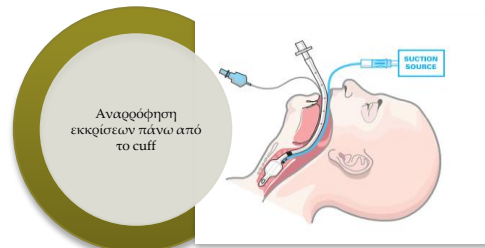


Πίεση cuff 20-30cmH2O

Stress ulcer
prophylaxis



Πλύσεις
στόματος με
Chlorhexidine



Αναρρόφηση
εκκρίσεων πάνω από
το cuff

Deep venous
thrombosis
prophylaxis



Ανύψωση
κεφαλής 30-
45°



Στοματογαστρικός
σωλήνας σίτισης

Daily sedation
assessment



Ευχαριστώ για την προσοχή σας!