SOCIETÀ ITALIANA
DI GERONTOLOGIA E GERIATRIA

La polmonite nell'anziano: effetti sulla disabilità e sulla cognitività

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CHEST

Original Research

PNEUMONIA

Decrease in Long-term Survival for Hospitalized Patients With Community-Acquired Pneumonia

Jose Bordon, MD, PhD; Timothy Wiemken, MPH; Paula Peyrani, MD; Maria Luz Paz, MD; Martin Gnoni, MD; Patricio Cabral, MD; Maria del Carmen Venero, MD; Julio Ramirez, MD; and the CAPO Study Group

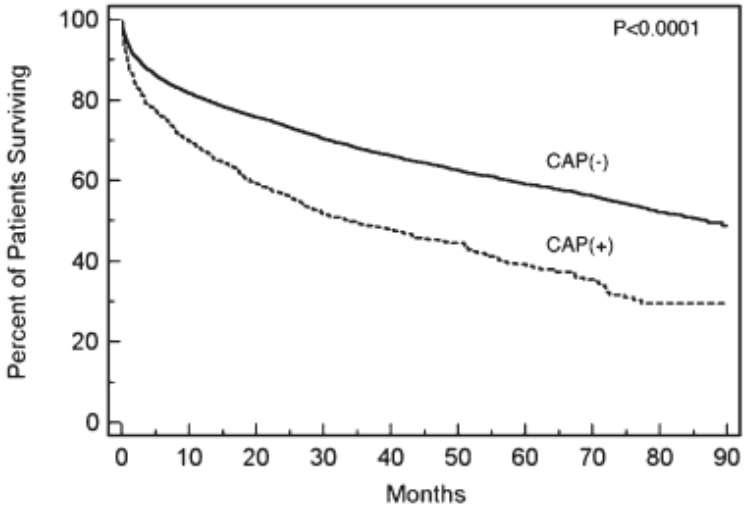

FIGURE 1. Kaplan-Meier survival curve comparing CAP(+) and CAP(−). CAP = community-acquired pneumonia; CAP(+) = patients hospitalized with diagnosis of CAP during the study period; CAP(−) = patients hospitalized for medical conditions other than CAP.

Table 3—*Factors Associated With Decreased Survival for the Study Population Using Cox Proportional Hazards Regression*

Variable	Hazard Ratio	95% CI	*P* Value
Age ≥ 65	2.6	2.43-2.86	< .0001
mCCI	1.3	1.30-1.32	< .0001
Hospitalization due to CAP	1.4	1.22-1.52	< .0001

mCCI = modified Charlson Comorbidity Index. See Table 1 for expansion of other abbreviation.

CURB-65 (Confusion, BUN, FR, BP-65y)

		score
Confusione	(demenza o delirium)	1
Azotemia	(>45 mg/dl)	1
Freq. respiratoria	(≥ 30/min)	1
Pressione arteriosa	(PAS≤90 o PAD≤60mmHg)	1
Età	(65+)	1
	Totale	____

Gruppo	Mortalità	Score	Trattamento
Gruppo 1	bassa (1,5%):	0-1	Domiciliare
Gruppo 2	intermedia (9,2%):	2	Hosp (LOS breve)
Gruppo 3	alta (22,0%):	3+	Hosp (se 4-5: ICU)

Indice di severità di polmonite- PSI

The Pneumonia Severity Index: A Decade after the Initial Derivation and Validation

Clinical Infectious Diseases 2008; 47:S133–9

Drahomir Aujesky[1] and Michael J. Fine[2,3]

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The prognosis of community-acquired pneumonia ranges from rapid resolution of symptoms and full recovery of functional status to the development of severe medical complications and death. The pneumonia severity index is a rigorously studied prediction rule for prognosis that objectively stratifies patients into quintiles of risk for short-term mortality on the basis of 20 demographic and clinical variables routinely available at presentation. The pneumonia severity index was derived and validated with data on >50,000 patients with community-acquired pneumonia by use of well-accepted methodological standards and is the only pneumonia decision aid that has been empirically shown to safely increase the proportion of patients given treatment in the outpatient setting. Because of its prognostic accuracy, methodological rigor, and effectiveness and safety as a decision aid, the pneumonia severity index has become the reference standard for risk stratification of community-acquired pneumonia.

Punteggio <90: consigliata una gestione a Domicilio

Punteggio >91: consigliata una gestione in Ospedale

Journal of HOSPITAL MEDICINE www.journalofhospitalmedicine.com

ORIGINAL RESEARCH

Short-Term Mortality Among Older Persons Hospitalized for Pneumonia: Influence of Baseline Patient Characteristics Beyond Severity of Illness

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[1]Department of Geriatric Medicine, Tan Tock Seng Hospital, Singapore; [2]National Healthcare Group Health Services & Outcomes Research, Singapore; [3]Department of Respiratory and Critical Care Medicine, Tan Tock Seng Hospital, Singapore; [4]Department of Respiratory and Critical Care Medicine, National University Hospital System, Singapore.

BACKGROUND: Although severity of illness indices such as pneumonia severity index (PSI) are good predictors of short-term mortality for community-acquired pneumonia (CAP) and healthcare-associated pneumonia (HCAP), other patient factors may have added prognostic value.

OBJECTIVE: To identify patient factors beyond the PSI which explain 30-day mortality among older persons hospitalized with CAP and HCAP.

DESIGN: Retrospective cohort study.

SETTING: Three acute care hospitals in Singapore in 2007.

PATIENTS: Hospitalized adults aged 65 years or older who have primary International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes 480 to 486 with clinical and radiological features of pneumonia.

INTERVENTIONS: None.

MEASUREMENTS: Thirty-day mortality, PSI class, demographic and clinical features, comorbid conditions, functional status, selected laboratory tests, and chest radiographic findings.

RESULTS: Among 1607 patients included, 890 (55.4%) had CAP and 717 (44.6%) had HCAP. After adjustment for PSI class in logistic regression analyses, pre-morbid ambulation impairment (odds ratio [OR] 2.61, 95% confidence interval [CI] 1.98 to 3.45), hospitalization in the prior 30 days (OR 1.93, 95% CI 1.38 to 2.71), and absence of cough and purulent sputum (OR 1.47, 95% CI 1.14 to 1.90) were all significantly associated with 30-day mortality. These associations remained constant when CAP and HCAP were analyzed separately.

CONCLUSIONS: Recent hospitalization, pre-morbid ambulation impairment, and atypical presentation were independently associated with higher 30-day mortality among older persons hospitalized for pneumonia, after adjusting for severity of illness. These factors could be considered in addition to PSI when performing risk stratification and adjustment in this setting. *Journal of Hospital Medicine* 2012;7:211–217. © 2011 Society of Hospital Medicine.

Caratteristiche dei pazienti anziani ospedalizzati per polmonite

Table 1. Characteristics and 6-Month Mortality Rate of 1803 Inpatients Consecutively Admitted in a Geriatric Ward for Pneumonia or Other Acute Noninfectious Diseases*

Characteristic	Pneumonia (n = 241)	Acute Noninfectious Diseases (n = 1562)	*P* Value
Age, y	83.3 ± 6.9	79.7 ± 7.0	.001
Male, %	24.5	19.3	.001†
MMSE score	19.7 ± 9.1	22.9 ± 7.1	.001
GDS score	5.1 ± 3.2	5.1 ± 3.6	.98
Barthel Index (15 days before admission)	72.6 ± 31.5	83.8 ± 23.2	.001
Barthel Index (on admission)	55.3 ± 37.9	74.5 ± 30.0	.001
IADL (functions lost)	3.9 ± 3.0	3.1 ± 2.8	.001
Diseases, No.	6.1 ± 2.1	5.3 ± 2.0	.001
Charlson Index	8.3 ± 2.5	7.0 ± 2.6	.001
Drugs, No.	4.5 ± 2.3	4.3 ± 1.9	.19
APACHE II score	13.3 ± 6.3	7.9 ± 4.1	.001
APS-APACHE II subscore	3.8 ± 4.2	1.9 ± 2.7	.001
Serum albumin, g/dL	3.6 ± 1.3	3.9 ± 0.6	.001
Hemoglobin, g/dL	11.7 ± 2.3	12.3 ± 2.0	.02
Serum cholesterol, mg/dL	186.2 ± 51.9	204.7 ± 51.1	.001
CRP, mg/dL	7.5 ± 5.6	2.6 ± 7.8	.001
Creatinine, mg/dL	1.2 ± 0.8	1.1 ± 0.8	.20
Length of stay, d	8.1 ± 5.1	6.4 ± 3.3	.001
6-mo mortality, %	27.4	20	.001†

Abbreviations: APACHE, Acute Physiology and Chronic Health Examination; APS, Acute Physiology Score; CRP, C-reactive protein; GDS, Geriatric Depression Scale; IADL, Instrumental Activities of Daily Living; MMSE, Mini-Mental State Examination.

SI conversion factors: To convert cholesterol to millimoles per liter, multiply by 0.0259. To convert creatinine to micromoles per liter, multiply by 88.4.

*Data are mean ± SD value unless otherwise specified.

†*P* value derived from χ^2 test. Other *P* values were derived from the *t* test.

(Rozzini et al. 2003)

ARCHIVES OF INTERNAL MEDICINE

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]

Table 2. Numbers of HCAP Patients in Each of the IDSA/ATS 2005 Risk Categories for HCAP[a]

Health care–Associated pneumonia risk factors	
Hospitalized within 3 months	105 (37.9%)
Residence in a long-term–care facility	98 (35.4%)
Home infusion therapy	26 (9.4%)
Home wound care	32 (11.6%)
Outpatient hemodialysis	7 (2.5%)
Known colonization with resistant pathogens	18 (6.5%)

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

[a] Numbers and percentages add up to >277 and 100% as some patients have more than 1 risk factor.

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]

Clinical Infectious Diseases 2011;53(2):107–113

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

	CAP patients	HCAP patients	*P* value
N	1071	277	
Demographics			
Age, median (IQR)	65 (48–77)	76 (65–83)	<.0001
Gender, % male	48.9%	53.8%	.2
Comorbidities			
Congestive cardiac failure	15.8%	29.6%	<.0001
Liver disease	4.9%	4.3%	.8
Renal failure	6.3%	8.3%	.3
Cerebrovascular disease	10.1%	18.8%	.0001
COPD	18.3%	30.0%	<.0001
Diabetes	9.3%	13.4%	.06
Risk factors for aspiration	11.6%	22.4%	<.0001
Functional status, mean (SD)	1.4 (1.13)	2.4 (1.44)	<.0001

NOTE. CAP, community-acquired pneumonia; COPD, chronic obstructive pulmonary disease; HCAP, health care–associated pneumonia; IQR, interquartile range.

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.

Characteristics, in H and 3-mos mortality rate of 356 Elderly Pts Hospitalized for Pneumonia

	CAP (N=235) M±SD / N(%)	HCAP (N=76) M±SD / N(%)	*P**	HAP (N=45) M±SD /N (%)	*P†*,	*P‡*
Age (years)	81.6±8.2	81.2±8.9	*0.785*	78.7±8.5	*0.033*	*0.118*
Gender (males)	115 (48.9)	35 (46.1)	*0.380*	20 (44.4)	*0.349*	*0.507*
CPR (mg/dl)	9.4±10.4	10.3±10.2	*0.506*	11.7±10.1	*0.181*	*0.478*
Serum Albumin (g/dl)	3.4±0.6	3.1±0.6	*0.009*	2.9±0.6	*0.000*	*0.101*
COPD	117 (49.8)	38 (50.0)	*0.540*	26 (57.8)	*0.206*	*0.261*
Heart failure (NYHA III-IV)	82 (34.9)	35 (46.1)	*0.055*	15 (33.3)	*0.493*	*0.118*
Renal Failure	56 (24.0)	26 (35.6)	*0.038*	12 (27.9)	*0.356*	*0.259*
Stroke	30 (12.8)	15 (19.7)	*0.097*	11 (24.4)	*0.041*	*0.349*
Cancer	27 (11.5)	12 (15.8)	*0.217*	8 (17.8)	*0.179*	*0.482*
Delirium	46 (19.6)	17 (22.4)	*0.353*	18 (40.0)	*0.004*	*0.032*
Dementia	85 (38.6)	37 (51.4)	*0.039*	24 (58.5)	*0.014*	*0.100*
Charlson Index	2.9±1.9	3.2±1.8	*0.191*	4.1±2.9	*0.000*	*0.040*
Drugs (n)	6.5±3.2	7.1±3.5	*0.244*	8.0±3.6	*0.009*	*0.205*
Disabled (2 wks before adm)	42 (17.9)	25 (32.9)	*0.006*	15 (33.3)	*0.019*	*0.557*
APACHE II-APS	7.3.9±6.2	9.8±6.9	*0.003*	10.9±5.9	*0.003*	*0.874*
CURB-65 (Class 3)	118 (50.2)	42 (55.3)	*0.263*	28 (62.2)	*0.094*	*0.289*
Length of stay (days)	6.7±3.4	6.5±3.8	*0.811*	8.2±5.3	*0.013*	*0.050*
In hospital mortality	23 (9.8)	14 (18.4)	*0.038*	10 (22.2)	*0.022*	*0.389*
Total 3 months mortality	65 (27.7)	29 (38.2)	*0.011*	20 (44.4)	*0.021*	*0.312*

(unpublished data)

Polmonite e stato funzionale

Functional status determined by Barthel Index predicts community acquired pneumonia mortality in general population

José Murcia [a], Pere Llorens [a], José Sánchez-Payá [b], Sergio Reus [c], Vicente Boix [c], Esperanza Merino [c], Fadoua Laghzaoui [a], Joaquín Portilla [c,*]

Table 3 30-day Mortality associated variables. Bivariate and multivariate analysis.

	Death *n*/total (%)	cOR (CI95%)	*p*	aOR (CI95%)	*p*
Pneumonity severity index					
IV–V	38/198 (19.2)	12.4 (5.1–29.8)	<0.001	3.9 (1.2–2.7)	<0.05
I–III	6/318 (1.9)				
Sex					
Male	26/341 (7.6)	0.7 (0.4–1.4)	NS	–	–
Female	18/176 (10.2)				
Barthel index					
≤80	33/138 (23.9)	10.5 (5.2–21.6)	<0.001	3.9 (1.4–10.5)	<0.05
>80	11/378 (2.9)				
Multilobar infiltrate					
Yes	17/85 (20)	3.8 (1.9–7.3)	<0.001	2.9 (1.1–7.3)	<0.05
No	27/431 (6.2)				

Pneumonia and Mortality Beyond Hospital Discharge in Elderly Patients

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Table 2—*Three-Month Mortality Risk in 2,948 Elderly Hospitalized Patients*

Characteristic	Events/No. of Patients	RR[a]	95% CI	RR[b]	95% CI
Age ≥ 90 y	58/269	2.5	1.8-3.4	1.7	1.2-2.4
Male	144/1,070	1.5	1.2-1.8	…	…
Smoker	103/857	1.2	1.0-1.5	1.2	1.0-1.8
Disabled 2 wk before admission	145/642	3.5	2.7-4.4	1.6	1.2-2.2
APACHE II-APS subscore > 12	55/138	6.2	4.3-8.9	1.7	1.2-2.6
Urea/creatinine ratio > 60	110/770	1.7	1.3-2.2	1.4	1.1-1.9
Pneumonia	46/240	2.1	1.5-2.9	1.4	0.9-2.0
Delirium	71/322	2.6	1.9-3.5	1.5	1.1-2.1
Dementia	122/554	3.6	2.8-4.6	1.9	1.4-2.7
COPD	88/608	1.5	1.2-1.9	2.4	1.1-5.8
Renal failure	70/447	1.7	1.2-2.2	…	…
Malnutrition	70/227	4.4	3.2-5.9	1.9	1.3-2.6
Stroke	65/362	1.9	1.4-2.6	…	…
Metastatic cancer	50/173	3.7	2.6-5.3	1.2	1.1-1.3
Charlson index ≥ 5	217/1,067	4.2	3.3-5.4	1.8	1.3-2.5
Drugs ≥ 7	133/621	2.5	1.9-3.3	1.6	1.2-2.1

Cox proportional hazard ratio was used to model the time-of-death data to identify possible predictors of mortality. Variables significantly associated with mortality in crude analysis were included as potential confounders in a final Cox proportional hazards regression model, with CAP admission status as the main predictor and time to death as the outcome. RR = relative risk. See Table 1 for expansion of other abbreviations.

[a]Crude analysis.

[b]Final Cox proportional hazards regression model.

Rozzini et al. Chest 2011

CHEST Original Research
CRITICAL CARE

Only Severely Limited, Premorbid Functional Status Is Associated With Short- and Long-term Mortality in Patients With Pneumonia Who Are Critically Ill

A Prospective Observational Study

Wendy I. Sligl, MD; Dean T. Eurich, PhD; Thomas J. Marrie, MD; and Sumit R. Majumdar, MD

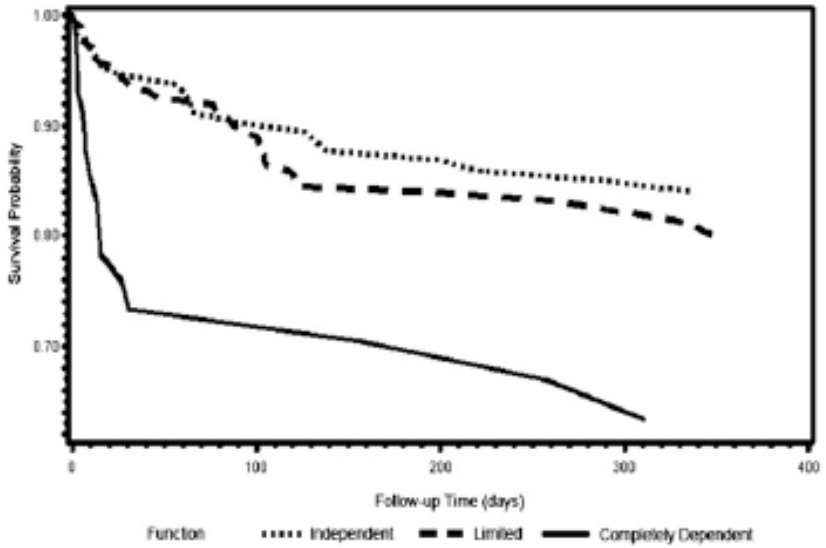

FIGURE 1. Mortality of patients who are critically ill with pneumonia according to functional status over 1 year of follow-up (adjusted survival curves).

Table 2—*Results of Multivariable Regression Examining Functional Status as a Correlate of 30-d and 1-y Mortality in Patients With Pneumonia in ICUs*

Variable	30-d Mortality	1-y Mortality
Functionally independent	1.0	1.0
Limited mobility	1.1 (0.4-3.0)	1.3 (0.7-2.3)
Completely dependent	5.3 (2.0-14.1)	3.0 (1.5-6.1)
Age, per decade	1.4 (1.0-1.9)	1.4 (1.2-1.7)
Male sex	0.8 (0.4-1.7)	0.9 (0.5-1.4)
Nursing home residence	1.3 (0.6-3.1)	1.5 (0.8-2.6)
PSI score, per 10 points	1.1 (0.9-1.2)	1.1 (1.0-1.2)

Mortality data are given as adjusted hazard ratio (95% CI). See Table 1 legend for expansion of the abbreviation.

La dipendenza funzionale premorbosa come indicatore di una condizione “stabile” di fragilità

Table 1. Characteristics of 125 Hospitalized Elderly Patients with Pneumonia According to Their Premorbid Functional Status

Characteristic	Total n = 125	Functionally Independent n = 64	Functionally Dependent n = 61	*P*-value*
Age, mean ± SD	81.0 ± 7.9	80.5 ± 8.4	81.6 ± 7.1	.43
Female, n (%)	72 (57.6)	33 (51.6)	39 (63.9)	.16
Mini-Mental State Examination score, mean ± SD	19.3 ± 9.5	23.2 ± 6.2	15.1 ± 10.7	.00
Geriatric Depression Scale score, mean ± SD	5.2 ± 3.3	4.9 ± 3.1	6.1 ± 3.5	.06
Barthel Index score, mean ± SD				
Before hospitalization	70.1 ± 31.9	94.7 ± 5.5	44.3 ± 27.4	.00
At admission	52.4 ± 37.2	78.4 ± 25.1	25.1 ± 26.7	.00
At discharge	55.4 ± 38.1	80.8 ± 26.1	28.8 ± 29.5	.00
Number of instrumental activities of daily living lost before hospitalization, mean ± SD	4.4 ± 2.9	3.0 ± 2.6	5.8 ± 2.5	.00
Charlson Comorbidity Index, mean ± SD	3.9 ± 2.7	3.0 ± 1.8	4.7 ± 3.1	.00
APACHE II score, mean ± SD	15.1 ± 5.8	13.9 ± 5.9	16.4 ± 5.5	.02
APACHE II acute physiologic subscore, mean ± SD	4.3 ± 4.4	3.5 ± 4.6	5.2 ± 4.1	.03
Number of drugs, mean ± SD	4.2 ± 2.2	4.0 ± 2.1	4.5 ± 2.2	.24
Serum albumin, g/dL, mean ± SD	3.5 ± 0.6	3.7 ± 0.6	3.3 ± 0.6	.002
6-month mortality, n (%)	30 (24)	9 (14.1)	21 (34.4)	.008

*chi-square test for comparing frequencies and Student *t*-test for comparing means.
SD = standard deviation; APACHE = Acute Physiology and Chronic Health Evaluation.

JAGS 55:308–317, 2007
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0002-8614/06/$15.00

Rozzini, et al. JAGS, 2007

La perdita funzionale come esito di polmonite

Hospital diagnoses, Medicare charges, and nursing home admissions in the year when older persons become severely disabled

L. Ferrucci, J. M. Guralnik, M. Pahor, M. C. Corti and R. J. Havlik

OBJECTIVE: To characterize hospital diagnoses, procedures and charges, and nursing home admissions in the year when older persons become severely disabled, comparing those in whom severe disability develops rapidly with those in whom disability develops gradually.

MAIN OUTCOME MEASURES: Characteristics associated with development of severe disability after the fourth annual follow-up, in which the disability is classified as catastrophic disability if the individual did not report any ADL disability in the 2 interviews prior to severe disability onset or as progressive disability if the individual had previous disability in 1 or 2 ADLs.

RESULTS: In the year during which severe disability developed, hospitalizations were documented for 72.1% of those developing catastrophic disability and for 48.6% of those developing progressive disability. The 6 most frequent principal discharge diagnoses included stroke, hip fracture, congestive heart failure, and pneumonia in both severe disability subsets. These diagnoses occurred in 49% of those with catastrophic disability and 25% of those with progressive disability.

CONCLUSIONS: In the year when they become severely disabled, a large proportion of older persons are hospitalized for a small group of diseases. Hospital-based interventions aimed at reducing the severity and functional consequences of these diseases could have a large impact on reduction of severe disability.

JAMA 1997;277:728–734.

The Importance of Geriatric-Specific Instruments and Functional Status Assessment in Infectious Diseases Research: Time to Start Preaching to the Congregation Instead of the Choir

JAGS 52:1768–1770, 2004

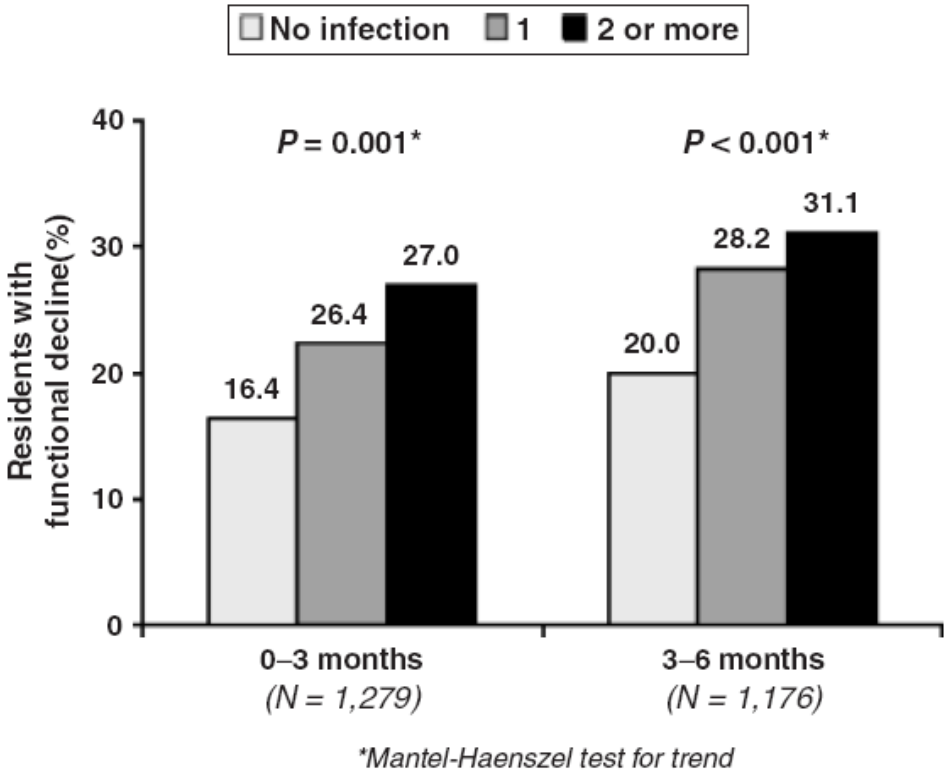

Figure 1. The effect of repeated infectious episodes on functional status in long-term care residents. Reprinted from[11] with permission.

La perdita funzionale come ulteriore “marker” di vulnerabilità

Table 1. Characteristics of 110 Patients Admitted to an Acute Care for the Elderly Medical Unit with a Diagnosis of Pneumonia According to Change of Functional Status (Five or More Points Loss at Barthel Index) Due to the Disease

Characteristic	Without Functional Change (n = 49)	With Functional Change (n = 61)	*P*-value*
Age, mean ± SD	80.2 ± 6.8	82.3 ± 6.8	.11
Female, n (%)	26 (53.1)	39 (63.9)	.33
Mini-Mental State Examination score at discharge, mean ± SD	21.9 ± 7.3	18.9 ± 9.2	.06
Barthel Index, mean ± SD			
Two weeks before hospitalization	80.6 ± 24.0	72.5 ± 25.8	.09
At admission	80.7 ± 24.0	36.4 ± 29.7	.00
At discharge	79.7 ± 26.5	43.4 ± 33.9	.00
Number of Instrumental Activities of Daily Living lost 2 weeks before hospitalization, mean ± SD	3.3 ± 2.8	5.1 ± 2.5	.004
Charlson Comorbidity Index, mean ± SD	7.5 ± 2.2	5.1 ± 2.6	.005
Acute Physiology and Chronic Health Evaluation II score, mean ± SD	13.1 ± 3.2	16.7 ± 6.7	.00
Physiology score, mean ± SD	2.7 ± 2.7	5.5 ± 5.1	.00
Serum albumin, g/dL, mean ± SD	3.7 ± 0.7	3.4 ± 0.6	.009
Serum cholesterol, mg/dL, mean ± SD	183.1 ± 44.3	158.6 ± 46.7	.02
Hemoglobin, g/dL, mean ± SD	12.3 ± 2.2	11.2 ± 2.4	.06
Number of drugs, mean ± SD	3.6 ± 1.7	4.8 ± 2.5	.005
Length of stay, mean ± SD	7.6 ± 2.8	8.9 ± 4.7	.09
Six-month mortality, n (%)	5 (10.2)	22 (36.1)	.002

*Chi-square test for comparing frequencies and Student *t* test for comparing means.
SD = standard deviation.

Rozzini, et al. JAGS, 2005

Table 1. Clinical Characteristics Associated with 3-Month Mortality in 429 Elderly Adults Admitted to the Emergency Department for Infection

Clinical Characteristics	Participants/ Deaths, n/n	Relative Risk (95% Confidence Interval)	
		Crude	Adjusted[a]
Barthel Index before admission (30–60)	357/125	3.7 (1.8–7.8)	–
Barthel Index major change (>30)	297/113	3.2 (1.9–5.4)	1.8 (1.1–3.1)
Acute Physiology and Chronic Health Evaluation II Acute Physiology Subscore >13	79/42	3.2 (1.9–5.3)	1.5 (1.0–2.4)
Dehydration (blood urea nitrogen:creatinine >60)	140/56	1.9 (1.2–3.1)	1.5 (1.0–2.2)
Mini-Mental State Examination score <18	96/47	3.9 (2.4–6.3)	2.8 (1.8–4.3)
Delirium	100/47	2.5 (1.5–3.9)	–
Active cancer (with or without metastasis)	49/31	4.6 (2.5–8.6)	3.6 (2.2–5.8)
Charlson Index ≥4	121/53	2.2 (1.4–3.4)	–
More than nine drugs	154/67	2.3 (1.4–3.5)	1.7 (1.1–2.6)
C-reactive protein ≥10	152/62	1.9 (1.3–2.9)	1.5 (1.0–2.3)
Serum albumin <3.5 g/dL	287/104	2.1 (1.3–3.4)	–
Serum cholesterol <140 mg/dL	124/47	1.6 (1.0–2.5)	–
Male	217/69	1.1 (0.7–1.6)	–
Aged >80	224/79	1.5 (0.9–2.4)	–

[a]Adjusted for all variables associated with mortality in crude univariate analyses.

Functional status does not predict mortality in older adults admitted with infection, but change in functional status does.

When an acute disease such as infection produces a functional impairment, this condition becomes an index of outcome and sholud be detected to predict poor clinical course

Rozzini and Trabucchi JAGS, 2012

Predictors of 6-Month Mortality in Elderly Patients with Mild Chronic Obstructive Pulmonary Disease Discharged from a Medical Ward After Acute Nonacidotic Exacerbation

Piera Ranieri, MD,† Angelo Bianchetti, MD,*† Alessandro Margiotta, MD,*† Adriana Virgillo, MD,*† Enrico M. Clini, MD,‡ and Marco Trabucchi, MD†*

Table 2. Comparison of Clinical Variables Associated with 6-Month Survival

Variables	Survivors (n = 195)	Nonsurvivors (n = 45)	*P*-Value
	Mean ± Standard Deviation		
Age	81.2 ± 7.3	83.1 ± 6.9	.57
Body mass index	25.5 ± 5.2	22.8 ± 5.6	.005
Mini-Mental State Examination score (range 0–30)	21.2 ± 6.4	18.2 ± 7.9	.04
Geriatric Depression Scale score (range 0–15)	4.1 ± 3.1	5.3 ± 3.4	.08
Instrumental activity of daily living functions lost (range 0–8)	3.7 ± 3.0	5.6 ± 2.4	< .001
Barthel Index (range 0–100)			
Preadmission	79.1 ± 25.5	62.1 ± 28.7	.001
Admission	57.2 ± 33.2	35.3 ± 31.1	< .001
Discharge	71.9 ± 29.0	53.2 ± 31.1	.001
Preadmission forced expiratory volume in 1 second, % predicted	67.2 ± 30.3	65.1 ± 31.1	.62
Partial pressure of arterial oxygen at admission, mmHg	62.6 ± 11.5	57.0 ± 10.6	.01
Partial pressure of arterial carbon dioxide at admission, mmHg	37.7 ± 8.3	41.4 ± 10.6	.03
Acute Physiology and Chronic Health Evaluation II score	9.1 ± 3.7	12.0 ± 5.3	< .001
Charlson index	3.8 ± 1.7	4.6 ± 2.3	.01
Serum cholesterol, mg/dL	176.7 ± 42.8	155.0 ± 41.6	.003
Serum albumin, mg/dL	3.4 ± 0.5	3.3 ± 0.3	.09
Erythrocyte sedimentation rate, mm/h	42.1 ± 27.7	38.1 ± 25.4	.39
C-reactive protein, mg/dL	54.8 ± 48.6	51.9 ± 46.3	.72
Hematocrit, %	36.6 ± 5.6	34.8 ± 5.2	.04

Table 3. Multivariate Cox Hazard Model for Factors Associated with 6-Month Mortality

Variable	β	Standard Error	Hazard Ratio	95% Confidence Interval	*P*-Value
Body mass index	− 0.16	0.08	0.85	0.73–0.99	.04
Barthel Index at discharge	− 0.03	0.01	0.98	0.96–0.99	.01
Acute Physiology and Chronic Health Evaluation II score	0.17	0.07	1.19	1.03–1.36	.02

Adjusted for age, sex, cognitive status, disability, comorbidity, frailty, and hypoxemia.

Ranieri et al. JAGS 2008

Decadimento cognitivo come fattore di rischio di polmonite

The NEW ENGLAND JOURNAL of MEDICINE

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The Clinical Course of Advanced Dementia

Susan L. Mitchell, M.D., M.P.H., Joan M. Teno, M.D., Dan K. Kiely, M.P.H., Michele L. Shaffer, Ph.D., Richard N. Jones, Sc.D., Holly G. Prigerson, Ph.D., Ladislav Volicer, M.D., Ph.D., Jane L. Givens, M.D., M.S.C.E., and Mary Beth Hamel, M.D., M.P.H.

ABSTRACT

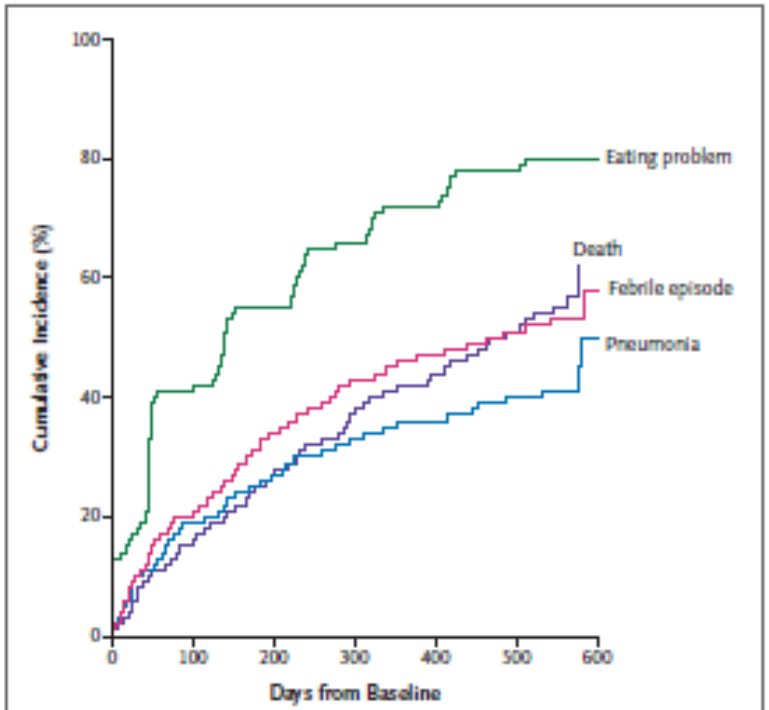
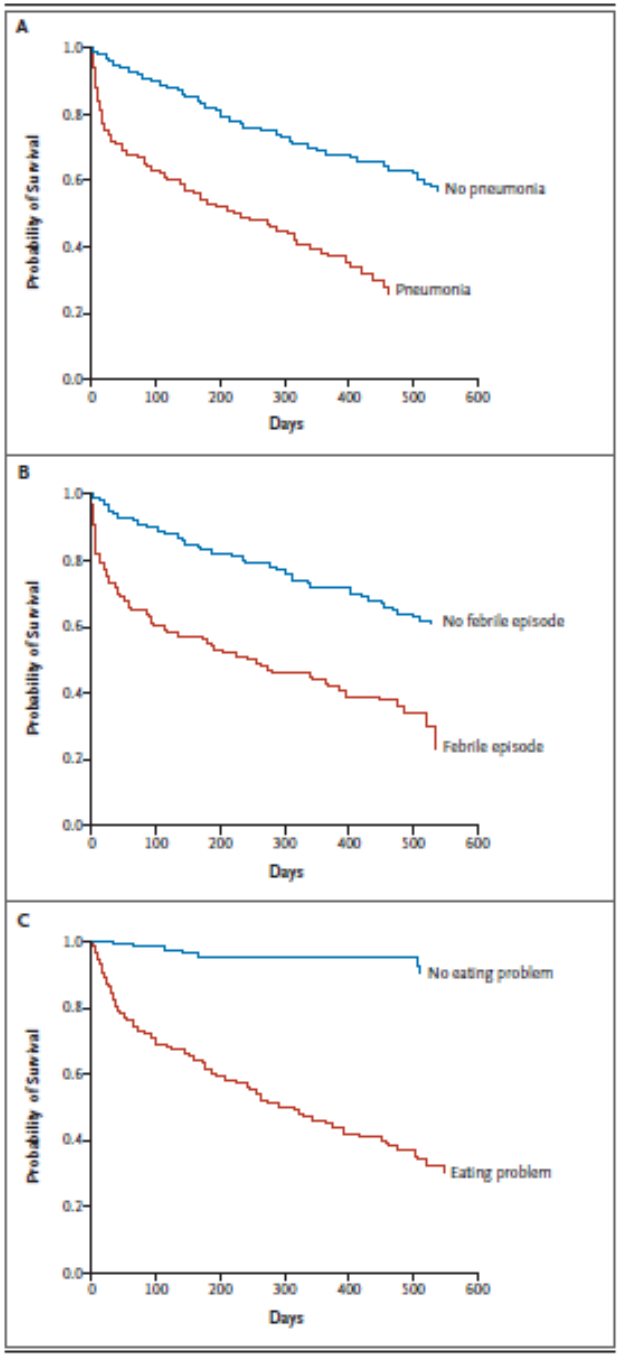


Figure 1. Overall Mortality and the Cumulative Incidences of Pneumonia, Febrile Episodes, and Eating Problems among Nursing Home Residents with Advanced Dementia.

Overall mortality for the nursing home residents during the 18-month course of the study is shown. The residents' median age was 86 years, and the median duration of dementia was 6 years; 85.4% of residents were women.

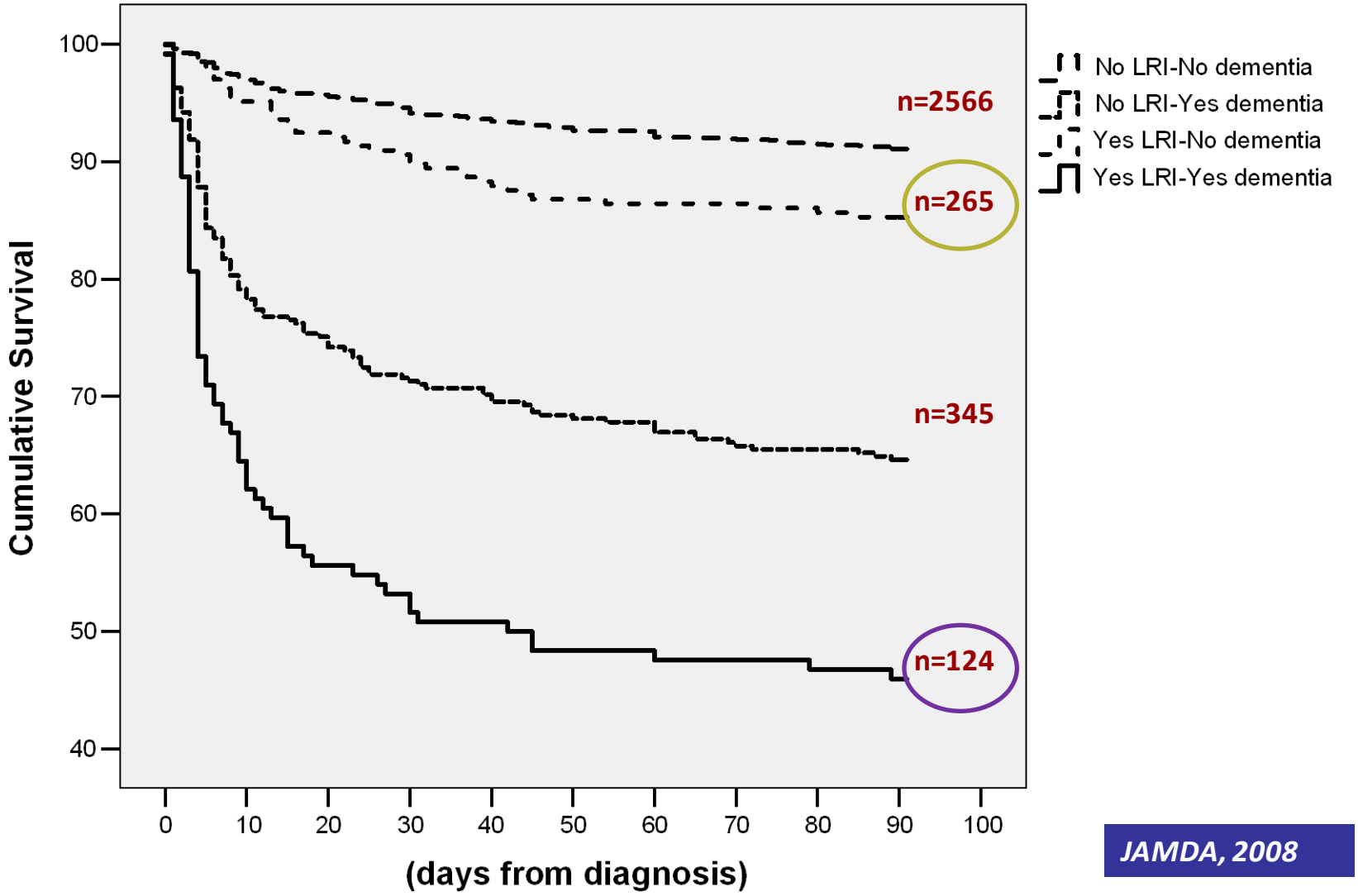


Characteristics and 3-months mortality rate of 3300 in patients affected by Low Respiratory Tract Infections (LRI) and dementia.

	Total (N=3300)	NoLRI-NoD (N=2566)	YLRI-NoD (N=265)	NoLRI-YD (N=345)	YLRI-YD (N=124)	*p*
	M±SD (%)	M±SD (%)	M±SD (%)	M±SD (%)	M±SD (%)	
Age (years)	79.2±8.0	78.4±7.7	80.0±8.2	83.2±7.7	83.4±8.4	*0.001*
Gender (males)(%)*	(38.3)	(24.5)	(24.5)	(24.5)	(19.3)	*0.001*
MMSE score	21.8±8.5	24.9±4.4	23.4±4.9	4.5±4.7	3.7±4.4	*0.001*
GDS score	4.6±3.5	4.6±3.5	4.2±3.1	---	---	*0.155*
Barthel Index (15 days bef)	78.7±27.9	86.5±19.8	76.2±26.6	45.7±34.5	30.2±28.7	*0.001*
Barthel Index (on adm)	60.1±38.1	71.8±32.2	48.6±37.1	22.0±29.2	5.5±14.2	*0.001*
IADL (functions lost)	3.3±2.9	2.6±2.6	3.4±2.9	6.3±2.4	7.0±1.6	*0.001*
Diseases (n)	5.1±2.0	5.1±1.9	5.3±2.0	5.2±2.2	5.4±2.3	*0.142*
Charlson Index	5.3±1.8	5.0±1.7	5.5±1.9	5.8±2.1	6.5±2.2	*0.001*
Drugs (n)	5.7±2.9	5.4±2.6	6.2±3.3	5.8±3.1	6.9±3.0	*0.194*
APACHE II score	10.6±5.9	9.1±4.9	13.7±4.9	13.0±6.8	18.3±6.6	*0.001*
APACHE II-APS subscore	4.4±5.2	3.1±3.9	6.1±5.1	6.5±6.4	10.9±6.9	*0.001*
Serum Albumin (g/dl)	3.7±0.7	3.8±0.6	3.4±0.6	3.3±0.7	3.1±0.6	*0.001*
Hemoglobin (g/dl)	12.5±2.3	12.6±2.3	12.2±2.2	12.0±2.5	11.9±2.5	*0.000*
Serum Cholesterol (mg/dl)	187.3±53.3	192.2±51.9	162.8±49.6	175.4±53.5	160.9±52.5	*0.001*
CPR (mg/dl)	4.4±7.4	2.9±5.7	9.1±10.4	7.3±9.6	11.1±9.1	*0.001*
Creatinine (mg/dl)	1.1±0.7	1.1±0.6	1.3±0.8	1.2±1.0	1.4±1.1	*0.000*
Length of stay (days)	6.5±3.7	6.5±3.6	7.8±4.1	5.8±4.0	5.4±3.9	*0.001*
3 mos mortality (%)*	(13.9)	(9.0)	(14.7)	(35.4)	(54.0)	*0.001*

JAMDA, 2008

Three months survival of elderly patients according to lower respiratory tract infection (LRI) and dementia



JAMDA, 2008

Delirium e polmonite

Pneumonia and Mortality Beyond Hospital Discharge in Elderly Patients

CHEST
For specialists in: Pulmonology, Critical Care, Sleep Medicine, Thoracic Surgery, Cardiorespiratory Interactions, and related disciplines

Table 1—*Characteristics and 3-Month Mortality Rate of 2,948 Elderly Hospitalized Patients With and Without CAP*

Characteristics	CAP (+) (n = 240)	CAP (-) (n = 2,708)	*P* Value[a]
Age, y	81.5 ± 7.6	79.7 ± 7.1	.000
Age ≥ 90 y	36 (15.1)	233 (8.6)	.171
Male	112 (46.9)	958 (35.4)	.000
Smoker	87 (36.4)	770 (28.4)	.006
CRP, mg/dL	8.4 ± 10.2	3.4 ± 6.2	.000
Serum albumin, g/dL	3.4 ± 0.7	3.8 ± 0.7	.000
Urea nitrogen, mg/dL	63.5 ± 40.9	55.6 ± 34.3	.001
Creatinine, mg/dL	1.3 ± 1.1	1.1 ± 0.8	.003
Urea/creatinine ratio > 60	69 (29.7)	701 (26.6)	.171
Delirium	42 (17.6)	280 (10.3)	.001
Dementia	77 (33.2)	477 (17.9)	.000
COPD	116 (48.5)	492 (18.2)	.000
Heart failure (NYHA III-IV)	19 (7.9)	338 (12.5)	.021
Renal failure	52 (22.0)	395 (14.8)	.003
Malnutrition	34 (14.3)	193 (7.2)	.000
Stroke	31 (13.0)	331 (12.2)	.401
Diabetes mellitus	63 (26.4)	555 (20.5)	.022
Cancer	6 (2.5)	116 (4.3)	.121
Metastatic cancer	4 (1.7)	169 (6.2)	.001
Charlson index ≥ 5	102 (42.7)	965 (35.6)	.019
Drugs ≥ 7	74 (37.8)	547 (28.4)	.005
Disabled (2 wk before admission)	90 (37.7)	552 (20.4)	.000
Disabled on admission	153 (64.0)	1060 (39.2)	.000
APACHE II-APS subscore	6.0 ± 5.6	3.4 ± 4.1	.000
APACHE II-APS subscore > 12	34 (14.2)	104 (3.8)	.000
CURB-65 high-risk score (class 3)	108 (45.2)	…	…
Length of stay, d	6.9 ± 3.2	6.7 ± 3.9	.331
3-Mo mortality (after discharge)	46 (19.2)	278 (10.3)	.000

Data are presented as mean ± SD or No. (%). APACHE II-APS = Acute Physiology and Chronic Health Evaluation II-Acute Physiologic Subscore; CAP(+) = with community-acquired pneumonia; CAP(-) = without community-acquired pneumonia; CRP = C-reactive protein; CURB-65 = confusion or dementia, urea nitrogen, respiratory rate, BP, and age ≥ 65 y; NYHA = New York Heart Association.

[a]Significant differences between groups were assessed using the independent *t* test and the χ^2 test for continuous and categorical variables, respectively.

Rozzini et al.2011

Intern Emerg Med
DOI 10.1007/s11739-013-0991-1

IM - ORIGINAL

Delirium is a predictor of in-hospital mortality in elderly patients with community acquired pneumonia

Filippo Pieralli · Vieri Vannucchi · Antonio Mancini · Maddalena Grazzini · Giulia Paolacci · Alessandro Morettini · Carlo Nozzoli

Table 4 Predictors of in-hospital death at multivariate analysis

	Multivariate analysis OR	95 % Confidence Interval	*p*
COPD[a]	6.21	1.75–22.01	0.005
Delirium	5.69	1.36–23.20	0.017
Male sex	5.10	1.65–15.75	0.005
CURB-65 (points)[b]	3.98	1.87–8.50	<0.0001

[a] Chronic obstructive pulmonary disease

[b] Confusion, blood urea nitrogen, respiratory rate, blood pressure and age ≥65 years (CURB-65) score

Pneumonia and Mortality Beyond Hospital Discharge in Elderly Patients

CHEST
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Table 2—*Three-Month Mortality Risk in 2,948 Elderly Hospitalized Patients*

Characteristic	Events/No. of Patients	RR[a]	95% CI	RR[b]	95% CI
Age ≥ 90 y	58/269	2.5	1.8-3.4	1.7	1.2-2.4
Male	144/1,070	1.5	1.2-1.8	…	…
Smoker	103/857	1.2	1.0-1.5	1.2	1.0-1.8
Disabled 2 wk before admission	145/642	3.5	2.7-4.4	1.6	1.2-2.2
APACHE II-APS subscore > 12	55/138	6.2	4.3-8.9	1.7	1.2-2.6
Urea/creatinine ratio > 60	110/770	1.7	1.3-2.2	1.4	1.1-1.9
Pneumonia	46/240	2.1	1.5-2.9	1.4	0.9-2.0
Delirium	71/322	2.6	1.9-3.5	1.5	1.1-2.1
Dementia	122/554	3.6	2.8-4.6	1.9	1.4-2.7
COPD	88/608	1.5	1.2-1.9	2.4	1.1-5.8
Renal failure	70/447	1.7	1.2-2.2	…	…
Malnutrition	70/227	4.4	3.2-5.9	1.9	1.3-2.6
Stroke	65/362	1.9	1.4-2.6	…	…
Metastatic cancer	50/173	3.7	2.6-5.3	1.2	1.1-1.3
Charlson index ≥ 5	217/1,067	4.2	3.3-5.4	1.8	1.3-2.5
Drugs ≥ 7	133/621	2.5	1.9-3.3	1.6	1.2-2.1

Cox proportional hazard ratio was used to model the time-of-death data to identify possible predictors of mortality. Variables significantly associated with mortality in crude analysis were included as potential confounders in a final Cox proportional hazards regression model, with CAP admission status as the main predictor and time to death as the outcome. RR = relative risk. See Table 1 for expansion of other abbreviations.

[a]Crude analysis.

[b]Final Cox proportional hazards regression model.

Rozzini et al. Chest 2011

Disabilità funzionale pre-morbosa

Disabilità cognitiva pre-morbosa

Ulteriore peggiorar
disabilità funzional

ggioramento delle
cognitive

PROGNOSI NEGATIVA a breve e lungo termine

Research article

Open Access

Determinants of short and long term functional recovery after hospitalization for community-acquired pneumonia in the elderly: role of inflammatory markers

Ali El Solh*[1,2], Lilibeth Pineda[1,2], Pam Bouquin[1] and Corey Mankowski[1]

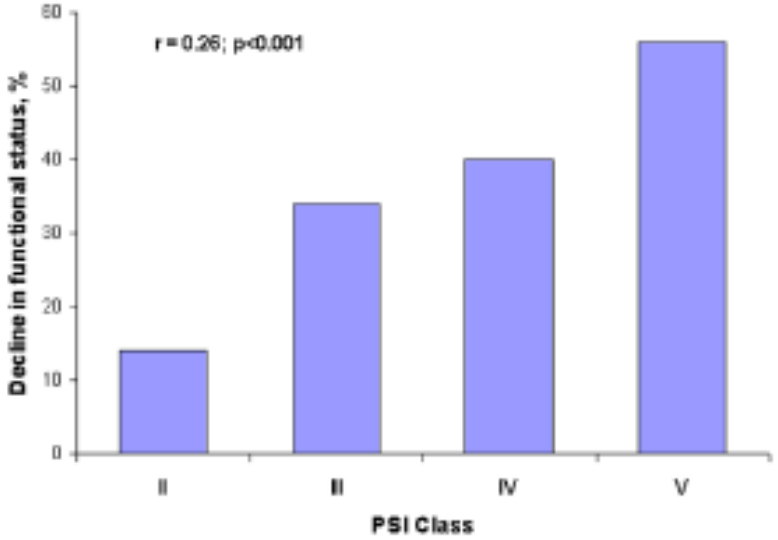


Figure 2
Frequency plot of decline in functional status stratified by the Pneumonia Severity Index classes ($p < 0.001$).

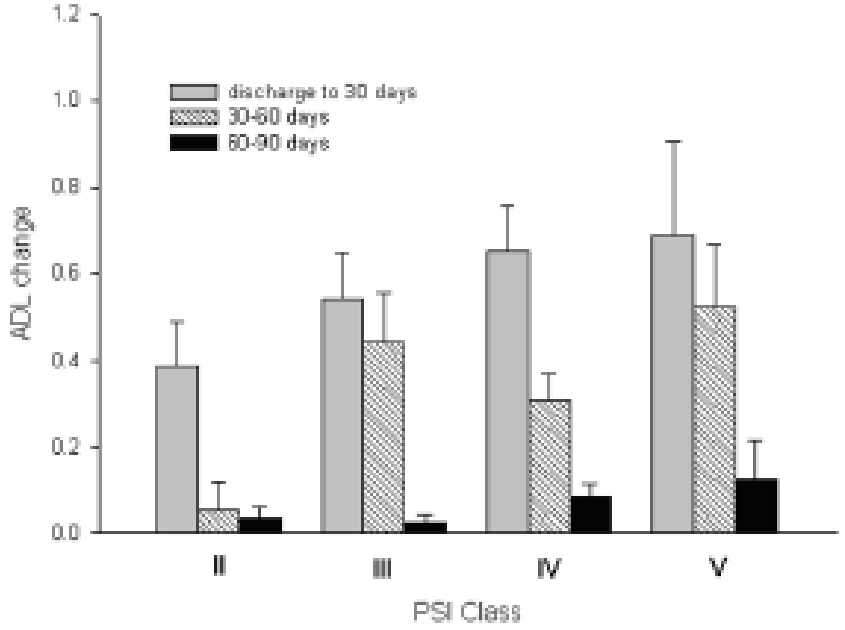


Figure 3
Change in Activity of Daily Living score (mean ± SD) for each of the Pneumonia Severity Index class at each successive follow-up period.

Table 4: Comparison of functional status at follow up time points to preadmission status

Functional status (ADL)	Favorable outcome (n = 239)	Unfavorable outcome (n = 62)	P value
Compared to preadmission			
Decline on discharge,*n (%)*	69 (29)	39 (63)	<0.001
Decline at day 30, *n (%)*	39 (16)	36 (58)	<0.001
Decline at day 60, *n (%)*	17 (7)	24 (39)	<0.001
Decline at day 90, *n (%)*	14 (6)	20 (32)	<0.001

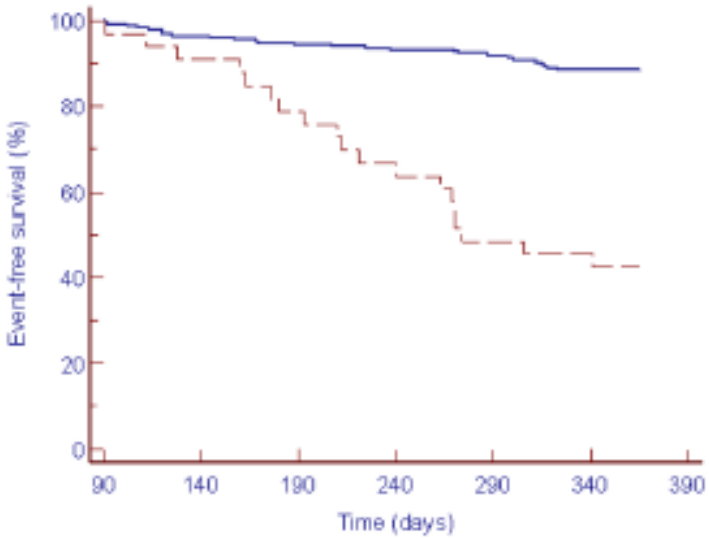


Figure 4
Kaplan-Meier plot of one year hospital readmission or death by functional decline at day 90 post hospital discharge from CAP. Persistent functional decline at day 90 (broken line) versus recovery of functional status by day 90 (continuous line) (logrank test $p < 0.001$).

Research article

Open Access

Determinants of short and long term functional recovery after hospitalization for community-acquired pneumonia in the elderly: role of inflammatory markers

Ali El Solh*[1,2], Lilibeth Pineda[1,2], Pam Bouquin[1] and Corey Mankowski[1]

Original article

High serum interleukin-6 level is associated with increased risk of delirium in elderly patients after noncardiac surgery: a prospective cohort study

LIU Pei, LI Ya-wei, WANG Xiao-shan, ZOU Xi, ZHANG Da-zhi, WANG Dong-xin and LI Shi-zhong

A series of studies investigated the relationship between the inflammatory markers and the occurrence of delirium. In a prospective study of elderly patients admitted for acute surgical repair of hip fracture, serum IL-6 and IL-8 levels were significantly elevated in those who developed delirium. And the IL-6 level was specifically associated with the hyperactive form of delirium.[12] The peripheral IL-6 level was similarly elevated in elderly patients who developed delirium after abdominal surgery.[13] In a study of patients undergoing open-heart surgery, it was also found that early postoperative delirium was associated with increased IL-6 and cortisol levels.[14]

Not all clinical studies on inflammation and delirium have found similar results. In a prospective case-control study, serum C-reactive protein, IL-6, and insulin-like growth factor-1 were measured preoperatively in elderly patients admitted for hip-surgery. No relationship was found between levels of preoperative circulating proinflammatory markers and occurrence of postoperative delirium.[15] An observational prospective study of elderly patients in an elderly acute care unit did not find any association between IL-6 or other proinflammatory cytokine levels and either delirium or the severity of delirium.[16] In another study of acutely ill elder patients, no relationship was found between delirium and IL-6, IL-1, and tumor necrosis factor-alpha.[17]

transactions
biochemsoctrans.org

Systemic inflammation and delirium: important co-factors in the progression of dementia

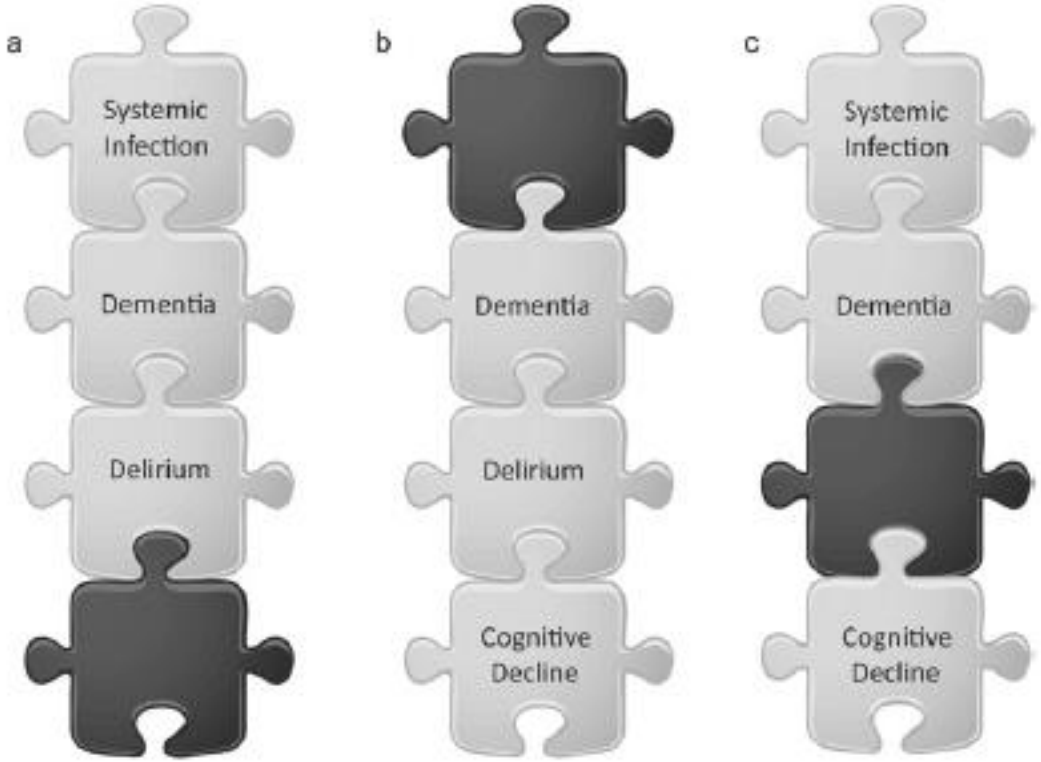
Colm Cunningham[1]
School of Biochemistry and Immunology and Trinity College Institute of Neuroscience, Trinity College Dublin, Dublin 2, Republic of Ireland

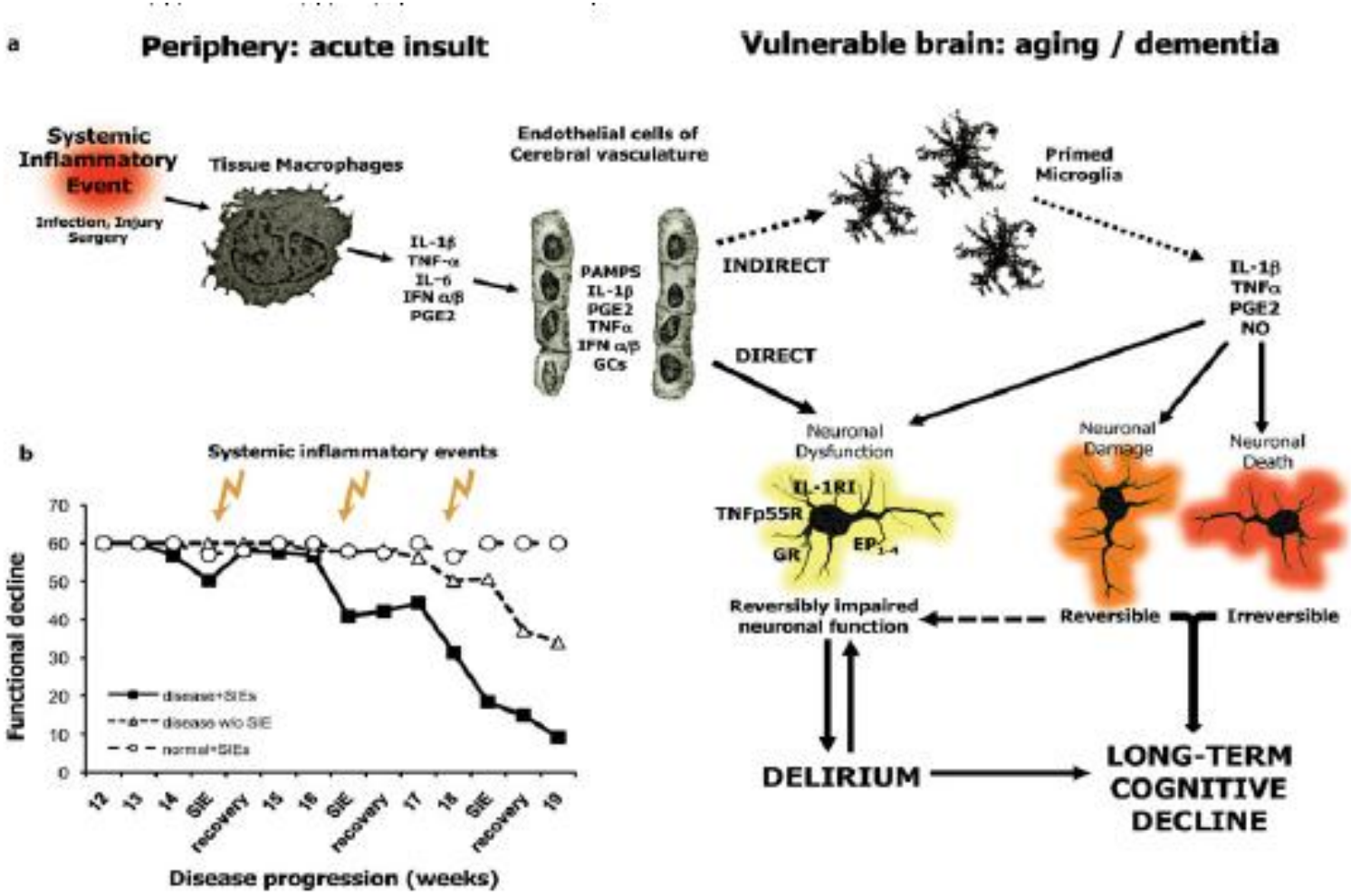
Abstract

It is widely accepted that inflammation plays some role in the progression of chronic neurodegenerative diseases such as AD (Alzheimer's disease), but its precise role remains elusive. It has been known for many years that systemic inflammatory insults can signal to the brain to induce changes in CNS (central nervous system) function, typically grouped under the syndrome of sickness behaviour. These changes are mediated via systemic and CNS cytokine and prostaglandin synthesis. When patients with dementia suffer similar systemic inflammatory insults, delirium is a frequent consequence. This profound and acute exacerbation of cognitive dysfunction is associated with poor prognosis: accelerating cognitive decline and shortening time to permanent institutionalization and death. Therefore a better understanding of how delirium occurs during dementia and how these episodes impact on existing neurodegeneration are now important priorities. The current review summarizes the relationship between dementia, systemic inflammation and episodes of delirium and addresses the basic scientific approaches currently being pursued with respect to understanding acute cognitive dysfunction during aging and dementia. In addition, despite there being limited studies on this subject, it is becoming increasingly clear that infections and other systemic inflammatory conditions do increase the risk of AD and accelerate the progression of established dementia. These data suggest that systemic inflammation is a major contributor to the progression of dementia and constitutes an important clinical target.

Figure 1 | Systemic inflammation, delirium and cognitive decline

(**a**) It is well established that systemic inflammation in those with dementia frequently leads to delirium. (**b**) It is also established that delirium in demented patients tends to exacerbate disease progression. (**c**) Thus insults that often trigger delirium may accelerate disease, in the presence or absence of the delirious episode. However, little research has addressed this scenario.




a
Periphery: acute insult
Vulnerable brain: aging / dementia
Systemic Inflammatory Event
Infection, Injury Surgery
Tissue Macrophages
IL-1β
TNF-α
IL-6
IFN α/β
PGE2
Endothelial cells of Cerebral vasculature
PAMPS
IL-1β
PGE2
TNFα
IFN α/β
GCs
INDIRECT
DIRECT
Primed Microglia
IL-1β
TNFα
PGE2
NO
Neuronal Dysfunction
IL-1RI
TNFp55R
GR
EP1-4
Neuronal Damage
Neuronal Death
Reversibly impaired neuronal function
Reversible
Irreversible
DELIRIUM
LONG-TERM COGNITIVE DECLINE
b
Systemic inflammatory events
Functional decline
disease+SIEs
disease w/o SIE
normal+SIEs
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18
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recovery
19
Disease progression (weeks)

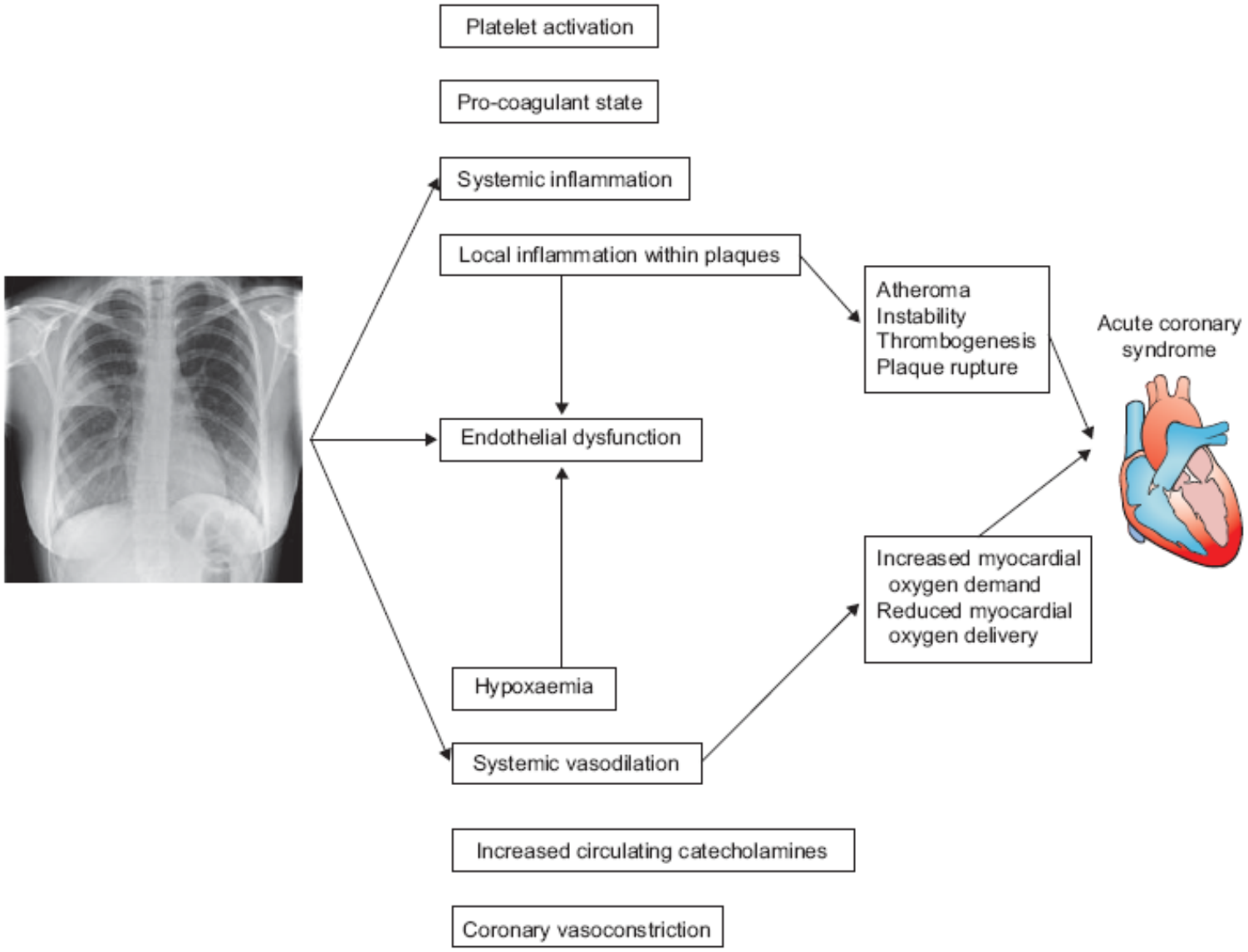

FIGURE 2. Summary of the proposed mechanisms by which community-acquired pneumonia may provoke acute coronary syndrome/acute vascular events.

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Factors associated with inflammatory cytokine patterns in community-acquired pneumonia

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ABSTRACT: **Raised systemic levels of interleukin (IL)-6 and IL-10 cytokines have been associated with poorer outcome in community-acquired pneumonia. The aim of our study was to identify potential associated factors with increased levels of IL-6, IL-10, or both cytokines.**

We performed a prospective study of 685 patients admitted to hospital with community-acquired pneumonia. IL-6 and IL-10 were measured in blood in the first 24 h.

30-day mortality increased from 4.8% to 11.4% ($p=0.003$) when both cytokines were higher than the median. Independent associated factors with an excess of IL-6 were neurologic disease, confusion, serum sodium <130 mEq·L^{-1}, pleural effusion, and bacteraemia. The associated factors for an excess of IL-10 were respiratory rate $\geqslant 30$ breaths·min^{-1}, systolic blood pressure <90 mmHg and glycaemia $\geqslant 250$ mg·dL^{-1}. The independent associated factors for an excess of both cytokines were confusion, systolic blood pressure <90 mmHg, pleural effusion and bacteraemia. Protective factors were prior antibiotic treatment and pneumococcal vaccination.

Different independent factors are related to an excess of IL-6 and IL-10. Confusion, hypotension, pleural effusion and bacteraemia were associated with the inflammatory profile with the highest mortality rate, whereas anti-pneumococcal vaccination and previous antibiotic treatment appeared to be protective factors.

TABLE 6 Independent variables related to an excess of interleukin (IL)-6, IL-10 and of both

Characteristic	IL-6		IL-10		IL-6 and IL-10	
	OR (95%CI)	p-value	OR (95%CI)	p-value	OR (95%CI)	p-value
CNS disorder	1.8 (1.2–2.8)	0.007				
Previous antibiotic treatment	0.6 (0.5–0.9)	0.015	0.4 (0.3–0.7)	<0.001	0.6 (0.4–0.9)	0.016
Anti-pneumococcal vaccination			0.5 (0.3–0.9)	0.012	0.5 (0.3–0.9)	0.027
Confusion	1.7 (1.0–2.8)	0.046			2.0 (1.2–3.3)	0.006
Respiratory rate ⩾30 breaths·min^{-1}			1.9 (1.3–3.0)	0.001		-
Systolic blood pressure <90 mmHg			4.8 (1.3–17.6)	0.018	2.7 (1.0–7.2)	0.050
Glycaemia ⩾250 mg·dL^{-1}			1.8 (1.0–3.1)	0.049		
Serum sodium <130 mmol·L^{-1}	1.9 (1.1–3.3)	0.015				
Pleural effusion	2.1 (1.3–3.3)	0.002			1.8 (1.1–3.0)	0.013
Bacteraemia	2.5 (1.3–4.7)	0.004			2.3 (1.2–4.3)	0.008

CNS: central nervous system.

30-day mortality increased from 4.8% to 11.4% (p=0.003) when both cytokines were higher than the median. Independent associated factors with an excess of IL-6 were neurologic disease, confusion, serum sodium <130 mEq·L^{-1}, pleural effusion, and bacteraemia. The associated factors for an excess of IL-10 were respiratory rate ⩾30 breaths·min^{-1}, systolic blood pressure <90 mmHg and glycaemia ⩾250 mg·dL^{-1}. The independent associated factors for an excess of both cytokines were confusion, systolic blood pressure <90 mmHg, pleural effusion and bacteraemia. Protective factors were prior antibiotic treatment and pneumococcal vaccination.

CHEST
For specialists in:
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Hospitalized CAP are associated with many deaths outside the time frame normally considered in this otherwise acute disease. They may support the hypothesis that pneumonia is an epiphenomenon of a preexisting condition, i.e. of reduced vitality (as indicated by higher prevalence of disability two weeks before admission); on the contrary we assist to the possibility of an independent pathological event induced by pneumonia itself. In the first case it would be rather difficult to reduce mortality hazard in old patients after pneumonia due to the frailty of the subjects, while in the second case interventions became object of specific studies.

Ours data indicate that clinicians must take in consideration the poor outcomes of old pneumonia patients predisposing the most appropriate care. On the same time we are well aware that the available instruments to reduce mortality are very poor and that studies should be urgently performed to give a more precise direction to our therapeutic efforts. Improved understanding of the poor long-term prognosis associated with CAP is needed to modify the dismal outcome of this common disease in elderly patients.

Rozzini & Trabucchi (2011)

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