pneumonia, both epidemiologically and microbiologically.

We declare that we have no conflicts of interest.

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1 Ewig S, Welte T, Chastre J, Torres A. Rethinking the concepts of community-acquired and health-care-associated pneumonia. *Lancet Infect Dis* 2010; **10:** 279–87.

2 Venditti M, Falcone M, Corrao S, et al, for the Italian Society of Internal Medicine Study Group. Outcomes of patients hospitalized with community-acquired, health care-associated, and hospital-acquired pneumonia. *Ann Intern Med* 2009; **150:** 19–26.

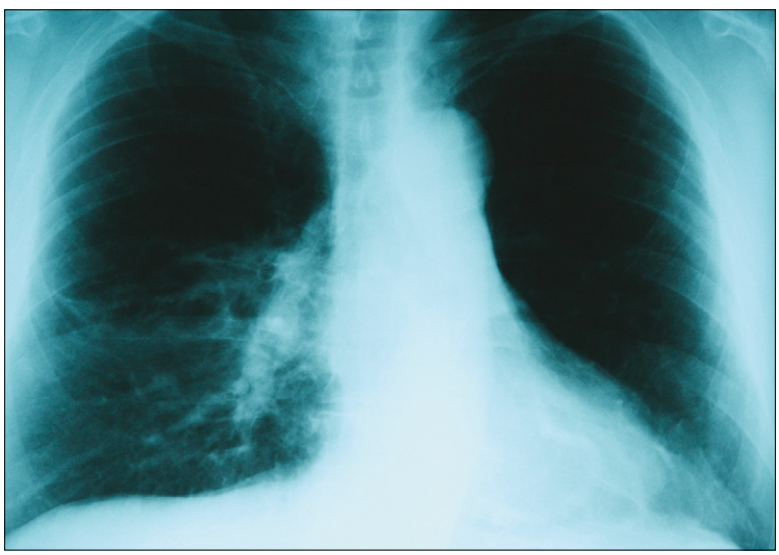
3 Kollef MH, Shorr A, Tabak YP, Gupta V, Liu LZ, Johannes RS. Epidemiology and outcomes of health-care-associated pneumonia: results from a large US database of culture-positive pneumonia. *Chest* 2005; **128:** 3854–62.

4 Shorr AF, Zilberberg MD, Micek ST, Kollef MH. Prediction of infection due to antibiotic-resistant bacteria by select risk factors for health care-associated pneumonia. *Arch Intern Med* 2008; **168:** 2205–10.

5 Shindo Y, Sato S, Maruyama E, et al. Health-care-associated pneumonia among hospitalized patients in a Japanese community hospital. *Chest* 2009; **135:** 633–40.

Authors' reply

We appreciate that Mario Venditti and colleagues now present their microbiological data for the Italian multicentre study of community-acquired, hospital-acquired, and health-care-assisted pneumonia (HCAP).[1] They claim that these data support the idea that HCAP is distinct from community-acquired pneumonia, a view with which we disagree. Microbiological data included samples from patients from the first 5 days after admission to hospital or within 5 days of diagnosis with pneumonia. Standards generally indicate that samples should be obtained at diagnosis. Results from samples obtained after diagnosis carry a significant risk for representing nosocomial colonisation or superinfection, particularly after introduction of antimicrobial treatment. This risk is a concern, particularly in view of the failure to undertake quantitative cultures of respiratory samples retrieved bronchoscopically. Overall, the diagnostic yield was low, with an aetiological diagnosis obtained in only 81 patients (22·4%). Of these 81, two had *Mycobacterium tuberculosis* and two had non-tuberculous mycobacteria, which are not usually regarded as pathogens of pneumonia. Of the patients with HCAP, only 28 had an aetiological diagnosis (26 excluding mycobacteria), which preclude valid conclusions about the aetiology of the populations studied.



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Classification of pneumonia on the basis of where it was acquired is under debate

The microbial range is statistically significant for only *Streptococcus pneumoniae*, which were more frequent in community-acquired pneumonia, and for meticillin-resistant *Staphylococcus aureus* (MRSA), which were more common in health-care-associated and hospital-acquired pneumonia. However, reported rates of MRSA are excessively high, reaching 17·1% even in community-acquired pneumonia, and if representative, would need guidelines of community-acquired pneumonia to be revised immediately. Moreover, caution should be taken when results of MRSA cultures are interpreted. In the absence of quantitative cultures, only bacteraemic episodes, or positive cultures from sites that are normally sterile, would be definite evidence for infection. *Pseudomonas aeruginosa* was even slightly higher in community-acquired than in hospital-acquired pneumonia (9·7% *vs* 7·1%), and Gram-negative enterobacteriaceae were more frequent in HCAP than in hospital-acquired pneumonia (32·1 *vs* 16·7). The unusually high rates of *P aeruginosa* and Gram-negative enteric bacilli in community-acquired pneumonia add to our reservations about the validity of the microbiological data. The investigators do not provide data for resistance patterns of *P aeruginosa* and Gram-negative enteric bacilli; we cannot therefore know the true rate of multidrug-resistant pathogens, although they claim to have identified an excessive rate of multidrug resistance in patients meeting the definition for HCAP.

Venditti and colleagues try to convince us that HCAP is different from community-acquired pneumonia with just 22 patients (11 with MRSA, two with *P aeruginosa*, nine with

Gram-negative enteric bacilli), and the susceptibility patterns of half are not even reported. They also suggest that patients with HCAP and with community-acquired pneumonia had the same functional status. We would argue that much more data, particularly for their daily activity living scores, are needed before such a conclusion can be accepted. Indeed, there are differences in age (4 years from community-acquired to HCAP, and 6 years to hospital-acquired pneumonia) and in comorbidity (eg, 10% higher for cardiac failure, renal failure, diabetes, and cancer, and antibiotic pretreatment). These differences are confirmed by the significant differences in pneumonia severity index, a score in which the weight of points assigned for age and comorbidities is particularly high. Even if we accept the reported aetiologies, these might be explained by the finding that 80 of 90 patients in the HCAP group were hospitalised in the past 6 months. Furthermore, more patients with HCAP had undergone surgery. This fact would fit our concept that patients with previous hospitalisation should be handled the same as patients with hospital-acquired pneumonia, particularly if they have received previous antimicrobial treatment during their hospital stay. Such a concept would obviate the need for a new entity of HCAP. However, the proportion of patients residing in nursing homes with resistant pathogens was very small. This finding is in line with our 10 year survey of nursing-home-acquired pneumonia. Although clinical characteristics, such as age of patients and comorbidities, are comparable to those for hospital-acquired pneumonia, microbiological and mortality data of patients with nursing-home-acquired pneumonia were more similar to the data for those with community-acquired pneumonia.[2]

The heart of the HCAP concept is that a different aetiology from community-acquired pneumonia, particularly a high frequency of multidrug resistance, leads to an increased inadequate empirical antimicrobial treatment at the start of therapy, and hence, an excess mortality. Therefore, such patients should receive broad-spectrum antimicrobial treatment in parallel with hospital-acquired pneumonia. However, the crucial link between inadequate antimicrobial treatment and excess mortality is still missing. We argue in favour of hidden treatment restrictions to be a reason for excess mortality in patients meeting criteria for HCAP,[3] and an analysis taking this confounder into account remains crucial to the interpretation of the HCAP concept.

We agree that further multicentre studies are necessary to validate our proposed modifications of the pneumonia triad. The key issue is to more precisely define the factors associated with resistant strains requiring additional antibiotics beyond recommendations for community-acquired pneumonia. However, in view of the wide consequences of a recommendation for broad-spectrum antimicrobial treatment for all patients meeting HCAP criteria, these studies should meet strict microbiological standards and should show strong external validity, and the relation of aetiology, initially inadequate treatment, and adverse outcomes should be thoroughly assessed, taking the main confounder of treatment limitation into account.

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1 Venditti M, Falcone M, Corrao S, Licata G, Serra P, for the Study Group of the Italian Society of Internal Medicine. Outcomes of patients hospitalized with community-acquired, health care-associated, and hospital-acquired pneumonia. *Ann Intern Med* 2009; **150:** 19–26.

2 Polverino E, Dambrava P, Cillóniz C, et al. Nursing home-acquired pneumonia: a 10 year single-centre experience. *Thorax* 2010; **65:** 354–59.

3 Ewig S, Welte T, Chastre J, Torres A. Rethinking the concepts of community-acquired and health-care-associated pneumonia. *Lancet Infect Dis* 2010; **10:** 279–87.

Prescription of antibiotics in hospitals: prescribers' opinions matter

In the March, 2010, issue of *The Lancet Infectious Diseases,* Marlies Hulscher and colleagues[1] provide an overview of knowledge about the social and behavioural aspects of antibiotic prescribing; however, several aspects should be further considered.

The investigators correctly implicate the statement from the European Academies Science Advisory Council that more involvement is needed from the social sciences in this research domain. Until now, there has been no clear evidence for selection of the proper interventions to improve antibiotic use; success or failure still depend on the judgment of decision makers.[2] However, the investigators also refer to the framework proposed by Cabana and colleagues,[3] describing the different barriers to the use of antibiotic guidelines. Although the Cabana framework is a useful overview of specific barriers, it is very similar to the theory of planned behaviour.[4] Use of this theory also has substantial advantages compared with the Cabana framework. First, it has been thoroughly tested for various problems, including antibiotic use.[5] Second, possible influential factors might be quantified, therefore