Current Perspective of the HCAP Problem: Is It CAP or Is It HAP?

Eva Polverino, M.D., Ph.D.¹ and Antoni Torres, M.D., Ph.D.¹

ABSTRACT

The number of individuals receiving health care outside the hospital setting, including home wound care or infusion therapy, dialysis, nursing homes, and similar settings is constantly increasing. One of the most frequent causes of hospitalization and mortality in these patients is pneumonia. Hence a new class of pneumonia has been identified: healthcare-associated pneumonia (HCAP).

The last American Thoracic Society/Infectious Disease Society of America (ATS/IDSA) guidelines define specific criteria to identify HCAP; however, the clinical practice suggests that the presence of indwelling devices (permanent catheters, etc.) may also be considered an additional criterion.

Different studies have shown that, in comparison with community-acquired pneumonia (CAP) patients, HCAP patients are significantly older, have a higher number of comorbidities (cerebrovascular diseases, congestive heart failure, dementia, and diabetes mellitus) and show worse functional status before admission. It has also been observed that HCAP differs from CAP in terms of clinical presentation, risk factors, etiology, prognostics, and, likely, therapeutic approach. The clinical presentation of HCAP is often unusual because it is frequently conditioned by advanced age, multiple chronic comorbidities, and neurological disorders. Classic respiratory symptoms of pneumonia are often mild in HCAP, whereas extrapulmonary manifestations, including mental confusion and gastrointestinal disorders, are frequent. HCAP patients, commonly present a worse clinical presentation (hypoxemia, altered consciousness, Fine score, multilobar infiltrates, etc.) than CAP, and a mortality rate close to that of hospital-acquired pneumonia. Many studies have attributed these findings to a nosocomial etiology [methicillin-resistant Staphylococcus aureus (MRSA), Pseudomonas aeruginosa, etc.] with a high frequency of multidrug-resistant infections (MRIs), even though this remains controversial. Further investigation on microbial composition and MRI risk factors of HCAP is fundamental because no definitive therapeutic indications are currently available.

KEYWORDS: Healthcare-associated pneumonia, healthcare-associated infections, nursing home–acquired pneumonia, long-term care facilities

¹Division of Pulmonary Medicine, Clinic Institute of Thorax (ICT), Hospital Clinic of Barcelona–Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS)–University of Barcelona (UB)–Ciber de Enfermedades Respiratorias (CIBERES), Barcelona, Spain.

Address for correspondence and reprint requests: Antoni Torres, M.D., Ph.D., Division of Pulmonary Medicine, Clinic Institute of Thorax (ICT), Hospital Clinic of Barcelona–Institut d’Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS)–University of Barcelona (UB)–Ciber de Enfermedades Respiratorias (CIBERES), c. Villarroel, 170, 08036 Barcelona, Spain (e-mail: atorres@ub.edu).

Community-Acquired Pneumonia; Guest Editor, Antoni Torres, M.D., Ph.D.

DEFINITIONS OF HEALTHCARE-ASSOCIATED PNEUMONIA

Pneumonia is one of the most common infectious diseases requiring medical treatment and hospitalization. The current clinical classification includes community-acquired pneumonia (CAP), hospital-acquired pneumonia (HAP), ventilator-associated pneumonia (VAP), and nursing home–acquired pneumonia (NHAP). However, important progress in healthcare system organization and settings and profound demographic and sociocultural changes in the general population have led to recognition of the necessity to modify the current classification.

In fact, the general tendency of healthcare administrations is to increase the number of ambulatory and long-term care facilities (LTCFs) to reduce the work load of acute care hospitals and to improve quality of care by stratifying levels and sites of care. As a result, the number of ambulatory patients (chemotherapy, dialysis, etc.) and individuals residing in LTCFs or receiving wound care or infusion therapy at home has steadily increased in the last decades.

Furthermore, the prolonged life expectancy, the new technologies, and the improved care level have increased the number of “chronically ill patients,” being commonly more elderly and with multiple comorbidities.

In addition, important cultural changes in the society have been observed in the last decades: the general push to prolong the duration of active working life and the rising employment rate among women have favored the shift of assistance to elderly and chronic patients from the previous “family-based model” to a “healthcare-based model,” facilitating the expansion of LTCFs, ambulatories, rehabilitative centers, and the like.

All these factors have contributed to the definition of a new and expanding class of patients developing pneumonia in a nonhospital environment but in regular contact with the healthcare system: HCAP.

Contemporarily, it has been observed that pneumonia in this class of patients differs from CAP and from HAP in many aspects, such as the clinical presentation and course, the patients’ characteristics (age, number of comorbidities, etc.), the incidence, the mortality, and, likely, the microbial etiology.

The last guidelines for the management of adults with HAP, VAP, and HCAP described a list of risk factors for HCAP (Table 1), including residence in a nursing home, chronic dialysis, home infusion therapy and wound care, prior hospitalization in the last 3 months, and contact with a family member with a multidrug-resistant infection (MRI).

These criteria are currently considered the definition of HCAP and are based on the risk to develop MRIs despite community residence, and, therefore, guide the antibiotic empirical treatment.

Table 1: Risk Factors for Multidrug-Resistant Pathogens Causing Hospital-Acquired Pneumonia, Healthcare-Associated Pneumonia, and Ventilator-Associated Pneumonia

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Antimicrobial therapy in preceding 90 days</td>
<td></td>
</tr>
<tr>
<td>b. Current hospitalization of 5 days or more</td>
<td></td>
</tr>
<tr>
<td>c. High frequency of antibiotic resistance in the community or in a specific hospital unit</td>
<td></td>
</tr>
<tr>
<td>d. Presence of risk factors for healthcare-associated pneumonia:</td>
<td>Hospitalization for 2 or more days in the preceding 90 days</td>
</tr>
<tr>
<td>a. Hospitalization for 2 or more days in the preceding 90 days</td>
<td>Residence in a nursing home or extended care facility</td>
</tr>
<tr>
<td>b. Home infusion therapy (including antibiotics)</td>
<td>Home infusion therapy (including antibiotics)</td>
</tr>
<tr>
<td>c. Chronic dialysis within 30 days</td>
<td>Chronic dialysis within 30 days</td>
</tr>
<tr>
<td>d. Home wound care</td>
<td>Home wound care</td>
</tr>
<tr>
<td>e. Family member with multidrug-resistant pathogen</td>
<td>Family member with multidrug-resistant pathogen</td>
</tr>
<tr>
<td>f. Immunosuppressive disease and/or therapy</td>
<td>Immunosuppressive disease and/or therapy</td>
</tr>
</tbody>
</table>

From Reference 9.

This definition of HCAP, however, is relatively recent given that the recommendations of the Centers for Disease Control and Prevention (CDC) for preventing HCAP published in 2003 still used healthcare-associated and nosocomial as synonyms. By contrast, on investigating bloodstream infections in adults, Friedman and colleagues highlighted the necessity to distinguish a new category of “healthcare-associated infections” (HCAIs) due to a high rate of multidrug resistance. The definition criteria for HCAI used by these authors were very similar to those recommended for HCAP by the American Thoracic Society/Infectious Diseases Society (ATS/IDSA) and described that frequency of comorbid conditions, source of infection, pathogens and their susceptibility patterns, mortality rate, and follow-up of HCAIs were very similar to nosocomial bloodstream infections. Similarly, in their review on lower respiratory tract infections in hospitalized patients, Grossman et al considered that HCAP was similar to HAP and should receive similar treatment.

Finally, the retrospective study of Kollef on positive-culture pneumonia described a high prevalence of MRIs among HCAP patients, with the definition criteria being very similar to those of ATS/IDSA. However, the microbial etiology and the empirical antibiotic treatment are still debated because contrasting data are reported in the literature. However, it is worth noting that guidelines only refer to hospitalized HCAP patients, whereas no clear indication is given about nonhospitalized patients.

EPIDEMIOLOGY OF HCAP: DIMENSIONS OF THE PHENOMENON

Residents of Long-Term Care Facilities

The most extensive information on HCAP currently derives from studies on NHAP. The number of older...
individuals living in nursing homes (NHs) or LTCFs is expected to increase dramatically in the next 30 years because it is likely that 40% of adults will reside in LTCFs during the last part of their life. It is clear that infectious diseases (and above all pneumonia) are one of the most frequent causes of hospitalization and mortality in these patients. 

Pneumonia is the second most common infection in NHs and is the leading cause of mortality and transfer to hospital. This is an expected finding considering that NH residents are usually elderly and have multiple underlying diseases and a poor functional status. According to the review by Muder, the annual incidence of pneumonia among LTCF residents is ~99 to 912 per 1000 person (median 365 per 1000), with a hospitalization rate 30 times higher than in the general population, whereas the incidence of pneumonia in the community (CAP) is ~12 per 1000 per year for the general population and 34 per 1000 in the elderly (≥75 years). In addition, 10 to 18% of all patients hospitalized for pneumonia are NH residents. In autopsy series, pneumonia was reported to be the cause of one third to one half of all cases of death, while in clinical series from NH the mortality rate ranged from 26 to 44% and from 20 to 40% in hospital-based series. The mortality of bacteremic pneumonia in these patients is up to 50%. Despite the variability among the studies published in the literature, it is clear that data of incidence and mortality of NHAP are similar to those of HAP and confirm that HCAP should be considered a unique pathogenic entity, different from CAP and HAP.

**Dialysis-Associated Pneumonia**

Although clinical experience suggests that pneumonia may occur frequently in dialysis patients, the underlying clinical epidemiology has, for a long time, been poorly defined. However, the retrospective Waves 1, 3, and 4 Dialysis Morbidity and Mortality Study has showed that pneumonia is common in hemodialysis patients and associated with poor survival. Moreover, a recent study from Guo and colleagues clearly demonstrates that patients chronically undergoing dialysis are at risk of pneumonia, likely as a consequence of the degree of comorbidity typically present in these patients and to their susceptibility to infection.

**Pneumonia in Patients Receiving Home Infusion Therapy or Wound Care**

Despite the lack of epidemiological data on the incidence of pneumonia in patients included in home-care programs for wound care or intravenous therapies, clinical practice suggests that these practices are frequently the cause of local infection [methicillin-susceptible *Staphylococcus aureus* (MSSA), methicillin-resistant *Staphylococcus aureus* (MRSA), *S. epidermidis*, etc.] and, possibly, pneumonia through hematogenous dissemination. In particular, MRSA infections acquired in home care can have several fatal complications such as pneumonia, cutaneous abscesses, empyema, necrotizing fasciitis, and sepsis, even in healthy individuals.

However, some information on the risks derived from these procedures is given in studies on bloodstream infections. The epidemiological study by Weinstein et al in the 1990s reported nearly equal proportions of community-acquired (48%) and nosocomial bacteremia (52%), where community-acquired infections included those of patients routinely cared for in outpatient settings (cancer and renal failure) or receiving home care. It is known that home-based intravenous therapy has an overall incidence of bacteremia of 2 to 4.2%, with an estimated risk for bloodstream infection of two per 1000 catheter-days. Friedman and colleagues have proposed a classification scheme for bloodstream infections that distinguishes community-acquired, nosocomial, and healthcare-associated infections. Definition of healthcare-associated infections (HCAIs) includes (1) patients who received intravenous therapy at home, wound care or specialized nursing care through a healthcare agency, family or friends who had self-administered intravenous medical therapy in the 30 days before the bloodstream infection; (2) patients who attended a hemodialysis clinic or received chemotherapy in the last 30 days; and (3) patients hospitalized in an acute care hospital for at least 2 days in the last 3 months. In this study, 37% of the 504 patients with positive bloodstream cultures were classified as HCAI (nosocomial, 35%; community-acquired, 28%).

Among the 186 patients with HCAI, 34% had received home healthcare, 42% had received home or clinic-based intravenous therapy or dialysis, 63% had been hospitalized in the previous 90 days, and 16% were NH residents. MRSA was documented in 35 patients (19%) with HCAIs (15 had received home intravenous therapy or nursing care, 16 had received dialysis or chemotherapy, and eight were residing in a nursing home).

Although this study does not specifically focus on pneumonia, it gives an idea of the dimensions of the problem of HCAI and suggests that more information is needed on the epidemiology and etiological composition of HCAP.

**Pneumonia in Patients Undergoing Chemotherapy**

Pneumonia is a common complication of chemotherapy due to neutropenia induced by antineoplastic agents (frequently seen with alkylating agents and purine analogues) and to immune defects related to underlying
Pneumonia in Patients with a Relative Harboring Multidrug-Resistant Infections

Close contact with a relative with an MRI is considered a risk factor for HCAP by the last ATS/IDSA guidelines. However, this criterion, suggested by clinical practice, is not supported at present by the literature because no epidemiological or clinical (clinical course, microbial etiology) studies have been conducted specifically in this type of patient.

POPULATION CHARACTERISTICS

It has been observed that HCAP patients, particularly NHAP patients, are more similar to those with HAP in terms of age, functional status, and number and severity of comorbidities (i.e., cerebrovascular accident, dementia, swallowing disturbances, etc.).

The prospective study by Martinez-Moragon and coworkers compared 25 NHAP with 66 CAP patients. They observed that, compared with CAP patients, NH residents were significantly older, had a higher number of comorbidities (cerebrovascular diseases, congestive heart failure, dementia, and diabetes mellitus) and showed worse functional status before admission (Karnofsky and Barthel indexes, ECOG [Eastern Cooperative Oncology Group] scale).

Similar data on age, number of comorbidities, and functional data are shown in other prospective studies comparing LTCF and community residents with pneumonia. On reviewing the literature on the extended definition of HCAP, we found similar results in the large retrospective series of Kollef and coworkers of 4543 patients with culture-positive pneumonia. They compared the demographic and clinical characteristics of patients with CAP, HCAP, and HAP and described that age and the prevalence of the main comorbidities [chronic and renal heart failure, previous transient ischemic attacks (TIAs), etc.] of HCAP were intermediate between CAP and HAP.

In conclusion, there are several studies suggesting that age and comorbidities play an important role in disease morbidity. However, the work of Vergis and colleagues provided interesting findings comparing patients with NHAP control, NH, and healthy residents, matched for age, functional status, and duration of institutionalization. They observed that an episode of pneumonia was associated with a higher mortality rate for up to 2 years and identified two associated risk factors: large-volume aspirations and sedative medication. These findings suggest that, among LTCF patients with a similar age and functional status, additional risk factors may increase the likelihood and severity of pneumonia.

CLINICAL PRESENTATION

The clinical presentation of HCAP is frequently unusual and nonclassical because it is frequently conditioned by different factors, including advanced age, the presence of multiple chronic comorbidities, and neurological disorders.

It is known that the classic respiratory symptoms of pneumonia in elderly individuals, such as cough, expectoration, dyspnea, and pleuritic chest pain, are commonly mild and less frequent than in younger patients. Similarly, Muder described that signs and symptoms associated with lower respiratory tract infections (LRTIs) in NH residents are less frequent than in age-matched CAP patients. On the other hand, extrapulmonary manifestations, including mental confusion and gastrointestinal disorders (anorexia, nausea, vomiting, abdominal pain, etc.), are more frequent in HCAP than in CAP populations and often predominate in respiratory symptoms. It has also been observed that in older CAP patients many symptoms (cough sputum, fatigue, anorexia, myalgias, etc.) are present for a longer time than in younger patients.
patients with CAP, whereas 19% of the patients did not have cough, sputum, or pleuritic pain, and altered mental status was present in almost 45% of this group.48

In addition, fever is less commonly present in older48,49 compared with younger CAP patients, likely as a result of an altered thermoregulatory capacity to produce and respond to endogenous pyrogens.50

The clinical presentation of pneumonia in patients with multiple chronic comorbidities (chronic obstructive pulmonary disease, congestive heart failure, renal failure, etc.) is frequently more suggestive of an acute exacerbation of a comorbidity than of pneumonia.45,51

A variable proportion of HCAP patients have neurological and cerebrovascular disorders with frequent bronchoaspiration episodes due to impairment in swallowing or cough reflexes.52 The reported incidence of dysphagia, particularly in NH, is between 50 and 75%.53,54 The definition of bronchoaspiration implies the aspiration of a considerable inoculum of pathogens from a previously colonized oropharynx or of a little inoculum in the presence of weaker clearance of the aspirated secretions, because of forceless coughing, insufficient ciliary transport, altered immunoresponse, or a high virulent bacterial burden. Indeed, Vergis et al identified witnessed aspiration and sedative medications as the most important risk factors for pneumonia in LTCFs,42 and Kikuchi and colleagues demonstrated the occurrence of aspiration in 71% of elderly patients with CAP compared with 10% in healthy age-matched control subjects.55 Two biologically plausible and modifiable risk factors were found to increase the risk of pneumonia in elderly NH residents: inadequate oral care [hazard ratio (HR), 1.60] and swallowing difficulty (HR, 1.65).56

Since the 1970s it has been largely accepted that disorders in swallowing and in cough reflex are a considerable source of pneumonia in the elderly, but the hypothesis that a poor oral hygiene could be linked to respiratory pathogen colonization has only recently aroused great interest, especially when considering NH residents. Studying a population of elderly patients with NHAP, El-Sohl et al described that in eight of 10 cases of pneumonia with documented microbial etiology, the organisms isolated in the airways coincided with those identified in dental plaques (DPs) as assessed by a genetic match of the samples.57 These findings suggest that the aerobic respiratory pathogens colonizing DPs may be an important reservoir for pneumonia in elderly institutionalized patients. In parallel, it has been demonstrated that correct and intensive oral care may reduce the incidence of pneumonia by improving cough reflex sensitivity in elderly nursing home patients.58,59

These studies demonstrate the importance of assessing the risk of aspiration because it may guide the empirical antibiotic therapy and the diagnostic approach and may also prevent recurring aspiratory pneumonia.

Moreover, dysphasia can significantly hinder the interpretation of signs and symptoms during medical evaluation.

In conclusion, in patients with suspicion of HCAP, particular attention is needed during the initial clinical evaluation because unusual clinical presentation (older age, comorbid illnesses, neurological disorders) and frequent predominance of the symptoms of comorbidities can cause considerable delay in the administration of the first dose of antibiotic,45,60,61 which is generally considered a predictor of bad outcome in pneumonia.62,63

Only recently, a specific article prepared by the HCAP Group, comprising several recognized experts in emergency medicine, infectious diseases, and pulmonary and critical care medicine, was published to create awareness about the new entity of HCAP and to provide knowledge of its identification and initial management in the emergency department.54

CLINICAL COURSE

Despite the great differences among the studies published on HCAP,8,15,41,65 it has also been unanimously described that, compared with CAP, HCAP patients commonly have a worse clinical presentation but apparently not a different incidence of complications (pleural effusion, myocardial infarction, etc.),8,14,66

In fact, Martinez-Moragón and coworkers14 observed that, in comparison with CAP, NHAP patients presented worse clinical conditions (respiratory rate, level of consciousness, arterial oxygenation and pH, Fine classes etc.), more analytical abnormalities (renal function, serum glucose, and albumin, etc.), and a higher number of affected lobes in chest x-rays at admission, despite a lower prevalence of respiratory symptoms (cough, expectoration, pleuritic pain, and fever). In the retrospective studies on positive culture pneumonia by Kollef and Micek the proportion of patients with a high severity score at admission was higher among HCAP patients in comparison with CAP and HAP, whereas the percentage of HCAP patients needing admission to the ICU and ventilatory support was intermediate between CAP and HAP.8,15

Interestingly, different studies15,66 have described that inappropriate initial antibiotic therapy, which is generally associated with a higher mortality, is considerably more common among HCAP patients than among CAP. These findings confirm that unusual clinical presentation and poor awareness of HCAP-associated risk factors may probably lead to inadequate empirical antibiotic therapy and incorrect severity assessment at initial medical evaluation.
CLINICAL OUTCOMES

Clinical outcome of HCAP also seems to be considerably different from other pneumonia categories (CAP or HAP). Indeed, a longer length of stay (LOS) is reported in both retrospective and prospective HCAP series in comparison with CAP. However, the study by El-Solh on very elderly patients with severe pneumonia showed a lower mean LOS in NH patients than in home patients, probably due to the particular composition of this HCAP population (all patients >75 years of age) and to the severity of the disease (all patients admitted to the intensive care unit for pneumonia needing mechanical ventilation) that likely shorten the life expectancy of NH patients compared with home patients, as also indicated by a higher Acute Physiology and Chronic Health Evaluation (APACHE) score at admission and a higher mortality rate.

All the recent series have clearly described that mortality in HCAP is intermediate between those of CAP and HAP. Indeed, according to specific population composition and microbiological testing the mortality rate of HCAP ranges from 10 to 20% and even approaches the higher mortality rates described for NH series and for HAP.

In the retrospective study by Micek et al, which analyzed a cohort of 208 CAP and 431 HCAP patients, the following independent risk factors were found to be associated with hospital mortality: HCAP (OR, 2.28), mechanical ventilation (OR, 5.05), bacteremia (OR, 3.29), Klebsiella (OR, 2.53), and inappropriate empirical antibiotic therapy (OR, 2.19).

MICROBIAL ETIOLOGY

If HCAP is, after all, universally recognized as a unique pathogenic entity in comparison with CAP and HAP because of its multiple peculiarities in clinical presentation, course, and outcomes, its microbial etiology is still controversial. In fact, it is debated to what extent HCAP has a microbial etiology analogous to HAP because they have similar risk factors for multidrug-resistant (MDR) microorganisms. As a consequence, the relative weight of etiology on high morbidity and mortality of HCAP is not clear.

Many authors have described a high incidence of pathogens common in nosocomial infections (gram-negative enterobacterias or S. aureus) and, particularly, of MDR microorganisms in HCAP. In particular, the big retrospective studies from the group in Washington found that the most common microorganisms yielded were S. aureus (globally, 46 to 48%; MRSA, 27 to 31%), and P. aeruginosa (25 to 26%) (Table 2). Similarly, two other prospective American studies on NHAP reported S. aureus, Enterobacteriaceae, and P. aeruginosa to be frequent etiologic yields as in common HAP series (Table 3).

Two different works have reported that 68 and 85%, respectively, of MRSA infections were identified in patients residing in NHs or receiving intravenous therapy or submitted to hemodialysis. A 7-year study on the incidence of MDR nosocomial infections showed that prior antibiotic administration, residency in LTCFs, and age >65 were risk factors associated with Escherichia coli, Klebsiella spp., and Enterobacter cloacae infections. A study conducted in patients with severe pneumonia residing in NHs described a higher frequency of MDR pathogens in those patients who had previously received antibiotics or who had a worse functional status.

On the other hand, despite confirming that HCAP patients differ from CAP in age, functional status, and illness severity, two prospective studies

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

<table>
<thead>
<tr>
<th>Author</th>
<th>Micek et al&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Kollef et al&lt;sup&gt;a&lt;/sup&gt;</th>
<th>El-Solh et al</th>
<th>El-Solh et al</th>
<th>Carratala et al&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Polverino et al</th>
<th>Lim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference</td>
<td>66</td>
<td>8</td>
<td>67</td>
<td>41</td>
<td>15</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>No. of patients</td>
<td>431</td>
<td>988</td>
<td>52&lt;sup&gt;c&lt;/sup&gt;</td>
<td>104&lt;sup&gt;c&lt;/sup&gt;</td>
<td>126</td>
<td>156&lt;sup&gt;c&lt;/sup&gt;</td>
<td>40&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>MSSA, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>14</td>
<td>21</td>
<td>0</td>
<td>36</td>
<td>3</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>MRSA, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>31</td>
<td>27</td>
<td>33</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Enterobact., %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>20</td>
<td>16</td>
<td>24</td>
<td>23</td>
<td>5</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>P. aeruginosa, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>26</td>
<td>25</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>S. pneumoniae, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>13</td>
<td>52</td>
<td>57</td>
<td>80</td>
</tr>
<tr>
<td>H. influenzae, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>3</td>
<td>23</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Atypical, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>NR</td>
<td>NR</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>Legionella, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.2%</td>
<td>NR</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Others, %&lt;sup&gt;d&lt;/sup&gt;</td>
<td>NR</td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>27%</td>
</tr>
</tbody>
</table>

<sup>a</sup>Retrospective study.
<sup>b</sup>Aspiration pneumonia was excluded from this analysis.
<sup>c</sup>Only nursing home residents were studied.
<sup>d</sup>Percentage refers to all cases with known microbial diagnosis.

Enterobacteriaceae include Escherichia coli, Klebsiella pneumoniae, Proteus spp., Serratia spp., and Providencia spp. Atypical includes: Mycoplasma spp. and Chlamydia pneumoniae. Others include influenza A virus, influenza B virus, respiratory syncytial virus, Moraxella catarrhalis, and other very infrequent microorganisms. NR, not reported.
performed in Great Britain and Spain did not find any significant differences in the etiological patterns, with *S. pneumoniae* as the most frequent harbored pathogen.\(^{13,14}\) Our series of 156 NHAP, collected between January 1, 1997, and July 30, 2007, also showed *S. pneumoniae* and *Haemophilus influenzae* to be the most frequently isolated microorganisms.\(^{16}\)

As shown in Table 3, on comparing microbiological data from the main studies in the literature, the etiological composition of HCAP patients remains uncertain.

Differences in population composition (NH residents, home wound care, hemodialysis, etc.), study design (prospective or retrospective, cohort, or case-control studies), and microbiological methodology may be invoked as the main causes of discrepancies among data published in the literature. It is also interesting to note that all the studies indicating an HCAP etiology close to nosocomial infections are from North America, whereas the remaining data are derived from European series. However, differences in the geographic distribution of etiological microorganisms in HCAP seem improbable.

Further investigation on the microbial composition of HCAP is fundamental because no definitive and recent therapeutic indications are currently available. By indicating previous contact with the healthcare system as a risk factor for MRI, the last ATS/IDSA guidelines indirectly suggest to empirically treat HCAP as HAP. However, due to the great differences in the literature and according to our experience, it is necessary to distinguish the individuals with a tangible risk for MRI among HCAP patients to optimize antibiotic therapy and clinical outcomes.

The recent HCAP Summit,\(^{65}\) involving several infectious disease opinion leaders, proceeded to analyze the current literature, clinical trial data, diagnostic considerations, therapeutic options, and treatment guidelines related to HCAP. On the basis of the data currently available in the literature and on clinical practice, participants achieved a general consensus on 10 clinical practice statements, shown in Table 3. As expected, the present lack of knowledge in regard to the microbiological features of such a wide spectrum of patients, MRI risk assessment and stratification, and evaluation of HCAP treatment failures leads to HCAP being managed as HAP in many aspects and to considerable possible mistakes. However, it seems clear that prospective multicentric studies, with homogeneous microbiological methodology, are needed in the future to identify real risk groups and to provide clear diagnostic and therapeutic indications according to risk stratification.

### Table 3  Healthcare-Associated Pneumonia Summit Clinical Practice Statements

<table>
<thead>
<tr>
<th>Workshop 1: Defining HCAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The patient in/from a healthcare-associated, nonhospital environment who develops a clinical presentation of pneumonia has HCAP.</td>
</tr>
<tr>
<td>2. The clinical and microbiological features of HCAP are more similar to HAP and VAP than to CAP.</td>
</tr>
<tr>
<td>3. The recommended evaluation of HCAP with treatment failures is the same as that for HAP.</td>
</tr>
<tr>
<td>4. The definitions are the same for HCAP and HAP treatment failures.</td>
</tr>
<tr>
<td>5. Severe CAP is not HCAP.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workshop 2: Therapeutic Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Initial empirical therapy for HCAP is the same as that for HAP.</td>
</tr>
<tr>
<td>7. Patients with HCAP who are at risk for gram-negative bacterial infections should receive dual empirical antibiotic coverage.</td>
</tr>
<tr>
<td>8. Patients should receive initial empirical therapy that covers MRSA at the time of HCAP diagnosis.</td>
</tr>
<tr>
<td>9. When microbiological data are unavailable, de-escalation in patients with HCAP should not occur.</td>
</tr>
<tr>
<td>10. The duration of antibiotic therapy for patients with HCAP with a clinical response should be 7 days.</td>
</tr>
</tbody>
</table>

CAP, community-acquired pneumonia; HAP, hospital-acquired pneumonia; MRSA, methicillin-resistant *Staphylococcus aureus*; VAP, ventilator-associated pneumonia.

From Kollef et al.\(^{15}\)

---

**IS THERE A NECESSITY FOR A REDEFINITION OF HCAP?**

If the reason for ATS/IDSA classification of HCAP patients is the likelihood for them to develop MRIs it is reasonable to consider some additional risk factors among criteria for the definition of HCAP, such as the presence of indwelling devices. Indeed, the study of Mody and colleagues assessed an association between the use of indwelling devices (permanent urinary catheters, feeding tubes, and peripherally inserted central catheters) in NH patients and a greater colonization with antimicrobial-resistant pathogens.\(^{71}\) In addition, advanced chronic respiratory diseases, such as chronic obstructive pulmonary disease and bronchiectasis, and several causes of immunosuppression (alcoholism, corticosteroids, etc.) can facilitate MRI in these patients.

Furthermore, the present HCAP classification\(^ {9} \) implies an empirical antimicrobial therapy for HCAP similar to HAP. Nevertheless, it is likely that not all HCAP really should be empirically treated for nosocomial microorganisms\(^ {72} \) because this could lead to overuse of antibiotics, with the resulting concern for emergent resistances and to an inadequate antibiotic coverage of some community pathogens such as *Legionella* spp.\(^ {73} \) and *Chlamydia pneumoniae*.\(^ {74} \)

Therefore, among all the patients classified as HCAP according to current criteria, it is recommended to distinguish those who really have consistent risk
Table 4 Additional Risk Factors for Multidrug-Resistant Infection in Healthcare-Acquired Pneumonia

<table>
<thead>
<tr>
<th>Risk Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Presence of chronic indwelling device</td>
</tr>
<tr>
<td>b. Prior antibiotic use in the last 3 months</td>
</tr>
<tr>
<td>c. Chronic and advanced pulmonary diseases (COPD, bronchiectasis, etc.)</td>
</tr>
<tr>
<td>d. History of alcoholism and immunosuppression (i.e., systemic corticosteroids, immunosuppressant therapy, etc.)</td>
</tr>
</tbody>
</table>

COPD, chronic obstructive pulmonary disease.

Factors for MRI to properly manage the empirical antibiotic therapy.

Accordingly, we suggest that, in addition to the ATS/IDSA criteria, the risk factors shown in Table 4 should also be considered.

FUTURE PERSPECTIVES

In conclusion, we consider that different aspects of HCAP management may be improved in the future:

1. Prompt and correct identification of HCAP patients in primary care and emergency departments and better risk assessment for MRI among HCAP patients to optimize the diagnostic approach and empirical antibiotic therapy
2. Improved prevention and intervention in primary care by sustaining the following:
   a. Seasonal vaccination plans
   b. Guidelines-based integrated care programs in LTCFs
   c. Oral hygiene care
   d. X-rays, and rapid microbiological testing at the primary point of care (rapid polymerase chain reaction tests, etc.)
3. Enhancement of home-care programs in chronic respiratory patients because nowadays chronic respiratory diseases have an increasing economic and social burden and constitute the optimal ground for infectious fatal illnesses such as pneumonia.

REFERENCES

60. Waterer GW, Kessler LA, Wunderink RG. Delayed administration of antibiotics and atypical presentation in community-acquired pneumonia. Chest 2006;130:11–15
61. Metersky ML, Sweeney TA, Getzow MB, Siddiqui F, Nsa W, Bratzler DW. Antibiotic timing and diagnostic uncertainty in Medicare patients with pneumonia: is it reasonable to expect all patients to receive antibiotics within 4 hours? Chest 2006;130:16–21
68. Tambyah PA, Habib AG, Ng TM, Goh H, Kumarasinghe G. Community-acquired methicillin-resistant Staphylococcus aureus infection in Singapore is usually “healthcare associated”. Infect Control Hosp Epidemiol 2003;24:436–438