Clinical Evaluation of the Management of Community-Acquired Pneumonia by General Practitioners in France*

Bruno Fantin, Jean Pierre Aubert, Philippe Unger, Hervé Lecoeur and Claude Carbon

Chest 2001;120;185-192
DOI 10.1378/chest.120.1.185

Clinical Evaluation of the Management of Community-Acquired Pneumonia by General Practitioners in France*

Bruno Fantin, MD; Jean Pierre Aubert, MD; Philippe Unger, MD; Hervé Lecoeur, MD; and Claude Carbon, MD†

Study objectives: **To evaluate the management of community-acquired pneumonia (CAP) by general practitioners (GPs) in terms of clinical efficiency and adherence to official recommendations.**
Design: **Prospective cohort study.**
Setting: **Community-based study from 11 French counties.**
Patients: **Adult patients clinically suspected of having CAP who were seen by GPs were included after confirmation of the presence of an infiltrate on chest radiographs.**
Intervention: **The management of the patients was left to the discretion of the GP.**
Measurements and results: **One hundred thirty patients were included in the study, and 13 patients (10%) were immediately hospitalized because of the severity of the pneumonia. The remaining 117 patients were treated as outpatients: 108 of 117 patients (92%) were cured, and 9 patients were subsequently hospitalized because of the failure of ambulatory treatment. Diagnostic error (n = 6) rather than antibiotic failure (n = 3) was the most frequent cause of the failure of ambulatory treatment. Only 40% of the patients received an initial antibiotic treatment that was in agreement with French recommendations. However, the rate of antibiotic failure leading to hospitalization was low (3 of 117 patients; 2.6%) and similar for patients treated or not according to recommendations ($p > 0.5$). Overall, five patients (4%) died; all deaths occurred during hospitalization and were related to the severity of the underlying disease but not to the choice of antibiotic treatment.**
Conclusions: **The management of CAP by GPs was clinically effective despite a poor adherence to official recommendations. Our results suggest that adequate assessment of severity rather than adherence to recommendations for antibiotic treatment had an impact on clinical outcome of CAP managed by GPs.** ***(CHEST 2001; 120:185–192)***

Key words: antibiotics; community; health planning guidelines; pneumonia

Abbreviations: CAP = community-acquired pneumonia; GP = general practitioner

Community-acquired pneumonia (CAP) is a potentially serious infection that results in numerous general practitioner (GP) visits and hospital admissions each year, and accounts for a considerable amount of antibiotic prescribing.[1,2] The mortality rate has been increasing since the early 1980s, particularly for the elderly, despite the use of broad-spectrum antibiotics and of more sophisticated investigations and advances in supportive care.[3,4] The choice of initial treatment is usually empirical because of the serious nature of the illness, which makes it necessary to start treatment before a definitive etiologic diagnosis. Therefore, in order to improve the appropriateness of the management of CAP, a number of official recommendations[5–7] have been published in the United States and in Europe regarding the need for hospitalization, diagnostic procedures, and choice of initial empirical antimicrobial treatment, according to local epidemiology. However, these guidelines relied on expert opinion to supplement objective data that derived mostly from academic studies, or were restricted to the subpopulation of patients who were sufficiently ill to

*From the Institut National de la Santé et de la Recherche Médicale EMI9933, and Service de Médecine Interne, Hôpital Beaujon (Dr. Fantin), Clichy; Société de Formation Thérapeutique du Généraliste (Dr. Aubert), Paris; EURAXI (Dr. Unger), Truyes; MEDILOG (Dr. Lecoeur), Roissy CDG; Institut National de la Santé et de la Recherche Médicale, EMi9933, and Service de Médecine Interne, hôpital Bichat (Dr. Carbon), Paris, France.
†A list of the general practitioners who included patients in the study is given in the Appendix.
This study was supported by a grant from Aventis to the Institut National de la Santé et de la Recherche Médicale.
Manuscript received August 8, 2000; revision accepted February 23, 2001.
Correspondence to: Bruno Fantin, MD, Service de Médecine Interne, Hôpital Beaujon, 100 boulevard du général Leclerc, 92118 Clichy Cedex, France; e-mail: bruno.fantin@bjn.ap-hop-paris.fr

require hospitalization, or to immunocompetent patients only.[1,8–11] Consequently, even the authors[1,12] who participated in these guidelines have advocated caution in their clinical adoption on a country basis by GPs until clinical and economic validations have been performed.

The aim of the present study was to evaluate the management of CAP by GPs in France in terms of treatment decisions and clinical outcomes in an unrestricted population of patients in the community with radiologically proven pneumonia, and to analyze its efficiency according to its consistency with French recommendations[13] available during the study period.

Materials and Methods

Patients

The study was prospectively conducted between October 1, 1995, and March 31, 1997, in 11 French counties. These counties represented three different areas in France (Paris and suburbs, Middle West, and South East). The investigators were primary-care physicians from two networks (Société de Formation Thérapeutique du Généraliste and EURAXI). The patients were included in the study and considered as having CAP if they met the following three criteria: (1) age > 18 years; (2) recent onset of fever (> 38.3°C) and/or presence of at least one of the following findings: purulent expectoration, chest pain, crackles, new onset of dyspnea, or worsening dyspnea; and (3) presence of an infiltrate on chest radiography performed within 72 h after the first clinical examination. Patients without radiography performed or with normal chest radiographic findings were excluded from the study. Also, patients living in convalescent centers or nursing homes were excluded. Because the aim of the study was to describe the management and outcome of the patients with CAP initially seen by primary-care physicians, there were no other criteria for exclusion. Therefore, patients known to be positive for HIV or with any comorbid illnesses were not excluded. Similarly, patients whose initial clinical status justified immediate hospitalization after the initial evaluation by the primary-care physician were also included provided the chest radiograph performed at hospital admission confirmed the initial suspicion of CAP.

All patients gave informed consent to participate in the study. The study protocol was approved by the Committee for Research on Human Beings of Bichat Hospital in June 1995

Study Protocol

During the initial visit by the GP, all clinical variables of interest (Table 1) were recorded for each patient. The management of the patients was entirely left to physician discretion initially and during follow-up. The physician could see the patient as many times as thought necessary. However, the study protocol requested that the patients be seen at least a second time by the physician, approximately 2 weeks after the initial visit, for those who were not hospitalized, in order to determine the final clinical outcome: cured, hospitalized, or dead. For the patients who were hospitalized, the principal diagnosis, microorganisms identified (if any), and outcomes (cure or death) were recorded.

Table 1—*Demographic and Clinical Characteristics of Patients Included at the Initial Visit With GPs (n = 130)

Variables	Data
Demographic features	
Mean (range) age, yr	52 (18–90)
Patients > 65 yrs	35 (27)
Male/female gender, No.	65/65
Place of initial visit	
Physician's office	74 (57)
Patient's home	56 (43)
Duration of symptoms prior to initial visit	
Mean (range), d	3 (0–30)
Previous antibiotic therapy before the initial visit	23 (18)
Risk factors and underlying diseases	
Tobacco use	67 (40)
COPD	38 (23)
Congestive heart disease	6 (4)
Alcoholism	8 (6)
Immunosuppression	13 (10)
HIV infection, No.	8
Other, No.	5
Central neurologic disease	6 (4)
Clinical symptoms and condition	
Cough	122 (94)
Temperature > 38.3°C	95 (74)
Chest pain	82 (64)
Expectoration	62 (48)
Respiratory rate > 30 breaths/min	11 (9)
Systolic arterial pressure < 90 mm Hg or diastolic arterial pressure < 60 mm Hg	7 (6)

*Data are presented as No. (%) unless otherwise indicated.

Evaluation of the Management

The evaluation of the management included clinical outcome and adherence to official recommendations. The final clinical outcome for each patient fell into two categories: cure or death from CAP or from other reason. In addition, for the patients who were not immediately hospitalized after the first visit and were treated as ambulatory patients, the ambulatory management was evaluated in terms of need for a subsequent hospitalization after an initial phase of ambulatory treatment. The adherence to recommendations was measured by the agreement between the choice of antibiotic treatment prescribed by the GP for patients who did not receive antibiotics prior to the initial visit and the official recommendations that were available during the study period.[13] Recommendations that were applicable for initial treatment by the GP suggested the use of amoxicillin or a macrolide for patients who were assumed previously healthy, without vital symptoms, and the use of amoxicillin-clavulanate or oral cephalosporins for patients with risk factors. In the latter case, a macrolide or a fluoroquinolone could be associated if legionellosis was suspected.

Microbiological Procedures

A laboratory network (MEDILOG) that paralleled the physician's location was included in the design of the study. Physicians could call a nurse from the corresponding laboratories to yield sputum examination if the patient could expectorate. Similarly, blood was drawn by the nurse within 3 to 4 days after the initial visit and 2 to 3 weeks later for serologic tests. Sputum and

serologic tests were performed in order to describe the microbiological epidemiology of the study population, but were not requested for inclusion of the patients. Sputum samples were examined after Gram's staining. A sputum sample was considered valid when < 10 epithelial cells and > 25 polymorphonuclear cells were present per microscopic field (magnification $\times$ 100).[14] Sputum was considered positive if the Gram's stain showed Gram-positive diplococci suggestive of *Streptococcus pneumoniae* confirmed by culture, and for other respiratory pathogens if the Gram's stain showed only one morphologic type of bacteria and the culture yielded at least 105 cfu/mL of the same pathogen after 24 h of incubation.[2,14] Pathogens were identified and then tested for susceptibility to antibiotics by disk diffusion on agar. Blood samples drawn for serologic testing were centrifuged and serum was frozen at $-$ 20°C until the tests were performed. All the sera were sent to the reference laboratory and run simultaneously in triplicate. Serologic tests were performed for influenza virus A and B, respiratory syncytial virus 1 and 2, *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*, and *Legionella pneumophila*. Antibody titers were determined by indirect immunofluorescent method for serotypes 1 to 6 of *L pneumophila*, agglutination assay for *M pneumoniae*, microimmunofluorescence method for *C pneumoniae*, indirect immunofluorescence for respiratory syncytial virus IgG titers, and hemagglutination for IgG titers against influenza virus type A and B.[5] The tests were considered positive if there was at least a fourfold rise in titers between the first and the second sample.

Statistical Analysis

Comparisons of proportions were performed by the χ^2 test or the Fisher's Exact Test, when appropriate.

Results

Clinical Presentation of the Patients With CAP at the Initial Visit

Among the 170 patients seen by GPs and suspected of having CAP, 130 patients showed an infiltrate on chest radiography, gave their informed consent, and were included in the study. The overall outcome of the study patients is shown in Figure 1. The clinical and demographic characteristics of the 130 patients included at the initial visit are presented in Table 1. Thirteen patients (10%) were considered as immunosuppressed: 8 patients were HIV infected, 2 patients had solid cancer, 2 patients were treated with steroids, and 1 patient had leukemia.

Management of the Patients With CAP by GPs at the Initial Visit

Thirteen of the patients (10%) were immediately hospitalized after the initial visit (Fig 1). None of these patients had received any antibiotic treatment prior to the initial visit by the GP. As shown in Table 2, these patients were characterized by the severity of their underlying diseases (two patients had lung cancer, four patients were HIV infected, six patients had COPD), and by the invasive nature of the involved pathogens (*S pneumoniae* in two patients, and *L pneumophila*, *Klebsiella pneumoniae*, and *Pneumocystis carinii* in one patient each). Findings in blood cultures drawn from these patients were positive in the two cases of pneumococcal pneumonia only.

The remaining 117 patients were initially managed by GPs as outpatients. Of these, 94 patients did not receive antibiotics before the initial visit. As shown in Table 3, the antibiotic treatment prescribed did not significantly differ among patients with or without risk factors ($p = 0.33$). The choice of antibiotic treatment was in agreement with the recommenda-

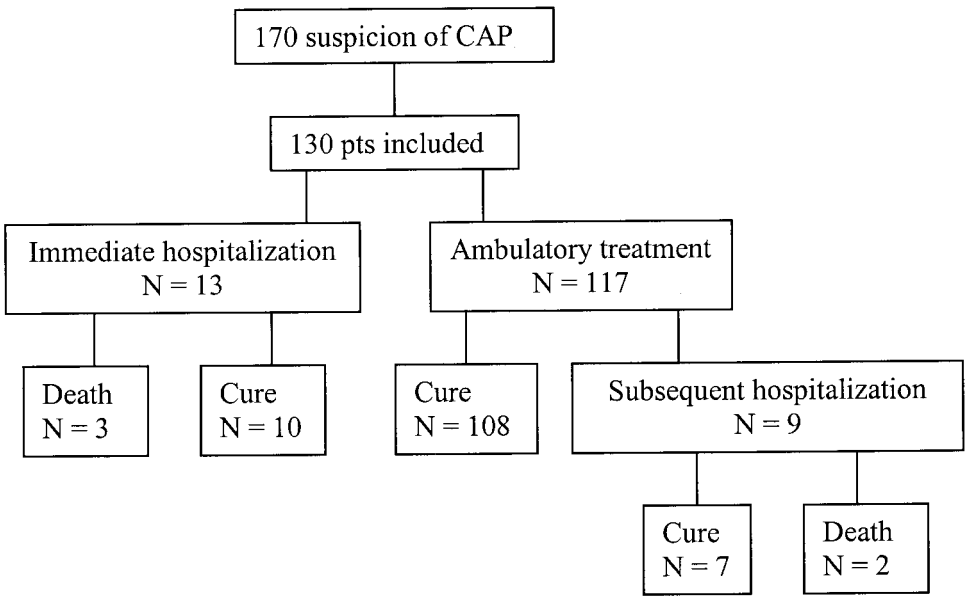

FIGURE 1. Outcomes of study patients with a suspicion of CAP managed by GPs. pts = patients.

Table 2—*Characteristics of the Patients With CAP and Initially Hospitalized by GPs

Patient No.	Sex/Age, yr	Underlying Conditions	Microorganism	Outcome
1	Male/47	HIV infection	*P carinii*	Death
2	Male/47	HIV infection	*S pneumoniae*	Cure
3	Female/37	HIV infection	*L pneumophila*	Cure
4	Male/61	COPD		Cure
5	Male/39	HIV infection	*S pneumoniae*	Cure
6	Male/62	COPD, alcohol		Cure
7	Male/67	Lung cancer, COPD, alcoholism		Death
8	Male/71	COPD, congestive heart disease	*K pneumoniae*	Cure
9	Male/44	COPD, alcoholism		Cure
10	Male/41	Lung cancer		Death
11	Female/39	COPD		Cure
12	Female/44	Active smoker		Cure
13	Female/85			Cure

tions in only 40% of the cases (Table 4). This result was quite similar in patients with or without risk factors ($p > 0.5$).

Efficiency of the Management of CAP by GPs

Of the 117 patients initially treated as outpatients, 108 patients (92%) were cured without hospitalization and 9 patients required a subsequent hospitalization because of a failure of the ambulatory management. The clinical characteristics, final diagnosis, and outcomes of these nine patients are shown in Table 5. Six of these nine patients actually did not have pneumonia but had a pulmonary disease or involvement that initially mimicked CAP, with new onset of pulmonary symptoms, fever, and new pulmonary infiltrate on chest radiographs (Table 5). Pulmonary embolism was responsible for the diagnosis error in four cases, and alveolar hemorrhage and leukemia were responsible for the diagnosis in one case each. The remaining three patients were actually considered to have pneumonia (patient 3, patient 4, and patient 9; Table 5). Only in these three patients could the hospitalization be attributed to a failure of the antibiotic treatment prescribed before the hospitalization; in one case (patient 4), the patient had been treated according to recommendations, while the two patients (patient 3 and patient 9) had not been treated according to recommendations (Table 5). The rate of antibiotic treatment failure in outpatients leading to a subsequent hospitalization was 1 of 38 patients (2.6%) for the patients who were treated according to recommendations, and 2 of 56 patients (3.6%) for the patients who were not treated according to recommendations ($p > 0.5$; Table 6).

Overall, of the 130 patients included in the study, 125 patients were cured and 5 patients died (3.8%). The mortality rates were 0 of 108 patients for outpatients and 5 of 22 patients for hospitalized patients (23%). All deaths were directly attributed to the severity of the pulmonary or underlying diseases (cancer in three patients, alveolar hemorrhage in one patient, and pneumocystosis in one patient), and none could be related to the initial management of the GP in terms of antibiotic treatment or hospitalization decision (Tables 2, 5).

Table 3—*Antibiotic Treatment Prescribed by GPs for Patients With CAP Who Did Not Receive Previous Treatment According to the Presence or Absence of Risk Factors (n = 94)

Antibiotic treatment	No Risk Factors	Risk Factors	Total†
Amoxicillin	18	13	31
Amoxicillin-clavulanate	7	10	17
Injectable cephalosporin	1	8	9
Oral cephalosporin	6	4	10
Macrolide	4	7	11
Fluoroquinolone	4	3	7
Other monotherapy	2	0	2
Combination therapy	5	2	7
Total	47	47	94

*Risk factors were age > 65 yr or presence of a comorbid illness or an underlying disease.

†Fisher's Exact Test for comparison between antibiotic treatment for the two groups, $p = 0.33$.

Outcome of the Patients With Ambulatory Treatment of CAP According to Microorganism Identification

Of the 108 outpatients with CAP, a sputum sample could be examined in 43 patients (40%). The reason for the lack of sputum examination in the remaining 65 patients was the absence of expectoration in 51 patients and the impossibility to rapidly perform the examination for logistic reasons in the remaining 14 patients. The sputum examination was positive in 13 patients (30% of those performed; 12% of the outpatient population). The microorganisms that were identified are shown in Table 7. Of the 108 outpa-

Table 4—*Agreement Between Initial Antibiotic Treatment Prescribed by GPs and French Recommendations for Ambulatory Patients With CAP Who Did Not Receive Previous Treatment (n = 94)

Antibiotic Treatment	Patients Without Risk Factors	Patients With Risk Factors	Total†
In agreement with recommendations	22 (47)	16 (34)	38 (40)
Not in agreement with recommendations	25 (53)	31 (66)	56 (60)
Total, No.	47	47	94

*Data are presented as No. (%) unless otherwise indicated. French recommendations for initial treatment of CAP[13]: patients without risk factors receive amoxicillin or a macrolide; patients with risk factors receive amoxicillin-clavulanate or oral cephalosporin (with or without macrolide or quinolone if legionellosis is suspected).

†$p > 0.5$ between agreement with recommendations in patients with or without risk factors.

tients, 86 patients actually had two serum samples for serologic studies. The serology finding was positive for the diagnosis of atypical pathogen or viruses in 12 patients, which represented 14% of the 86 outpatients tested and 11% of the outpatient population (Table 7).

Outcomes of HIV-Infected Patients

Of the study population, eight patients (6%) were HIV infected. Of these patients, six patients (75%) were hospitalized (vs 17% for the overall study population) and five patients (62.5%) had a microbiologically proven pulmonary infection (vs 24% for the overall population). Infecting pathogens were *S pneumoniae* in two patients, *P carinii* in two patients, and *L pneumophila* in one patient. One patient died from pneumocystosis.

Discussion

The main finding of our study was the discrepancy between the poor adherence of GPs to French recommendations and, overall, the good outcome of CAP managed by the GP. Indeed, evaluation of antibiotic treatments showed that GPs prescribed antibiotics that were in agreement with recommendations in only 40% of the cases, and that the choice of antibiotics did not take into account the presence or absence of underlying conditions. Furthermore, this study did not systematically examine the dose given for each antibiotic, a parameter that was previously characterized by its inappropriateness among French office-based physicians.[15,16]

Nevertheless, management of CAP by GPs was indisputably associated with an excellent clinical evaluation of the initial severity of the disease, and an appropriate indication of the need of hospitalization of patients whose conditions failed to improve with initial ambulatory treatment. All patients who were initially hospitalized had a worrisome clinical condition due to either a severe underlying disease or an extreme age, and/or a final identification of an invasive microorganism that justified, retrospectively, the initial decision (Table 2). The analysis of the nine patients who were subsequently hospitalized disclosed, in two thirds of the cases, a disease mimicking CAP, and in one third of the cases only a failure of antibiotic treatment (Table 5). Noninfectious illnesses mimicking CAP are part of the differential diagnosis when there is no response or deterioration after initiation of empirical therapy.[5] These conditions include pulmonary embolism, cancer, or pulmonary hemorrhage, as observed in our patients (Table 5). Thus, in only 3 of the 130 study patients could hospitalization be related to an ineffectiveness

Table 5—*Characteristics of Patients With an Initial Diagnosis of CAP Made by GPs Who Subsequently Justified Hospitalization Because of the Failure of Ambulatory Treatment (n = 9)*

Patient No.	Sex/Age, yr	Underlying Disease	Antibiotic Administered Before Hospitalization	Final Diagnosis	Comments	Outcome
1	Male/32		Amoxicillin	Pulmonary embolism	Diagnostic error	Cure
2	Male/84		Amoxicillin-clavulanate	Pulmonary embolism	Diagnostic error	Cure
3	Female/63	COPD, diabetes	Amoxicillin	Pneumonia	Antibiotic failure	Cure with amoxicillin-clavulanate
4	Male/35	HIV infection	Macrolide	Pneumonia	Antibiotic failure	Cure with ceftriaxone
5	Male/75	Congestive heart failure	Oral cephalosporin	Alveolar hemorrhage	Diagnostic error	Death
6	Male/59		Amoxicillin	Pulmonary embolism	Diagnostic error	Cure
7	Male/49	COPD	Macrolide	Leukemia	Diagnostic error	Death
8	Male/32		Amoxicillin	Pulmonary embolism	Diagnostic error	Cure
9	Male/40	HIV infection	Ceftriaxone	Pneumocystosis	Antibiotic failure	Cure with cotrimoxazole

Table 6—*Efficiency of Antibiotic Treatment Prescribed by GPs According to Their Consistency With Recommendations for Ambulatory Patients With CAP Who Did Not Receive Prior Antibiotic Treatment (n = 94)

Outcomes	Data	Reasons for Failure of Ambulatory Management
In agreement with recommendations (n = 38)		
Success (n = 32)	84.2	Not applicable
Failure (n = 6)	15.8	Diagnostic error (n = 5), antibiotic failure (n = 1; 2.6%)
Not in agreement with recommendations (n = 56)		
Success (n = 53)	94.6	Not applicable
Failure (n = 3)	5.3	Diagnostic error (n = 1), antibiotic failure (n = 2; 3.6%)

*Data are presented as %. Treatment failure was defined by the need for subsequent hospitalization.

of ambulatory antibiotic regimen. It is important to outline that the rate of antibiotic failure in outpatients leading to a subsequent hospitalization was similar for outpatients who were treated or not according to recommendations (2.6% vs 3.6%; $p > 0.5$) and that two of these three patients were HIV positive.

Overall, the efficiency of the management of CAP by GPs was characterized by a clinical cure without request of subsequent hospitalization in 108 of the 117 ambulatory patients (92%) and no mortality in outpatients. Mortality in hospitalized patients was 5 of 22 patients (23%) and was mainly due to the severity of the underlying disease (Table 5). These results compared favorably with the literature (average mortality < 1% in outpatients and 14% in hospitalized patients),[5] taking into account the fact that immunocompromised patients, including HIV-infected patients, were not excluded from our study, contrary to other studies.[9–11]

The apparent discrepancy between poor adherence to guidelines for the antibiotic treatment for CAP and favorable outcome of CAP managed by GPs in our study may have several explanations. (1) GPs promptly identified at the initial visit the patients requiring immediate hospitalization because of the severity of CAP; therefore, those patients requiring urgent empirical antibiotic treatment active against the suspected microorganism because of life-threatening conditions were not treated by the GP. (2) GPs also hospitalized patients with severe underlying conditions, either initially or subsequently, for whom any inappropriateness of antibiotic treatment might have vital consequences. As shown in Tables 2, 5, mortality was restricted to this subgroup of patients. Therefore, ambulatory patients treated by GPs were logically selected for the absence of vital symptoms and of severe underlying disease. HIV-infected patients were particularly representative of this aspect, since they represented 8 of 130 patients (6%) of the overall population, 6 of 22 patients (27%) of the hospitalized patients, and 2 of

Table 7—*Microorganisms Identified Among 130 Patients With CAP and Managed by GPs According to Outcome*

Variables	Outpatients* (n = 108)	Hospitalized Patients (n = 22)	Total Patients (n = 130)
Pyogenes			
S pneumoniae	5	2	7
Haemophilus influenzae	7	0	7
Staphylococcus aureus	1	0	1
K pneumoniae	0	1	1
Pyogenes identified/total microorganisms identified, No. (%)	13/25 (52)	3/6 (50)	16/31 (52)
Atypical pathogens			
M pneumoniae	5	0	5
C pneumoniae	2	0	2
L pneumophila	1	1	2
Atypical pathogens identified/total microorganisms identified, No. (%)	8/25 (32)	1/6 (17)	9/31 (29)
Viruses			
Respiratory syncytial virus	3	0	3
Myxovirus influenzae	1	0	1
Viruses identified/total microorganisms identified, No. (%)	4/25 (16)	0/22 (0)	4/31 (13)
P carinii identified/total microorganisms identified, No. (%)	0/25 (0)	2/6 (33)	2/31 (6)
Microorganisms identified/total patients, No. (%)	25/108 (23)	6/22 (27)	31/130 (24)

*Among outpatients, a sputum sample could be examined in 43 patients; 86 patients had two blood samples for serologic studies.

the 3 patients who were considered as hospitalized because of a failure of ambulatory antibiotic treatment (Tables 2, 5). Thus, GPs hospitalized the subgroup of patients for whom the inappropriateness of antibiotic treatment would have had a major impact on clinical outcome. (3) Microbiological studies of outpatients showed that microorganisms identified as responsible for CAP were bacteria susceptible to common antibiotics, or were viruses, and that no microorganism was identified in the majority of the cases (Table 7). This result is in accordance with the fact that almost one half of the cases of CAP that necessitate hospitalization are of unknown origin despite extensive diagnosis procedures.[2,17] This point suggests that the impact of the choice of antibiotic treatment may, in fact, be limited in this subpopulation of patients with unidentified microorganisms.

When studying sputum examination, our aim was not to defend this practice (which is uncommon in France), but rather to examine its yield in the community and in general practice. A valid sputum sample could only be obtained in 40% of the patients; of those 40%, 30% had a positive examination result (12% of the overall outpatient population). This sensitivity of 30% may be considered as low as compared to the 50 to 60% sensibility reported in some studies.[8,18–20] However, it is important to outline that our microbiological study was community based, that 18% of the patients received an antibiotic treatment prior to the initial visit, and that the patients were not specifically suspected of having pneumococcal pneumonia. All these factors may have contributed to a decrease in the sensitivity of the test. Therefore, we believe that this result is more realistic for GPs dealing with CAP than optimal results obtained from hospital laboratories in hospitalized patients.

Several explanations may account for the poor adherence to guidelines by GPs for antibiotic therapy of CAP. Recommendations that applied when this study began were written by experts[13] who may have given too much importance to all of the possible microorganisms involved in CAP and not enough to hospitalization decisions. Therefore, this might lead toward the use of broad-spectrum antibiotics or antibiotic combinations instead of the selection of patients who would benefit from a simple first-line antibiotic strategy. Indeed, of the 47 outpatients without any risk factors, 22 patients (47%) received amoxicillin or a macrolide antibiotic (Table 3). Another explanation may be related to the fact that GPs were not involved in the process of definition and diffusion of guidelines. This may explain the limited adherence to the recommendations among GPs. Finally, since the end of the present study, not less than three official recommendations have been published on the management of community-acquired pneumonia that would concern French GPs (one European,[6] one from the French Society of Pneumology,[21] and one from the French Agency for Drugs[22]). Obviously, the multiplicity of the recommendations available in France might be a factor limiting the adherence of the French GP to any of these recommendations.

In conclusion, our study showed that the management of CAP by GPs in France was effective in terms of clinical outcome despite the frequent inappropriateness of the antibiotic regimens prescribed according to French recommendations. This was mainly due to a good selection of the patients requiring hospitalization. Our results do not justify the fact that recommendations were not followed by GPs but strongly suggest that GPs should be involved in the procedure of recommendations for the treatment of CAP. Adherence to recommendations for antibiotic treatment of CAP by GPs might have a more substantial impact on other parameters than clinical outcome. In particular, the economical analysis of GP behavior is currently being evaluated.

ACKNOWLEDGMENT: The authors thank Drs. Michel Cadilhac and Sylvie Fiessinger (Aventis) for their active participation to the project, and Stephanie Chavane (MEDILOG) for her technical assistance.

Appendix

EURAXI: Dusset Gérard, Ramos Alain, Chemin Patrick, Fierfol Luc, Richard Jean-Jacques, Becq Jean-Philippe, Chastan Georges, Drugeon Michel, Duffaut Gérard, Solomiac Jacques, Breton Nicolas, De Joux Emmanuel, Duvochel Louis, Farenc Roger, Flori Jeanne, Osseni Bissiriou, Stefanaggi Thierry, Azzopardi Yves, Dalle Rive Marie-Catherine, Ecochard Cirica Nadine, El Sawy Alain, Gichard Gérard, Jallon Pascal, Mongourdin Benoît, Salembier Alain, Constensoux Jean-Pierre, Destrube Bernard, Meker Denis, Aroun Jean-Marc, Mercier Charles-Henry, Berthier Alain, Esnault Pierre, Marzin Yves, Pierre Philippe, Paillard Guy-Marc, Saitta Marc, Bardin Rémi, Bonet François-Xavier, De Sainte Lorette Eric, Gasser Jean-Hugues, Gelin Daniel, Houdry Pavie Suzanne.

Société de Formation Thérapeutique du Généraliste: Adorian Danielle, Aubert Jean-Pierre, Avramov Danielle, Bernard Catherine, Block Frédérique, Bloede François, Botte Christine, Bouix Jean-Claude, Brami Jean, Bryn Agnès, Buffel Thierry, Caulet Marie-Cécile, Chapiro Ouri, Chaumie Catherine, Chenay Christian, Cohen Floriane, El-Kaddi Aïman, Gallai-Profit Maria, Graciani Pierre, Guiller Murielle, Henry Ghislaine, Herblot Thierry, Huet Christian, Hureau Jean-Philippe, Jean Alain, Jomier Bernard, Kartowski Estelle, Labbe Véronique, Lacour Christiane, Langlois Pierre, Laval Sylvette, Lavielle Maïté, Lecompte Françoise, Magnier Anne-Marie, Mollard Jean-Marc, Moula Hervé, Nahon Françoise, Petit Jean-François, Pirolli Christian, Pitras Jérôme, Rance Philippe, Rey-Giraud Pierre, Ribaud Patrick, Siary Alain, Weizmann Ledicia.

References

1 Gleason PP, Kapoor WN, Stone RA, et al. Medical outcomes and antimicrobial costs with the use of the American Thoracic

Society guidelines for outpatients with community-acquired pneumonia. JAMA 1997; 278:32–39
2 Marrie TJ. Community-acquired pneumonia. Clin Infect Dis 1994; 18:501–515
3 Campbell DG. Overview of community acquired pneumonia: prognosis and clinical features. Med Clin North Am 1994; 78:1035–1048
4 Pinner RW, Teutsch SM, Simonsen L, et al. Trends in infectious diseases mortality in the United States. JAMA 1996; 275:189–193
5 Bartlett JG, Breiman RF, Mandell LA, et al. Community-acquired pneumonia in adults: guidelines for management. Clin Infect Dis 1998; 26:811–838
6 Huchon G, Woodhead M, Gialdroni-Grassi G, et al. Guidelines for management of adult community-acquired lower respiratory tract infections. Eur Respir J 1998; 11:986–991
7 Niederman MS, Bass JB, Campbell GD, et al. American Thoracic Society guidelines for the initial management of adults with community-acquired pneumonia: diagnosis, assessment of severity, and initial antimicrobial therapy. Am Rev Respir Dis 1993; 148:1418–1426
8 Bartlett JG, Mundy LM. Community-acquired pneumonia. N Engl J Med 1995; 333:1618–1624
9 Fine MJ, Smith DN, Singer DE. Hospitalization decision in patients with community-acquired pneumonia: a prospective cohort study. Am J Med 1990; 89:713–721
10 Fine MJ, Auble TE, Yealy DM, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. N Engl J Med 1997; 336:243–250
11 Fine MJ, Smith MA, Carson CA, et al. Prognosis and outcome of patients with community-acquired pneumonia. JAMA 1996; 275:134–141
12 Fein AM, Niederman MS. Guidelines for the initial management of community-acquired pneumonia: savory recipe or cookbook for disaster? Am J Respir Crit Care Med 1995; 333:1618–1624
13 Société de Pathologie Infectieuse de Langue Française. Quatrième conférence de consensus en thérapeutique anti-infectieuse: les infections des voies respiratoires. Med Mal Infect 1991; 21(suppl octobre):1–8
14 Murray PR, Washington JA. Microscopic and bacteriologic analysis of sputum. Mayo Clin Proc 1975; 50:339–344
15 Guillemot D, Carbon C, Balkau B, et al. Low dosage and long term treatment duration of β-lactam risk factors for carriage of penicillin-resistant *Streptococcus pneumoniae*. JAMA 1998; 279:365–370
16 Guillemot D, Carbon C, Vauzelle-Kervroëdan, et al. Inappropriateness and variability of antibiotic prescription among French office-based physicians. J Clin Epidemiol 1998; 51: 61–68
17 Carbon C, Leophonte P, Petitpretz P, et al. Efficacy and safety of temafloxacin versus amoxicillin in hospitalized adults with community-acquired pneumonia. Antimicrob Agents Chemother 1992; 36:833–839
18 Boerner DF, Zwadyk P. The value of the sputum Gram's stain in community-acquired pneumonia. JAMA 1982; 247:642–645
19 Gleckman R, De Vita J, Hibert D, et al. Sputum Gram stain assessment in community-acquired bacteremic pneumonia. J Clin Microbiol 1988; 26:846–849
20 Levy M, Dromer F, Brion N, et al. Community-acquired pneumonia: importance of initial noninvasive bacteriologic and radiographic investigations. Chest 1988; 93:43–48
21 Recommandations de la Société de Pneumologie de Langue Française: conduite à tenir devant une infection respiratoire communautaire de l'adulte. Rev Mal Respir 1999; 16:224–233
22 Rapport de L'Agence du Médicament. Antibiothérapie par voie générale en pratique courante: infections ORL et respiratoires basses. Rec Méd Mal Infect 1999; 29:209–211

Clinical Evaluation of the Management of Community-Acquired Pneumonia by General Practitioners in France*

Bruno Fantin, Jean Pierre Aubert, Philippe Unger, Hervé Lecoeur and Claude Carbon

Chest 2001;120; 185-192
DOI 10.1378/chest.120.1.185