Community-Acquired Pneumonia in the Elderly
A Practical Guide to Treatment

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Contents

Abstract ......................................................... 93
1. Risk Factors .................................................. 95
2. Aetiology ..................................................... 95
3. Clinical Manifestations ........................................ 96
4. Laboratory Tests ................................................ 96
5. Imaging ....................................................... 97
6. Clinical Syndromes and Aetiology .............................. 97
7. Indications for Hospitalisation ................................ 98
8. Complications and Mortality .................................. 99
10. Antibiotic Therapy ............................................ 99
10.1 Standard Therapy ........................................... 100
10.2 Newer Fluoroquinolones .................................. 100
10.3 Newer Macrolides ........................................... 101
10.4 Current Recommendations .................................. 101
10.4.1 Switch from Intravenous to Oral Therapy ............... 102
10.4.2 Duration of Therapy ..................................... 102
11. Disease Prevention ........................................... 102
12. Economic Aspects ............................................. 102
13. Conclusions ................................................... 103

Abstract

The incidence of community-acquired pneumonia (CAP), an infectious disease, sharply increases among the elderly and the main risk factor for CAP in this age group is chronic comorbidity. The use of the term CAP in the elderly population should be reserved for pneumonia acquired outside of the nursing home setting, since nursing home-acquired pneumonia differs from CAP in terms of its aetiology and clinical manifestations.

The main aetiology for CAP is Streptococcus pneumoniae, but atypical pathogens also play an important role as causative agents. The clinical presentations of CAP in the elderly can be different from those in younger patients, and therefore it is important to be aware of and familiar with these differences to avoid unnecessary delays in reaching the correct diagnosis. Imaging is essential to diagnose...
Pneumonia is an infectious disease of the lung parenchyma. It has a broad spectrum of severity and is the leading cause of death among the infectious diseases. Historically, pneumonia has been classified as nosocomial [hospital-acquired pneumonia (HAP)] or community-acquired pneumonia (CAP). This classification is based on the striking differences between these 2 categories in terms of aetiology, severity and outcome.

It is difficult to determine the exact incidence rates of CAP in nonhospitalised patients. In contrast, there are reliable incidence data on CAP in hospitalised patients, but these data are affected by hospitalisation policies in the regions in which the studies were conducted. The annual incidence of CAP in hospitalised adults in the US is 267 per 100,000.\(^1\) The incidence rate increases sharply with age, ranging from 92 per 100,000 in individuals aged <45 years to 277 per 100,000 in those aged between 45 and 64 years, and to 1012 per 100,000 in persons aged >65 years. These high incidence rates for CAP in the hospitalised elderly, in addition to those for patients who are treated as outpatients, reflect the extent and importance of CAP in this age group.

The accepted classification of patients with pneumonia into those with CAP and those with HAP is very useful in the younger and middle age groups, but it is not appropriate for the elderly population. In the elderly, pneumonia should be classified into 3 categories with a separate grouping for nursing home-acquired pneumonia (NHAP). In recent years, the proportion of the elderly population living in nursing homes is increasing continuously. This situation, together with data showing that the incidence rate for NHAP is 2- to 3-fold higher than that for CAP,\(^2\) explains the increasing proportion of NHAP among all patients with pneumonia. In terms of clinical manifestations, NHAP can be graded between CAP and HAP, but it is more similar to HAP.\(^3\)-\(^6\) The clear distinctions between NHAP and CAP have become well established in recent years. The absence of this distinction in earlier studies led to a case mix, under the single category of CAP, of elderly patients who live and function independently in the community with elderly patients with limited functional capacity living in nursing homes. As a result, some of the features of NHAP were ascribed incorrectly to CAP in the general elderly population. The present review...
emphasises this distinction as much as possible and will refer to CAP without referring to NHAP.

1. Risk Factors

As individuals grow older, age-related structural and functional changes occur in the lungs, among which air trapping and changes in the diaphragm position are the most important. These changes reduce the effectiveness of the cough[7] and mucociliary clearance.[8] Although these and other changes adversely affect natural pulmonary defence mechanisms against infection, their importance as risk factors for CAP in the elderly are secondary to the critical importance of chronic comorbidity. The list of diseases that have been cited as risk factors for pneumonia in the elderly include all of the common diseases in this age group, such as chronic obstructive pulmonary disease, congestive heart failure, ischaemic heart disease, diabetes mellitus, chronic renal insufficiency, neurological disease, malignancy and malnutrition.[4,9-11] Among elderly patients hospitalised for CAP, 60 to 91% have one or more of these illnesses.[6,12] It is unclear whether old age per se is a risk factor for CAP. It would appear that the risk of developing CAP is directly related to the number of risk factors mentioned above, with old age considered to be one of them.[13]

2. Aetiology

Determination of the exact aetiology of CAP in general, and in the elderly patient in particular, is problematic. Positive blood cultures, the most reliable diagnostic test, are obtained in no more than 18% of elderly patients with CAP.[12] Most elderly patients with CAP do not produce phlegm for examination. Even when sputum is obtained for culture, the aetiological value of this test is limited and a Gram stain is of diagnostic value in only a few patients. Invasive tests to diagnose CAP are not usually performed in the elderly and have not been reported in most published series. ‘Atypical’ CAP aetiologies are usually determined by serological methods, but convalescence serum samples, which are critical for the diagnosis, are not usually obtained. Thus, it is not surprising that in most series that have tried to describe the distribution of various aetiologies for CAP in the elderly the most common categorisation is ‘unknown aetiology’. In addition, it is difficult to compare the aetiological distributions among the various studies because of the differences in the microbiological techniques used, in the composition of the populations studied (in terms of the proportion of patients with NHAP) and in the light of geographical differences. Therefore, we do not present a table of the aetiological distribution of CAP among the elderly, but do discuss the principal aetiologies involved.

*Streptococcus pneumoniae* is, without doubt, the most common aetiology of CAP in the elderly population. This finding has been confirmed in all published studies, almost without exception. The relative prevalence of this aetiology in most studies ranges from 40 to 60%.[9,12,14-17] Within the elderly population, the relative prevalence of *S. pneumoniae* increases with age from 46% in the 65- to 74-year-old age group to 58% among patients aged ≥75 years.[12] *Haemophilus influenzae*, nontypeable *Haemophilus* spp., and *Staphylococcus aureus* were found to cause CAP in only some of the studies of elderly patients, and there were significant differences in prevalence rates. These aetiologies appear to be common in NHAP but are rare in independently functioning elderly patients who were hospitalised from their homes, as is the case for Gram-negative bacilli.[9,12,18]

The relative prevalence of *Legionella* spp. among the aetiologies of CAP in the elderly ranges in various series between 0 and 15%.[12,19] The importance of *Chlamydia pneumoniae* as a CAP aetiology has become clearer over recent years. It is found in 6 to 26% of elderly patients hospitalised for CAP.[6,9,12,20] To date, the data collected on this aetiology are too limited to reach definite conclusions, but it is becoming clearer that this pathogen, like *Legionella* spp., has strong geographic variability and is very dependent on the intensity of the aetiological work-up and the diagnostic methods used. *Mycoplasma pneumoniae* is either rarely alluded to in studies of CAP in the elderly, or referred to as an unusual cause of CAP. Lastly, *Mycobacterium avium complex* and *Mycobacterium tuberculosis* are rarely reported as a cause of CAP in the elderly.
to as an unimportant aetiological factor. However, it is impossible to ignore the reports of a significant proportion of patients with *M. pneumoniae* pneumonia being elderly.\(^{[12,21]}\)

Respiratory viruses, especially those from the influenza and parainfluenza groups, and respiratory syncytial virus, particularly during epidemics, contribute to the list of aetiologies of CAP in the elderly, and as predisposing factors in the development of serious bacterial infections. The prevalence of this aetiology ranges from 6% in the 65- to 74-year-old age group to 13% in those aged ≥75 years.\(^{[12]}\)

Another important characteristic of the aetiology of CAP in the elderly is the relatively high rate of CAP caused by more than one pathogen. More than one pathogen is involved in a third of the patients with CAP,\(^{[12]}\) and despite its therapeutic importance, remains undiagnosed in most.\(^{[22]}\)

Another aetiological factor that has not been mentioned in most series on CAP in the elderly is aspiration pneumonia. In contrast to the other aetiologies described above, this factor is an acute event that brings a collection of potential infective pathogens into the lungs. *S. pneumoniae* and *H. influenzae*, but not anaerobic bacteria, have been identified in patients with community-acquired aspiration pneumonia.\(^{[23]}\)

### 3. Clinical Manifestations

In comparison with the classic presentations of pneumonia, pneumonia in the elderly is characterised both by a quantitative reduction, or even absence, of these manifestations and the appearance of symptoms and findings that are unique to this age group. Fever, which accompanies pneumonia in younger patients may not be present in the elderly. Cough and the production of phlegm, which also usually accompany the disease in younger patients, occur less frequently in the elderly.\(^{[24-27]}\) The occurrence of fever and productive cough are significantly reduced in bed-ridden patients, but only slightly reduced in functioning patients who were hospitalised from their homes. The unique characteristics of pneumonia in the elderly are, on the one hand, an acute confusional state and, on the other, a gradual deterioration manifested by reduced eating and drinking, falls, urinary incontinence, dizziness and decreased or absent communication with the surroundings.

All of these impairments have been observed in elderly patients with CAP, even in those without fever or hypoxaemia, and they apparently stem from a direct effect of the infective pathogen on the elderly brain that has undergone age-related changes that reduce its capacity to cope with stressful circumstances. The high prevalence of concomitant disease in the elderly leads to a situation in which a frequent or, at times, the only expression of CAP in the elderly is a severe ‘unexplained’ exacerbation of chronic concomitant conditions such as congestive heart failure or chronic obstructive pulmonary disease. The acute changes in consciousness, the deterioration in the patient’s general state and the worsening of other chronic diseases are characteristic of CAP in well-functioning elderly patients and are not unique to bed-ridden patients. Tachypnoea and tachycardia are more prevalent in elderly patients with pneumonia than in younger patients, but they are not specific findings. However, it should be remembered that unexplained tachypnoea or tachycardia may be the only early manifestation of pneumonia in the elderly. As a rule, no association has been found between the clinical expression of CAP in the elderly and the microbiological aetiology of the disease.\(^{[24]}\)

The practical significance of the atypical clinical presentation of pneumonia in the elderly is the delay in diagnosis and a consequent delay in treatment. This delay in initiating therapy is very significant in terms of the chances of an elderly patient surviving the illness and returning to their pre-morbid functional state.

### 4. Laboratory Tests

Routine laboratory tests do not make a significant contribution to the diagnosis of CAP or its aetiology. The principal importance of these tests is to identify acute or chronic anaemia, electrolyte or fluid imbalances and the loss of control of
chronic comorbidities. The level of oxygenation should be measured in all elderly patients with CAP, at least by using pulse oximetry. Blood-gas tests are indicated in patients with a clinical suspicion of carbon dioxide retention or an acid-base disturbance.

The mean total leucocyte count is higher among elderly patients with CAP than in younger ones[12] and this rise appears to stem from a different mix of aetiologies in the older population, including more pneumococcal infections. However, it is important to bear in mind that CAP can appear in elderly patients with a normal leucocyte count or even leucopenia. Elevated serum urea levels have been mentioned as a poor prognostic factor in CAP in the elderly. Hypoxaemia has been studied infrequently in elderly patients with CAP, and was not found to be different from that in younger age groups,[12,28]

5. Imaging

A pulmonary infiltrate visible on chest x-ray has traditionally been considered the gold standard and a sine qua non for the diagnosis of CAP. This truism has been challenged in light of a recent study[29] in which high-resolution computed tomography (HRCT) identified a pneumonic infiltrate in a significant number of patients with chest x-rays that were interpreted as normal, and bilateral infiltrates in patients in whom the x-ray showed only unilateral evidence of pneumonia. This important observation, if it is confirmed by other studies, may make HRCT the gold standard for the diagnosis of CAP.

Pulmonary infiltrates are seen in the vast majority of patients on admission to hospital, but in a minority the infiltrate can appear a day or two later. In elderly patients with CAP there is a higher prevalence of multilobar involvement, progression of the infiltrate throughout the course of hospitalisation and a slow resolution in the convalescence phase of the disease.[25] Slow resolution of the pulmonary infiltrate on chest x-ray is particularly characteristic in very old patients, in the presence of chronic comorbidity and when there is multi-

lobar involvement. In 50% of elderly patients with pneumococcal pneumonia, the most prevalent aetiology in this age group, there is complete x-ray resolution after 5 weeks, and after 2 to 3 months in the rest. Radiological resolution takes about 20% longer for each decade of age above 20 years.[30]

Another important characteristic of the radiological expression of CAP in the elderly is the effect of chronic comorbidity on the accurate interpretation of x-ray findings. An acute intercurrent febrile illness in an elderly patient with congestive heart failure could cause a worsening of the heart condition and the appearance of an ill-defined pulmonary infiltrate. The clinician treating such a patient with fever and a new pulmonary infiltrate on chest x-ray will be forced to administer treatment for CAP. Only when the infiltrate and the fever disappear the next day, will the physician realise that the patient had an exacerbation of congestive heart failure and not CAP. Other chronic comorbid conditions that can affect the interpretation of chest x-rays include lung cancer, bullous emphysema and pre-existing scars in the lungs or the pleura, which may be considered to be new infiltrates in the absence of previous x-rays for comparison.

6. Clinical Syndromes and Aetiology

The question of whether there is an association between clinical manifestations, routine laboratory test results and radiological findings with the aetiology of CAP is critical, especially from the therapeutic standpoint. Until about 10 years ago it was commonly believed that a combination of clinical manifestations, physical findings, the total leucocyte count and especially radiological findings could provide a reasonably accurate diagnosis of pneumococcal disease among the various aetiologies of CAP. This was the basis for the differentiation between ‘typical’ and ‘atypical’ pneumonia. Developments over recent years in diagnostic methods for identifying the aetiology of CAP have convincingly shown that the correlation between clinical and radiological findings and the true aetiology of CAP is weak. The classic combination of manifestations indicative of ‘typical’ pneumonia
could actually be caused by one of the *Legionella* spp., while pneumococcal pneumonia can be manifested by an ‘atypical’ combination of findings.

The recently published observation that HRCT can distinguish between bacterial and ‘atypical’ CAP\(^3\) is not sufficiently convincing at this stage. Thus, the commonly held position in the literature today\(^{18,32-35}\) is that clinical manifestations, routine laboratory tests results and radiological findings are not sufficient to provide an accurate aetiological diagnosis in individual patients with CAP. Pathogen-specific laboratory tests are required to reach a precise aetiological diagnosis, and these are not available to clinicians at the time they have to decide on initial therapy for their patients. This important conclusion has therapeutic implications that have been discussed in section 10.

7. Indications for Hospitalisation

The decision whether to hospitalise the elderly patient with CAP is one of the more important, if not the most important, therapeutic decision. The arguments against hospitalisation are substantial and are based on the desire to: (i) protect the elderly patient from exposure to nosocomial infections that may cause morbidity and mortality; (ii) avoid the behavioural changes that often accompany removal of the elderly patient from their natural surroundings; and (iii) reduce the high financial burden of hospitalisation. On the other hand, CAP in the elderly has a significant rate of morbidity and mortality, which can be reduced by observation and treatment in the hospital.

According to the guidelines of the American Thoracic Society (ATS),\(^{34}\) the decision on hospitalisation should take into consideration the age of the patient, comorbid conditions, impaired vital signs or state of consciousness and impaired laboratory test results. The patient’s social condition should also have a strong bearing on the decision to hospitalise, particularly the absence of a supportive framework at home. In addition to the above, it is recommended to hospitalise patients for an observation period of 24 to 48 hours if their overall appearance seems unfavourable, even if the other criteria in the guidelines are not fulfilled.

In a recently published study of a very large number of patients with CAP\(^3\) a scoring system was proposed that categorised patients with CAP into 5 mortality risk groups. In general, the scoring system is based on specific scores for each of the clinical parameters cited in the ATS guidelines.\(^{34}\) The patient’s age (in years) is included as is in the score for men, but is reduced by 10 for women. Most of the patients in the first 3 risk categories (scores below 90) are at relatively low risk for death and are considered suitable for ambulatory care, while patients in the other 2 categories should be hospitalised. A safeguard that has been proposed is to hospitalise all patients with hypoxaemia (oxygen saturation below 90%), regardless of the patient’s risk score.

The authors of the scoring system take pains to emphasise that it is not a substitute for physician judgement and that the patient’s social situation must not be ignored when deciding upon hospitalisation. When considering this scoring system, it is important to remember that some of the patients are seen at an early stage of their illness, before it has reached its peak severity. At this point, the score does not support hospitalisation, but it may do so a short time later. This has been confirmed in a study that looked at the course of the illness contrasted with the patient’s condition on admission to the hospital.\(^{17}\)

In terms of the scoring system and elderly patients, age *per se* should only be an indication for hospitalisation in very old patients. However, the high rate of chronic comorbidity in these patients and the physiological and mental changes that often accompany CAP in the elderly bring about a situation in which hospitalisation is indicated in most of these patients. In order to prevent unnecessary hospitalisations, or at least to shorten the duration of hospitalisation, the possibility of a 24- to 48-hour observation period should be considered to assess the severity and dynamics of the illness and allow empirical therapy to be initiated under observation. At the end of the observation
period, patients can be discharged for ambulatory care even if they have not recovered completely.

8. Complications and Mortality

The direct complications of CAP are mostly the result of the infectious process that can cause bacteremia, leading to dissemination of the infection to adjacent and distant organs, to the development of pulmonary abscesses and to haemodynamic instability including septic shock as an expression of the systemic inflammatory response syndrome. In extreme cases, the situation can deteriorate to become multisystem organ dysfunction syndrome. Another direct complication stems from impairment of the respiratory system that can result in respiratory insufficiency and necessitate mechanical ventilation. One or a combination of these complications is the cause of death in most patients with CAP who die of the disease. Other complications include pulmonary embolism, atrial fibrillation and myocardial infarction, which reflect the high prevalence rates of chronic cardiovascular comorbidity in this age group.

In some studies, CAP in the elderly is reported to cause the loss of functional status and increased dependency. Reports of this complication are not consistent and it apparently occurs primarily in hospitalised patients with a low premorbid level of functioning. Among functionally independent elderly patients who were hospitalised from their homes, this complication is relatively rare.\[12,38\]

Mortality rates from CAP reported among elderly populations range from 44%\[39\] to 2%\[40\]. Undoubtedly, the higher percentage represents elderly patients with particularly severe chronic comorbidity in whom CAP is the immediate cause of death. Osler’s statement that ‘pneumonia is the friend of the elderly’ is apt for this group. The lower percentage apparently represents a select population with a mild form of the disease that is not characteristic of this age group as a whole, not even of those who are hospitalised from their homes. The real association between mortality rates and CAP appears to depend on the surroundings from which the elderly patient came to the hospital, the premorbid functional status of the patients, the nature of their chronic comorbidity and the aetiology of CAP. A severe involvement for any of these factors, and particularly for more than one of these factors, increases the mortality rate significantly. There is a noteworthy increase in mortality rates between patients aged <75 years and those above this age.\[12\]

9. Treatment of Accompanying Problems

In addition to the antibiotic regimen, the treatment of CAP requires attention to a broad spectrum of accompanying problems. The most important of these problems are impaired water and electrolyte balance and hypoxaemia. Failure to correct these impairments, which are highly prevalent in the elderly, will worsen the clinical manifestations of the disease, especially by affecting the state of consciousness. In the elderly patient it is also necessary to pay attention to nursing needs according to the actual functional state of the patient during the course of the acute illness. Treatment of these problems is important but not specific to CAP, and therefore, is not discussed in detail in this review.

10. Antibiotic Therapy

When deciding on the antibiotic therapy for the elderly patient with CAP we should take into account the age-related changes in drug absorption, distribution and metabolism, in general and for each antibiotic preparation specifically. These changes affect the systemic concentration of the drug and its efficacy and toxicity. It is also important to consider interactions between antibiotics and other medications that the patient may be taking regularly for other comorbid conditions. The cost of the antibiotic should also be considered when selecting antibiotics, especially if the choices have similar levels of efficacy and toxicity.

Another important factor in choosing the antibiotic therapy is that the exact aetiology of CAP cannot be determined in the first phase of the disease. The lack of correlation between the various manifestations of the disease and its aetiology was discussed in section 6. Thus, a consensus exists...
that the initial therapy for CAP must be empiricai\cite{34,35} and should cover a broad range of suspected aetiologies that are affected by the patients’ type of residence and epidemiological data from their geographical region. The empirical regimen must take into account the patient’s comorbidities and the clinical severity of the illness.

In recent years, several antibiotic regimens have been proposed for the treatment of elderly patients with CAP, on the basis of the principles discussed earlier in this section.\cite{13,18,22,34,41-45} Despite overlap among these reported regimens, there is a degree of variation that stems, most likely, from different patient characteristics and from personal enthusiasm on the part of the authors for specific antibiotic preparations. The most prominent influence is the guideline proposed by the ATS for CAP in adult patients.\cite{34} The advantages of their proposed treatment protocol are reflected in the positive experience that has been reported by those who have used it, the broad consensus that has developed around it, the clarity of the recommendations and its ease of use in routine clinical work. The following abridged description of the ATS recommendations should not be a substitute for a thorough study of the guidelines.\cite{34}

10.1 Standard Therapy

According to the ATS guidelines, elderly patients with CAP are classified as category 2 if their disease does not necessitate hospitalisation. These patients should receive oral therapy with second generation cephalosporins or a \( \beta \)-lactam/\( \beta \)-lactamase inhibitor (e.g. amoxicillin and clavulanic acid). In regions with a high prevalence of \textit{Legionella} spp. aetiology, erythromycin or another macrolide should be added to the regimen.

Hospitalised elderly patients are classified by the severity of their illness. Patients with a relatively mild illness are classified as category 3 and those with a severe illness as category 4. Both of these categories should be initially treated with intravenous antibiotics. The recommended regimen for category 3 is a second or third generation cephalosporin or a \( \beta \)-lactam/\( \beta \)-lactamase inhibitor with the addition of a macrolide if \textit{Legionella} spp. infection is prevalent in the region. The recommendation for category 4 patients is to administer treatment with a macrolide and a third generation cephalosporin that is active against \textit{Pseudomonas aeruginosa}. Alternatives to the latter are other preparations effective against \textit{P. aeruginosa} such as imipenem/cilastatin or ciprofloxacin.

Since the publication of the ATS guidelines in 1993, several significant developments have taken place in the field of antibiotic therapy for CAP. The most important of these is the increasing body of data on the prevalence of atypical pathogens in the aetiology of CAP\cite{46} and growing evidence of the development of resistance to some of the classic antibiotics, particularly penicillin, cephalosporins and macrolides, among the pneumococcal strains that cause CAP.\cite{47} Risk factors for the development of resistance include old age and the presence of more than 2 comorbid conditions. Although \textit{in vitro} resistance to one antibiotic was identified in 52% of the patients, the indices of severity of disease and complications were no more severe in these patients than in others. The explanation for this phenomenon is that the microbiological threshold used to define resistance is significantly lower than the level obtained in infected tissue using accepted penicillin and cephalosporin preparations and dosages.\cite{47} Thus, it would appear that pneumococcal resistance to antibiotic preparations in use today can complicate the management of CAP but the impact of this resistance on outcome is not clear.\cite{30}

10.2 Newer Fluoroquinolones

Another recent important development is the accumulation of experience with the use of fluoroquinolone preparations as drugs of choice, instead of erythromycin, in severely ill patients with CAP caused by \textit{Legionella} spp.\cite{48} However, as monotherapy for CAP, the older preparations – ofloxacin, ciprofloxacin and perflaxacin – do not provide optimal coverage against pneumococci, the principal cause of CAP. A fourth important development is the successful completion of several clinical tri-
als that have led to the introduction of new antibiotic preparations for the treatment of CAP. In contrast to older preparations, these new antibiotics have improved pharmacokinetic qualities that make once-daily administration possible. These new preparations cover a broad microbiological range of aetiologies, so they can be used as monotherapy for the vast majority of CAP aetiologies, including some of the resistant pneumococci, in addition to causing significantly fewer adverse effects.

One of these groups of new antibiotics is the third generation fluoroquinolones. In addition to their efficacy against atypical pathogens these agents have excellent activity against Gram-positive aerobic cocci. The following 3 preparations in this group have been shown to be effective as once-daily monotherapy for CAP in controlled clinical trials: sparfloxacin,[49-51] levofloxacin[52] and moxifloxacin.[53] In all of the clinical trial reports, these preparations were found to be at least as effective, and in most cases more effective than, the active comparators. They were administered by either oral or intravenous route to patients with CAP with mild-to-moderate disease severity. Like the other fluoroquinolones, these 3 preparations were well tolerated in the elderly. The main adverse effects reported were: (i) levofloxacin caused a few gastrointestinal and CNS adverse events and was associated with minimal phototoxicity; and (ii) sparfloxacin infrequently caused gastrointestinal or CNS effects but was associated with relatively high rates of phototoxicity and asymptomatic prolongation of the electrocardiographic QTc interval.[49,52,54] Owing to the high rate of the latter 2 adverse effects, the use of sparfloxacin has been discontinued in several countries. Moxifloxacin appeared to have a low propensity for causing phototoxicity or CNS excitatory effects; the most common adverse effects with the drug were gastrointestinal disturbances.[53]

10.3 Newer Macrolides

A second new drug group is the new macrolides, which includes azithromycin,[55] clarithromycin[56] and dirithromycin.[57] Agents in this macrolide group have a long plasma elimination half-life that enables once-daily administration (including clarithromycin) with a relatively short treatment period (azithromycin and dirithromycin) compared with other preparations. These drugs have also been used successfully as monotherapy in patients with CAP in controlled clinical trials.[55-56] The principal adverse effects associated with the use of these agents are gastrointestinal, but their prevalence is much lower than with erythromycin. Azithromycin may also cause some central and peripheral nervous system effects.[55] Intravenous clarithromycin may cause phlebitis and its interaction with digoxin may precipitate digoxin toxicity.[58] Although dirithromycin has been found to be effective when administered orally in bacteremic patients with CAP,[57] the new macrolides should only be given by the intravenous route in moderate and severely ill patients.[35,59]

10.4 Current Recommendations

Synthesis of the ATS guidelines for the initial empirical therapy of CAP with the 4 developments detailed above leads to the conclusion that immunocompetent elderly patients with CAP who do not need hospitalisation can receive oral monotherapy using a third generation fluoroquinolone or a new macrolide. Hospitalised elderly patients who are not severely ill can also receive these same drugs but, initially, by the intravenous route, followed by oral therapy. Severely ill elderly patients with CAP (category 4) should receive an intravenous combination of a third generation cephalosporin with activity against P. aeruginosa and an older or newer fluoroquinolone. These recommendations are based on the assumption that monotherapy is preferable to combined therapy if the 2 options have the same efficacy. The improved pharmacokinetic qualities of the new drugs make once-daily dosing feasible with relatively good tolerability. In the final analysis these 2 factors should compensate for the added acquisition cost of the new drugs compared with the older ones.

The relevant microbiological information received after the initiation of antibiotic therapy,
such as a positive blood culture, necessitates a reassessment of the treatment in the light of such information and the patient’s response to empirical therapy. If the patient’s condition deteriorates with empirical therapy, an uncommon aetiology should be considered and the antibiotic regimen should be changed accordingly, or an invasive diagnostic procedure should be performed.

10.4.1 Switch from Intravenous to Oral Therapy

The switch from intravenous to oral antibiotic therapy is critical to the timing of the discharge of the patient with CAP from the hospital. An accepted routine is to switch therapy after the patient has stabilised clinically and is afebrile. Two recently published studies reported identical efficacy for 2-day compared with longer intravenous therapy.\[60,61\] These important data support an earlier switch to oral therapy, leading to a significantly reduced duration of hospitalisation, with all its ramifications. The accepted policy of keeping patients with CAP in the hospital for observation after switching to oral therapy has also been investigated in low risk patients and found to be of very doubtful value.\[62\] The practical implications of these studies are that, at least in some patients, the switch from intravenous to oral therapy can be made earlier than is currently practised and hospitalisation time can be shortened, with attendant cost savings, without endangering the patients’ chances to recover.

10.4.2 Duration of Therapy

It is recommended that oral antibiotic treatment be continued for 72 hours after the patient becomes afebrile in patients with pneumococcal CAP, and for 10 to 21 days in patients with atypical CAP.\[35\] Since most patients do not have an exact aetiological diagnosis, we recommend completing a course of 10 days’ treatment in patients with a short febrile course and to complete another weeks’ treatment after patients with a long febrile course become afebrile.

11. Disease Prevention

The principal means of preventing CAP in the elderly is immunisation against S. pneumoniae (the major cause of CAP) and viral influenza, which predisposes to CAP with high mortality rates. Both immunisations are easy to administer, inexpensive and recommended for the entire population above the age of 65 years, individuals with cardiovascular or respiratory diseases and residents of nursing homes.\[63,64\] The pneumococcal vaccine is given once in a lifetime, except in very old patients who should be reimmunised after 7 years. The immunisation for viral influenza should be taken annually at the end of autumn. The unaltering belief in the effectiveness of pneumococcal vaccination in preventing pneumonia has been cast in doubt recently with the publication of a study that found that the immunisation does not prevent pneumonia in general, and pneumococcal pneumonia in particular, in middle-aged and elderly patients.\[65\]

Although neither immunisation can guarantee complete security against infection, and despite the study cited above,\[65\] it is recommended to immunise the at-risk population because of the data indicating that immunisations can prevent at least some morbidity and mortality. During outbreaks of influenza epidemics, the at-risk population that has not been immunised can be protected partially, and those already immunised can have their immune status fortified, by taking amantadine. Patients already with influenza can receive significant symptomatic relief by taking this drug for 5 days starting within the first 48 hours of the clinical illness.

12. Economic Aspects

In this era of worldwide attempts at health service cost-containment, it is impossible to complete a review of CAP in the elderly without relating to the economic aspects of the disease. The total annual expenditure for the treatment of CAP in the US is estimated at $US8.4 billion (1998 values). Of this total, $US4.8 billion are spent on patients aged >65 years and $US4.4 billion are spent to finance 0.6 million annual hospitalisations. The mean duration of hospitalisation for elderly patients with CAP is 7.8 days and the mean cost of hospitalisation is $US7166.\[66\]
In view of these costs, any activity that can prevent CAP in the elderly, or prevent or shorten hospitalisation as a result of CAP, would be of substantial economic significance. The economic implications of indications for hospitalisation and switching from intravenous to oral therapy have been discussed above. In this regard, 2 recent studies that evaluated reasons for hospitalising patients with CAP at low risk and factors delaying the discharge of hospitalised patients as soon as their condition permits are noteworthy.\cite{67,68} The important conclusions of these studies are that superfluous hospitalisations can be avoided and hospitalisation time can be shortened by reiterating the need to identify patients with CAP at low risk and arranging for intravenous therapy in the ambulatory care setting with nursing visits to the patients’ homes during acute illness. The costs of hospitalisation can also be reduced by avoiding unnecessary diagnostic procedures. This conclusion was reached because no significant difference was found in mortality or rehospitalisation rates among different hospitals, despite significant differences in the cost of hospitalisation related to diagnostic procedures that were conducted in some of them.\cite{69}

13. Conclusions

It is important to differentiate between CAP and NHAP in elderly patients. The main risk factor for CAP in elderly patients is chronic comorbidity. The primary aetiology of CAP is pneumococcal, but atypical aetiologies also play an important role. It is important to be aware of the different clinical manifestations of CAP in elderly patients compared with younger ones. An imaging procedure is essential for the diagnosis of CAP and the assessment of CAP severity. It is important to identify patients at low risk for death and to try to avoid hospitalisation of these patients. The aetiology of CAP cannot be determined on the basis of clinical manifestations, imaging techniques or routine laboratory tests, so initial antibiotic therapy in elderly patients with CAP has to be empirical, and based on accepted guidelines.

Recent developments make it possible to give, in the initial phase, once-daily antibiotic monotherapy to elderly patients with CAP, if they are not severely ill, using a third generation fluoroquinolone or a new macrolide. In addition to antibiotic therapy, it is essential to identify and treat the physiologic impairments that accompany CAP in the elderly, primarily decompensation of chronic diseases. As soon as the patient’s clinical condition allows, intravenous antibiotic therapy should be switched to oral therapy and discharge from the hospital should be considered. Immunisations against pneumococcus and viral influenza can reduce CAP morbidity and mortality. These immunisations should be administered regularly in the primary care setting.

References


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