Appendix I: Nursing-home acquired pneumonia

The committee for The Japanese Respiratory Society guidelines in management of respiratory infections

The Japanese Respiratory Society

OUTLINE OF LONG-TERM CARE FACILITIES FOR THE ELDERLY

As shown in Figure 1, long-term care facilities for the elderly are classified into six categories: 'special nursing homes for the elderly', 'nursing homes for the elderly', 'low-cost nursing homes for the elderly', 'welfare centres for the elderly', 'comfort homes for the elderly' and 'vacation homes for the elderly'. In addition to the three types of nursing homes for the elderly (listed above), there are also 'charged nursing homes for the elderly'.

The numbers of bedridden patients and of elderly patients with dementia have been rapidly increasing in Japan, one of the most rapidly progressive aging societies in the world. In view of these circumstances, in April 2000 a so-called 'nursing insurance programme' was instituted to support 'the elderly and handicapped who require assistance' by society as a whole. Elderly and handicapped persons who require assistance for a variety of reasons (Grade 1–5) can take advantage of care facilities. As shown in Figure 2 they can use any one of three facilities where the 'nursing insurance programme' is applicable: care facilities for the elderly, special nursing homes for the elderly, and sanatorium-type medical facilities.

The so-called 'special nursing homes for the elderly' and 'special hospitals for the elderly' accommodate the elderly with the lowest activities of daily living. A (side-by-side) comparison of the background factors of these two facilities and a data summary are presented in Table 1. As shown in the table, 'special nursing homes for the elderly' are places for the elderly who require assistance and nursing care to live. Although there are many bedridden patients, antibacterial agents are used very infrequently, and invasive procedures are rarely employed. Moreover, only a few 'special nursing homes for the elderly' provide tube feeding (nasal feeding, etc.). Independent individuals (who can take care of themselves) are generally admitted to 'nursing homes for the elderly' and 'low-cost nursing homes for the elderly'.

DEFINITION OF NURSING-HOME ACQUIRED PNEUMONIA

‘Nursing-home acquired pneumonia’ refers to pneumonia that occurs in elderly persons living in nursing homes. Elderly patients are admitted to the facilities of 'special nursing homes for the elderly' for a short stay, but if they develop pneumonia there, it is also included in the category of 'nursing-home acquired pneumonia'. According to the regulations governing care facilities, elderly persons over 65 years of age and people over 40 years of age who require assistance and care because of special diseases are admitted to 'special nursing homes for the elderly'. Elderly persons over 65 years of age are admitted to 'nursing homes for the elderly', while elderly persons over 60 years of age are admitted to 'low-cost nursing homes for the elderly'.

CHARACTERISTICS OF NURSING-HOME ACQUIRED PNEUMONIA

Epidemiology

The population of Japan as a whole is aging at an alarming rate (faster than in any other country in the world). In this new era the average life span in Japan is 80 years. In 2000, 17.2% of the entire population was over 65 years of age, the same as the current level in Scandinavian countries. In the year 2025, as many as 27.4% of the entire Japanese population will be over 65 years of age, creating an unprecedented super-aged society. With the advent of the super-aged soci-
Among the nursing homes for the elderly listed above, the incidence of pneumonia is highest in ‘special nursing homes for the elderly’. The incidence of pneumonia in ‘nursing homes for the elderly’ and ‘low-cost nursing homes for the elderly’ is not much different from its incidence among the elderly living in the community.

Risk factors and modes of onset of the disease

Risk factors for nursing-home acquired pneumonia are listed in Table 2. Three modes of onset of nursing-home acquired pneumonia have been described: (i) community-acquired pneumonia of the elderly, (ii) HAP of the elderly, and (iii) a dual type (combination of both types). ‘Nursing-home acquired pneumonia’ is primarily classified into the three categories listed below.

<table>
<thead>
<tr>
<th>Risk Factors</th>
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<tbody>
<tr>
<td>Old age</td>
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<tr>
<td>Aspiration</td>
</tr>
<tr>
<td>Decreased ADL</td>
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<tr>
<td>Swallowing disturbances</td>
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<tr>
<td>Bedridden</td>
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<tr>
<td>Feeding through an esophageal tube</td>
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<tr>
<td>Cerebrovascular diseases</td>
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<tr>
<td>Malnutrition</td>
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<tr>
<td>Respiratory diseases</td>
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<tr>
<td>Use of sedatives</td>
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</table>

Table 1 Comparison of special nursing homes for the elderly and hospitals

<table>
<thead>
<tr>
<th>Purpose of the facility</th>
<th>Hospital (Surgery and Internal Medicine)</th>
<th>Special nursing home for the elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis and treatment of primary diseases</td>
<td>Residence for elderly who require assistance</td>
<td></td>
</tr>
<tr>
<td>Principal staff</td>
<td>Physicians and nurses</td>
<td>(Nurses), assistants, and care staffs</td>
</tr>
<tr>
<td>Mean age of patients</td>
<td>75.7 years of age</td>
<td>82.1 years of age</td>
</tr>
<tr>
<td>Mean length of stay</td>
<td>35.7–49.6 days</td>
<td>4.2 years</td>
</tr>
<tr>
<td>Percentage of bedridden patients (%)</td>
<td>33.2</td>
<td>43.9</td>
</tr>
<tr>
<td>Percentage of patients who receive antibiotic administration (%)</td>
<td>30–15%</td>
<td>0–4%</td>
</tr>
<tr>
<td>Use of intravenous catheters</td>
<td>30–4%</td>
<td>0–1%</td>
</tr>
<tr>
<td>Patients who have undergone surgery</td>
<td>++ + +</td>
<td>—</td>
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</table>

Figure 1 Nursing home and institutions for the elderly. M, (medical) covered by Japanese National Health Insurance; A, (assistance) covered by Japanese National Health Insurance.
and kidneys. Elderly patients often develop pneumonia in association with worsening of their underlying diseases, such as cerebrovascular disease, congestive heart failure, chronic respiratory diseases, diabetes mellitus, renal disease, liver disease or malignant tumours.

2. Aspiration pneumonia (Refer to Chapter 8). Bedridden patients and elderly patients with cerebrovascular diseases often develop aspiration pneumonia at care facilities. Microaspiration at night constitutes another important aetiologic mechanism of aspiration pneumonia in addition to overt aspiration pneumonia.

3. So-called 'influenza pneumonia'. In recent years there have been epidemics of influenza at nursing homes for the elderly from time to time, and a number of the elderly patients developed pneumonia after contracting influenza. A considerable number of elderly patients have been reported to die of so-called 'influenza pneumonia'. Mortality rates for 'influenza pneumonia' have risen in winter during influenza outbreaks, which is called 'influenza-induced pneumonia-related death' (so-called 'influenza-induced excessive death'). The incidence of bacterial pneumonia reaches 16–26% among elderly patients infected with influenza.

Causative bacteria

A number of investigators have reported that the causative bacteria of nursing-home acquired pneumonia (CAP) and HAP. The most prevalent pathogen is *Streptococcus pneumoniae*, followed by *Haemophilus influenzae* and *Staphylococcus aureus*. Aerobic gram-negative rods, including *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, are common causative bacteria of nursing-home acquired pneumonia, and the prevalence of MRSA is quite high in certain care facilities where antibiotic agents are frequently used, as reported by Kobashi et al. Only a few studies in Japan have ever investigated the prevalence of a variety of viruses, *Legionella*, mycoplasma, and chlamydia in elderly patients with nursing-home acquired pneumonia. The incidence of pulmonary tuberculosis is also quite high among the elderly in Japan, and pulmonary tuberculosis is an important disease that afflicts the elderly, and must not be ignored.

DIAGNOSIS OF NURSING-HOME ACQUIRED PNEUMONIA

Clinical findings

It has been documented that elderly patients with pneumonia exhibit atypical symptoms and often remain 'asymptomatic' more often than young adults. Elderly patients with pneumonia often cough and produce sputum, and they may manifest anorexia and facial palor. Care should be exercised in regard to observation of other signs, such as 'somewhat inactive' and 'absent-minded'. Approximately 73–77% of elderly patients with pneumonia have a fever (over 38°C), which is the most important clinical finding associated with nursing-home acquired pneumonia. Body temperature is routinely measured daily at 'special nursing homes for the elderly', but is not always measured at 'nursing homes for the elderly' or 'low-cost nursing homes for the elderly', leading a risk of fever being missed at both places. Taking all of the above into consideration, the nursing staff should carefully and diligently monitor elderly patients at nursing homes for the elderly, thereby allowing early diagnosis of pneumonia.

Chest X-ray examination

Although it is essential to perform a CXR to confirm a diagnosis of nursing-home acquired pneumonia, CXRs are only taken at a few nursing homes for the elderly. To obtain a CXR, elderly patients usually need to go to a hospital affiliated with the care facility or to a private practitioner in the neighbourhood. It is obviously more informative if the current CXR can be compared with an old one, and makes the diagnosis easier.

Decision to admit patients to the hospital

Whether to admit the patient must be decided, generally based on the severity of the pneumonia, the presence or absence of underlying disease states and complications, and the clinical services available at the nursing home. As a rule, elderly patients with moderate pneumonia who are dehydrated should be hospitalised, and, the patients with severe pneumonia should be hospitalised. Even if the pneumonia is mild, elderly patients with anorexia or dysphagia should be hospitalised. Elderly pneumonia patients with aggravated underlying disease states or complications should also be hospitalised. If oxygen therapy or ventilation is required, the patient should be hospitalised for treatment.

TREATMENT

Before instituting antimicrobial therapy in elderly patients with pneumonia admitted to 'nursing homes for the elderly', it is important to decide the following: (a) whether to treat them at the nursing home or at the hospital; (b) which antibacterial agents to use (oral preparations or injection); (c) the duration of treatments; and (d) when to switch to oral medication if parenteral antibiotics are used.

Antibacterial therapy to be used at nursing homes for the elderly

Elderly patients with mild pneumonia can generally be treated at nursing homes for the elderly. Oral antibacterial agents with a broad spectrum, such as third-generation cephems, β-lactamase- inhibitor-
Key points for treatment on an inpatient basis

Elderly patients with moderate or severe pneumonia should be treated on an inpatient basis. Antibiotic preparations should be administered by intravenous drip infusion and it is equally important to provide overall patient care (systemic management), including management of dehydration, nutritional control, oxygen therapy and sputum aspiration. Since many elderly patients with pneumonia have underlying diseases affecting their prognosis, it is also important to treat their underlying diseases appropriately.

One key issue common to the treatment of pneumonia in the elderly is that care should be exercised in the management of the patient's psychiatric status and ADL. Many elderly patients get used to living at nursing homes for the elderly, and some of them exhibit changes in their psychiatric status, such as anxiety, agitation and loss of orientation, after being transferred to a hospital where intensive care is provided. In such situations, it is essential that the medical staff, family and friends provide mental and emotional support to the patient. It is also important to minimise intravenous infusion to prevent bedsores and to prevent loss of muscle strength in the lower extremities. In addition, it is important to select antibiotics with a relatively long plasma terminated half-life, as then an adequate antimicrobial effect can be achieved by once daily administration. If the pneumonia subsides and the patient’s condition stabilises, it is desirable to switch from intravenous infusion therapy to oral preparations. An effort should be made to restore ADL, which will contribute to the patient’s early return to a nursing home for the elderly.

Prevention of Nursing-Home Acquired Pneumonia

Control of underlying diseases

The elderly tend to acquire a variety of underlying disorders with advancing age, and they often increase their susceptibility to pneumonia. The major underlying diseases are cerebrovascular disease, respiratory disease (pulmonary emphysema, sequelae of pulmonary tuberculosis, interstitial pneumonia and chronic pulmonary distress syndrome), congestive heart failure, renal failure, diabetes mellitus and malignant tumours. It is difficult to cure pneumonia in patients with these underlying diseases, and the pneumonia often relapses in such patients. In addition, these underlying diseases contribute to an increased mortality rate. It is very important to accurately assess these underlying disease states at the time of admission to a nursing home for the elderly. It is also important to perform routine health assessment on a regular basis (e.g., every six months). Physicians, managers of nursing homes for the elderly and the director of care facilities play a vital role in preventing nursing-home acquired infection in elderly patients admitted to nursing homes for the elderly.

Strategies for prevention of ‘aspiration’ and ‘microaspiration’

The most important preventive measures among daily activities at nursing homes for the elderly are listed below.

Assistance of feeding

It is possible to prevent ‘aspiration’ in patients with mild to moderate dysphagia through proper selection of food products and maintaining proper posture during and after meals. It is significant to select viscous foods and to add glutinous agents (viscid substances) to liquid food products, such as milk and juice, to increase their viscosity. During meal hours, patients should sit up straight in their chair, incline their head slightly forward, while retracting their jaw slightly. This posture helps patients to swallow foods more smoothly and not aspirate them. After meals, patients should remain in a seated or at a partially seated position for approximately one to two hours, while gastric contents move from the stomach to the duodenum.

Mouth care (oral hygiene)

If elderly patients contract infectious diseases as their ADL decreases, followed by administration of antibacterial agents, Gram-negative rod-bacteria tend to colonise the mucous membranes of the throat and pharynx. Adequate oral care and removal of plaque from the oral cavity enhance saliva secretion. The self-cleaning system then becomes operational and inhibits bacterial growth in the oral cavity. Even if microaspiration occurs, there will be a little risk of developing pneumonia. Practically speaking, oral care should be performed in the morning, after every meal, and at bedtime. Oral care at bedtime is most important in preventing pneumonia.

containing penicillins, and fluoroquinolones, should be selected as empiric therapy. Oral antibiotic preparations (microgranules) are useful if the patients are being fed through tubes (such as a nasal tube or gastric tube). (Refer to Chapter 5 for details.)

At nursing homes for the elderly where staff-physicians or attending physicians supervise patient care, elderly patients with nursing-home acquired pneumonia can be treated with parenteral antibiotic preparations and by fluid replacement. Intramuscular injection of antibiotics is effective if it is difficult to secure an intravenous route or if the patient is demented. When parenteral therapy is selected the patient can be quickly switched to oral therapy if symptomatic improvement occurs or the patient regains the ability to ingest food orally. (Refer below to ‘How to use antibacterial agents in the elderly’)
**Vaccination**

**Influenza vaccine**

To prevent influenza-associated pneumonia, it is necessary to take appropriate measures to prevent influenza outbreaks at nursing homes for the elderly. One of the basic preventive strategies is vaccination against influenza. The results of so-called ‘healthcare science studies’ at ‘special nursing homes for the elderly’ and ‘welfare centres for the elderly’ conducted on residents over 65 years of age showed that influenza morbidity was reduced by 34–55% and influenza mortality was lowered 82% by vaccination (only once) of the elderly over 65 years of age. Local skin reactions were the primary adverse reaction, and there were no systemic adverse reactions. It is important to vaccinate the staff of nursing homes for the elderly, because they often become influenza virus carriers.

**Pneumococcal vaccine**

*Streptococcus pneumoniae* are the most prevalent causative bacteria of nursing-home acquired pneumonia. The prevalence of penicillin-resistant *Streptococcus pneumoniae* (PRSP) has been rising in recent years, and prevention of pneumonia with *Streptococcus pneumoniae* vaccine has received considerable attention. Surveillance studies conducted in Japan to investigate the distribution of the serotypes of *Streptococcus pneumoniae* polysaccharide found that most were in the 23-valent vaccine. As such this vaccine is expected to be very effective in prevention of *Streptococcus pneumoniae*. Antibody titres start to rise approximately one month after vaccination with a 0.5-mL/dose *Streptococcus pneumoniae* vaccine, and the serum antibody titres remained elevated in the circulation for approximately 5 years.

**REFERENCES**