Hospital discharges for pneumonia in Finland between 1972 and 1993 in the population aged 65 years or over

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Abstract

Aim: to describe the use of hospital services by Finnish adults aged 65 or over with pneumonia from 1972 to 1993.

Material and methods: the study was based on nation-wide hospital discharge records. Patients in hospital for over 150 days were excluded. The number of persons aged 65 or over was 458 156 in 1972 and 707 341 in 1993.

Results: pneumonia caused 237 330 periods of hospital treatment and a total of 3 826 986 hospitalization days in elderly people during the 22-year period. Annual hospital treatment periods increased from 15.5 to 23.9 per 1000 of population aged 65 years or over within this interval. The average annual change in the age-adjusted rate of hospital admissions for pneumonia was 1.45% [95% confidence interval (CI) 1.03 to 1.87] for males and 0.83% (95% CI 0.39 to 1.28) for females. The increase was highest in the oldest male group, those aged 85 years or over. In 1972 the number of hospitalization days recorded was 126 690 (277 per 1000) and in 1993 it was 242 638 (343 per 1000), implying an absolute increase of 91.5%. However, the average annual change in the age-adjusted rate of hospitalization days for pneumonia showed a decrease of 0.62% (95% CI 1.04 to 0.19).

Conclusion: the recorded increase in the use of hospital services by elderly patients with pneumonia, combined with the current increase in size of the elderly population, suggests that the prevention and treatment of pneumonia in this sector of the population will pose a challenge for the health service in the future.

Keywords: hospital admissions, length of stay, old age, pneumonia

Introduction

Pneumonia is a common reason for admission to hospitals and an important cause of morbidity, mortality and health expenditure [1-3]. It accounts for over 1 million hospital admissions annually in the US, corresponding to a total of approximate 4 million cases, and is the eighth leading cause of death [4, 5]. In Finland the incidence of community-acquired pneumonia was estimated in a population-based study in 1982 at 11.6 per 1000 inhabitants per year [6].

Advancing age is associated with an increase in the incidence of pneumonia [6-9]. Elderly patients with severe underlying illnesses such as chronic obstructive lung disease or congestive heart failure have a high risk of contracting it [2, 3, 8, 10-12]. More elderly patients need to be hospitalized than younger patients, and they require a longer period of treatment and experience more complications.

Since both the absolute number and the proportion of elderly persons in the population will grow markedly in the future, the present study of the use of hospital services for pneumonia among persons aged 65 years or over was designed to provide a basis for predicting how this might influence the need for hospital services. The survey covered 22 years (1972-93) and was based on nation-wide hospital discharge records.

Materials and methods

Patients and data

The National Research and Development Centre for Welfare and Health keeps a register of all patients treated in hospitals in Finland, including their diagnoses, and it was possible to extract all treatment periods from this for which the primary diagnosis or an additional one was pneumonia [diagnoses 480-486
Table 1. Annual age-specific numbers of pneumonia-related hospital treatment periods and hospitalization days per 1000 persons and mean length of stay in Finnish men and women aged 65 or over from 1972 to 1993

<table>
<thead>
<tr>
<th>Sex and age (years)</th>
<th>No. of treatment periods</th>
<th>Hospitalization (days/person)</th>
<th>Length of stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td>16.7 (1.4)</td>
<td>243 (28)</td>
<td>15.4 (2.2)</td>
</tr>
<tr>
<td>75-84</td>
<td>41.3 (5.9)</td>
<td>686 (59)</td>
<td>18.2 (1.7)</td>
</tr>
<tr>
<td>85+</td>
<td>73.2 (16.7)</td>
<td>1293 (239)</td>
<td>19.5 (1.7)</td>
</tr>
<tr>
<td>All</td>
<td>26.0 (4.1)</td>
<td>410 (32)</td>
<td>17.1 (1.7)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td>7.1 (0.8)</td>
<td>103 (21)</td>
<td>16.2 (1.9)</td>
</tr>
<tr>
<td>75-84</td>
<td>19.9 (1.5)</td>
<td>347 (30)</td>
<td>20.8 (1.9)</td>
</tr>
<tr>
<td>85+</td>
<td>36.7 (6.3)</td>
<td>715 (99)</td>
<td>23.9 (2.0)</td>
</tr>
<tr>
<td>All</td>
<td>13.4 (1.7)</td>
<td>226 (19)</td>
<td>19.8 (1.4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17.9 (2.5)</td>
<td>292 (21)</td>
<td>18.4 (1.5)</td>
</tr>
</tbody>
</table>

and 471, International Classification of Diseases (ICD) 8th revision, from 1972 to 1986; diagnoses 480–485 and 4870A in the 9th revision of ICD, from 1987 to 1993]. All pneumonias were accepted irrespective of cause, including those related to influenza. Pneumonia was coded as a primary diagnosis in 67.1% of cases.

All the days on which a patient was treated in hospital were counted as hospitalization days, taking the days of arrival and departure as making up 1 day. If the recorded duration of treatment was more than 150 days, the episode was excluded from the analyses to avoid errors caused by chronic patients treated initially in hospital for some reason other than pneumonia. These accounted for 10.5% of all hospital periods over the 22 years. The average length of time in hospital was calculated by dividing the number of hospitalization days by the number of treatment periods of less than 151 days. Sex- and age-specific rates were calculated separately for three age groups: 65–74 years, 75–84 years and over 84 years. Age-adjusted rates using 5-year increments were calculated and directly standardized against the standard population of Finland in 1982.

The population data were based on information from the Central Statistical Office of Finland. The number of persons aged 65 or over was 458 156 in 1972 (whole population 4 653 401) and 707 341 in 1993 (whole population 5 075 069).

Statistical methods

Sex and age differences in hospitalization days and periods were tested with the two-sample t-test. The relative rate of change was calculated by linear regression on the natural logarithm of the hospitalization rate, the percentage change per year being equivalent to \(100(e^\beta - 1)\) [13]. The statistical analyses were performed using the SPSS for Windows program, version 6.1.

Results

Treatment periods

A total of 237 330 pneumonia-related treatment periods and 3826 986 hospitalization days were recorded for persons aged 65 years or over during the study period. There were 7092 hospital treatment periods for pneumonia in persons aged 65 years or over in 1972 (15.5 periods per 1000 persons); the figure in 1993 was 16 918 (239 per 1000), a rise of 138.6%. The rates were greater among men in all the age groups (\(P<0.001\)), whereas the highest age-specific rates for both sexes were found in the oldest age groups (Table 1). The age-adjusted rates of hospitalization increased significantly from 1972 to 1993 in men of all age groups and in women aged 85 or over (Figure 1, Table 2).

Hospitalization days and length of hospital stay

The number of hospitalization days recorded was 126 690 in 1972 (277 per 1000) and 242 638 in 1993 (343 per 1000), showing an increase of 91.5%. The age-specific rate of hospitalization days was higher in the older age groups than in the younger ones, and the rate was significantly higher in men than in women in all age groups (\(P<0.001\)). The annual age-adjusted rates of pneumonia-related hospitalization days decreased in both sexes from 1972 to 1993 (Figure 2).

The average length of stay in hospital was longer for the older age groups than for the younger ones in both sexes. No differences were found between the sexes in the youngest age group, but in the older age groups the
women had longer treatment times in hospital \( (P=0.231, P<0.001, P<0.001) \). As a consequence, all the women over 64 years had a longer treatment time than the men aged 64 years or over \( (P<0.001) \). The average duration of treatment decreased over the period of 22 years in all age groups and in both sexes. The average length of hospital stay for men aged 65 or over decreased from 18.4 to 14.3 days and that for women from 19.6 to 17.5 days.

**Discussion**

The Finnish Hospital Discharge Register maintained by the National Research and Development Centre for Welfare and Health is an extensive one, as it covers all private, public, general and mental hospitals in Finland. The correspondence between its diagnostic data and patient records in the hospitals has been found to be as high as 95% [14]. The discharge register includes patient identification data, dates of arrival and departure, code of the medical speciality concerned, diagnoses and results of treatment. This register has been operating since 1967, making it possible to examine pneumonia-related hospital treatment periods and trends in the use of hospital services over a period such as the 22 years chosen for the present study.

Since the present large body of data cover the whole

<table>
<thead>
<tr>
<th>Sex and age (years)</th>
<th>Hospital treatment periods</th>
<th>Hospitalization days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td>0.70 (0.18 to 1.23)</td>
<td>-1.42 (-1.91 to -0.93)</td>
</tr>
<tr>
<td>75-84</td>
<td>1.84 (1.35 to 2.33)</td>
<td>0.35 (-0.25 to 0.95)</td>
</tr>
<tr>
<td>85+</td>
<td>3.16 (2.53 to 3.80)</td>
<td>2.38 (1.60 to 3.16)</td>
</tr>
<tr>
<td>All</td>
<td>1.45 (1.03 to 1.87)</td>
<td>-0.18 (-0.60 to 0.23)</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td>-0.76 (-1.52 to 0.01)</td>
<td>-2.38 (-3.17 to -1.58)</td>
</tr>
<tr>
<td>75-84</td>
<td>0.28 (-0.20 to 0.77)</td>
<td>-1.02 (-1.52 to -0.52)</td>
</tr>
<tr>
<td>85+</td>
<td>1.94 (1.09 to 2.80)</td>
<td>1.01 (0.09 to 1.94)</td>
</tr>
<tr>
<td>All</td>
<td>0.19 (-0.33 to 0.72)</td>
<td>-1.05 (-1.55 to -0.54)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.83 (0.39 to 1.28)</td>
<td>-0.62 (-1.04 to -0.19)</td>
</tr>
</tbody>
</table>
population of Finland over a long time, the effects of temporal and regional variations are effectively evened out.

The data concern patients with a main or additional diagnosis of pneumonia, including community-acquired, hospital-acquired and influenza-related pneumonia. Two classifications of diseases were in use in Finland in the course of the 22-year period chosen for investigation, but these coincided well enough for the trend in pneumonia incidence not to be attributable to any alteration in the classification. Possible confounding factors could, however, be the change in numbering for influenza-related pneumonia and the more precise numbering scheme adopted for aspiration pneumonitis, as well as difficulties in coding a diagnosis of pneumonia.

The upper limit of 150 days for hospitalization periods accepted for this data set is well above the mean length of stay recorded either in Finland or elsewhere [3, 15, 16]. The purpose of this upper limit was to eliminate those chronic patients with some other basic disease for whom pneumonia was only a terminal event. Such cases account 10.5% of the total pneumonia episodes. Although this procedure meant the loss of some of the serious cases of pneumonia with complications, it also ruled out all the acute episodes of pneumonia suffered by elderly patients already in long-term institutional care who were in many cases bedridden.

The increase in the absolute numbers of treatment periods was a product of both the rise in the numbers of elderly people and the resulting growth in need for hospital care [12]. The population over 64 years of age rose by 54.4% between 1972 and 1993, and that over 84 years by 247.1%. Further effects leading to an increase in the number of treatment periods in hospital are the growth in the numbers of elderly people of a very advanced age, on account of the increase in mean life expectancy [17], and changes in occupational and social structure, including the greater frequency of elderly people living alone [18]. On the other hand, the number of pneumonia episodes requiring hospital treatment has increased by about one-third over the 22 years (when standardized directly for age), so that the ageing of the population structure does not alone explain the increasing numbers of treatment periods. It would appear that this increase has been a product of administrative and social changes that have taken place in Finland within the study period. Also, expectations to be treated in hospital for pneumonia rather than at home can influence both doctors' and patients' attitudes and decision-making.

The finding that considerably more treatment periods were recorded for men than for women may be partly attributed to the effects of heavy smoking and alcohol consumption among men [18–21].

One factor contributing to the shortening of the mean length of treatment period observed here in both women and men may have been the generally greater efficacy achieved in all forms of hospital care. The mean duration of hospitalization in general hospitals at the national level is 6 days [22]. In comparison, the mean treatment time for pneumonia cases, (15–20 days) is markedly long, especially with all stays of more than 150 days duration eliminated from the data set. Factors tending to prolong hospitalization may include the general decline in resistance to infection that accompanies old age, the diminished response to treatment brought about by slower recuperation [23], the high mortality rate associated with pneumonia [12] and the long period of rehabilitation required before the patient can be sent home.

The probable reasons why the duration of hospital treatment tended to be longer for women than for men in the older age-groups include social factors and concomitant diseases. Almost every second woman aged 70 years or over is living alone, as opposed to one man in four [18]. The deficient social networks of elderly women and their greater difficulties in coping with daily tasks relative to men of similar age [18] make it difficult to arrange satisfactory home care for them. Concomitant diseases that tend to prolong the hospitalization of women include hypertension, depression, dementia and diabetes, all of which are more common in women. On the other hand, more men than women tend to have chronic bronchial diseases [8].

Where the total number of days spent in hospital per year in Finland increased from 20.5 million to 21.1 million between 1972 and 1992—a rise of approx. 2.9% [22]—the increase in hospital days required for the treatment of pneumonia over the same period, relative to the total population, at 23.8%, was about 10 times greater. The reasons for this are probably the same as those suggested for the number of hospitalizations. The fact that the number of hospital days when standardized for age decreased over the same period, however, testifies to the greater efficacy of the treatment provided. All the same, the shortening of treatment times has not been able to compensate for the increase in the absolute number of days spent in hospital because of pneumonia.

The ageing of the population and changing needs for hospital care have led to a rise in the demand for hospital admission. In the future, changes in the age structure of the population will further accentuate the demand for treatment for pneumonia and other lower respiratory tract infections. It will be necessary for the health service to prepare for this, either by increasing the numbers of beds available or by developing means of preventing such diseases, e.g. immunization against influenza and pneumococcal pneumonia.
Key points

• The number of hospital treatment periods and total time spent in hospital for pneumonia has increased significantly for elderly people, meanwhile the mean length of stay has shortened.
• Greater effectiveness in hospital care has contributed to the shortening of treatment times, but has not succeeded in compensating for the increase in the absolute number of hospitalization days.
• Health care systems must prepare for increased demands for hospital care by either preventing pneumonia or increasing the numbers of hospital beds.

References


Received 7 November 1996
Photograph: Help the Aged.