

# REGIONAL AND SEASONAL VARIATION IN THE LENGTH OF HOSPITAL STAY FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN FINLAND

## ABSTRACT

Notable regional and seasonal variation has been reported in the rate of hospital admissions for chronic obstructive pulmonary disease (COPD). The aim of this study was to assess the variation in the length of hospital stay for COPD in Finland on the north – south axis and by season. For this purpose, the patient records of subjects aged over 45 hospitalised altogether 153,401 times with COPD as their primary diagnosis during 1987 – 1998 were retrieved from the Finnish Hospital Discharge Register maintained by the National Research and Development Centre for Welfare and Health. During this period, the average length of hospital episodes was 9.8 (SD 47.8) days in northern Finland and 11.9 (SD 54.5) days in southern Finland ( $p=0.001$ ). Throughout Finland, the mean duration of hospital stay was longest in the winter, 12.3 (SD 62.3) days, and shortest in the summer, 11.0 (SD 42.3) days ( $p=0.001$ ). The mean duration of hospital stay in northern Finland was also longest in the winter, 10.6 (SD 56.7) days, and shortest in the summer, 8.8. (SD 26.7) days ( $p=0.015$ ). Hospital episodes for COPD vary in duration in Finland, probably mainly due to regional differences in health care resources and treatment routines. The light and warm northern summer may also speculatively serve to shorten hospital episodes. (*Int J Circumpolar Health* 2002; 61: 131-135).

**Key words:** COPD, hospital stay, seasonal variation, regional variation, hospital discharge register

Altogether 12.5 % of retired Finnish men and 3 % of women suffer from chronic obstructive pulmonary disease (COPD) (3). In 1995, this disease caused about 14,000 hospital admissions, and the patients spent a total of 140,000 days in Finnish hospitals. About 1000 Finns annually die of this disease. The hospital stay following admission is often long and hence expensive. The tendency of COPD patients to seek admission into hospital and their mortality show notable seasonal variation. Patients seek admission and use health care services more in the winter than in the summer, the mean range of variation being  $\pm 10$  % (13). The

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seasonal variation is explained by the cold weather and the higher incidence of respiratory infections in the winter and partly also by the seasonal variation in airborne pollutants (7, 11, 14). The purpose of this study was to find out whether location on the north – south axis has any significance for the seasonal variation and to propose possible reasons for these differences.

## MATERIAL AND METHODS

The Finnish Hospital Discharge Register maintained by the National Research and Development Centre for Welfare and Health was searched for the records of COPD patients aged over 45 who had been hospitalised during 1987 – 1998 with the primary diagnosis of COPD (International Classification of Diseases, ICD 9, codes 491, 492 and 496, ICD 10 codes J41-J44). There were altogether 153,390 such episodes of inpatient care. The days of admission and discharge were both considered a day spent in hospital. If the patient was admitted and discharged on the same day, a one-day stay in hospital was recorded. Long hospital episodes of more than 150 days were excluded from analysis. The duration of hospital stay was analysed by the patient's sex, the geographic location of his/her residence, and the day of discharge. Days of discharge in December, January and February were classified as winter, the following three months as spring, June, July and August as summer, and the remaining three months as autumn. Finland was divided into northern and southern Finland along the southern boundary of Oulu Province approximately 200 km south of the Arctic Circle. The mean lengths of hospital stay were compared with the statistical SPSS software for geographic location and seasons. The differences between the groups were analysed with the independent samples t-test.

Table 1. Regional differences in Finland in the number of hospital episodes for COPD in 1987-1998, patients' age and sex, medical speciality of hospital and length of hospital stay.

	Northern Finland	Southern Finland	Whole Finland
Number of hospital episodes	27 762	125 628	153 390
Mean age	69.6	70.7	70.5
Percentage of men out of hospital episodes	79.7%	76.3%	76.9%
Patients treated in pulmonary hospitals	45.6%	56.2%	54.3%
Mean length of hospital stay	9.8 .8 (SD 47)	11.9 (SD 54.5)	11.6 (SD 3.4)

( p=0.001)

## RESULTS

The mean length of hospital stay during the years 1987 – 1998 was 11.6 (SD 53.4) days. There was a statistically significant difference in this mean value between northern and southern Finland (Table 1). In northern Finland, the average age of men on admission was 69.9 years, while the corresponding age of women was 68.7 years. The corresponding figures for southern Finland were 70.8 and 70.4

years. In northern Finland, the duration of hospital stay was the same among men and women, being 9.8 days (SD 49.6 and 39.9, respectively). In southern Finland, the mean duration of hospital stay was 11.5 days (SD 53.0) for men and 13.3 days (SD 59.0) for women ( $p=0.001$ ). The mean hospital stay in pulmonary departments was 7.5 (SD 21.5) in Northern and 9.3 (SD 19.4) in Southern Finland ( $p=0.001$ ).

During the follow-up period, the mean length of hospital stay in Finland was longest in the winter, 12.3 days (SD 62.3), and shortest in the summer, 11.0 days (SD 42.3),  $p=0.001$  (Fig. 1). In northern Finland, the mean duration of hospital stay was longest in the winter, 10.6 days (SD 56.7), and shortest in the summer, 8.8 days (SD 26.7),  $p=0.015$ . In southern Finland, the duration of hospital stay was also longest in the winter, 12.7 days (SD 63.5), but shortest in the autumn, 11.3 days (SD 52.3),  $p=0.003$ . Patients of both sexes had the longest hospital episodes in the winter, 12.2 days (SD 64.3) for men and 12.9 days (SD 55.2) for women. The shortest hospital episodes of men, 10.6 days (SD 40.1), occurred in the summer and those of the women, 12.3 days (SD 59.9), in the autumn.

## DISCUSSION

The Finnish Hospital Discharge Register covers all Finnish hospitals, both private and public. Its reliability has been found to be good, with up to 95 % correspondence between the register and the patient records (4). During the study period 1987 – 1998, only two diagnostic classifica-

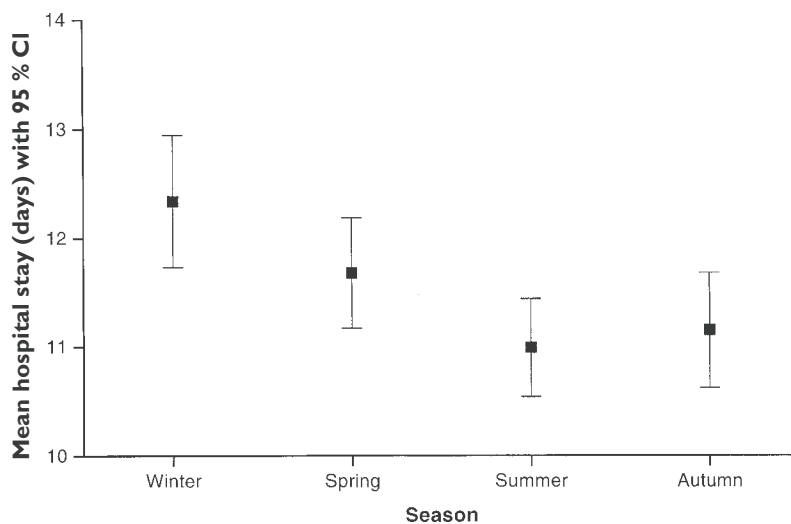


Fig. 1. Seasonal variation of the mean length of hospital stay for COPD in Finland in 1987-1998. The difference of these lengths between summer and winter was very significant ( $p=0.001$ ).

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tions were used, which is why the diagnostic practices were probably relatively uniform. The practice of differential coding between especially COPD and asthma may have varied somewhat in the different parts of the country.

The mean age of the patients was roughly the same in northern and southern Finland. The hospital episodes of men accounted for three fourths of all admissions in the whole country and in northern Finland, which overrepresentation is due to the higher number of male smokers in the past. Less than half of the hospital episodes in northern Finland were in pulmonary hospitals, while an opposite situation prevailed in southern Finland. More widely used specialised health care, contrary to some expectations, did not seem to reduce the duration of treatment in southern Finland.

The prevalence of COPD varies between different countries and even within a given country. In Spain, for example, notable regional variation of up to 4.9 % - 18 % was seen between the different parts of the country (9). According to the present findings, the mean duration of COPD treatment episodes was more than 2 days longer in southern Finland than in northern Finland, where the respective duration was only slightly longer than in an international survey (8).

The most probable reasons for the variation in the duration of COPD treatment in Finland are the differences in service culture and possibly also the regional differences in health care capacity. In 1991, Finnish general and health centre hospitals had 9.0 beds per 1000 inhabitants, while the corresponding figure in northern Finland was 8.3. Northern Finland has had a functional primary health care system and stratified specialised health care for a long time already. In Lapland, the service process for pulmonary diseases began to network in the early 1980s, which networking further continued in the 1990s (5, 12) and presumably shortened hospital stays in pulmonary departments. Primary health care in northern Finland has been inherently independent and efficient due to the long distances. Nor do patients wish to stay too long in a hospital far from home.

Airborne pollutants and the higher population density may explain the longer hospital episodes in southern Finland, though these factors are probably of much less significance than the differences in therapeutic routines. According to our findings, the duration of hospital stay for COPD is shortest in the summer and longest in the winter in the whole country. In terms of climate, Finland belongs to the snow and forest climate zone with humid and cold winters.

The snow cover persists for 2 – 3 months in south-western Finland, but for as long as 7 months in northern Finland. The Finnish climate is characterised by a distinct seasonal rhythm: a cold winter with snow, a fairly short spring, a warm but short summer, and a cloudy and cool autumn. Cold weather has been found to increase respiratory symptoms (2). The cold winter weather and the high prevalence of respiratory infections probably explain the seasonal variation in the COPD patients' need for hospital care (7, 14). Especially in the older age groups, the wintertime epidemics of influenza, often complicated by pneumonia, may result in a need for hospitalisation and even death in concurrence with chronic diseases, such as COPD. The Spanish study did not reveal seasonal differences in the characteristics of COPD, though there were differences in the number of hospitalised COPD patients (1). In the summer, the light northern nights may increase melatonin concentrations in local people. Melatonin, in turn, may have an effect on sleep quality (10) and perhaps promote the recovery of COPD patients and hence shorten their hospital stay.

Reasons other than medical may also contribute to the regional and seasonal variation in the length of hospital episodes. Hospital wards are closed down in the summer, which results in overcrowding and shorter hospital episodes. Due to the high unemployment rate, the socioeconomic status of northern people is probably lower, and they may hence not be able to afford such long hospital episodes as people in southern Finland.

To sum up, there is notable variation in the length of hospital episodes for COPD in Finland both on the geographic axis between the northern and southern parts of the country and seasonally. The regional differences are probably mostly due to differences in treatment practices and health care resources. The significance of climatic conditions is highlighted during the different seasons. National guidelines for the prevention and treatment of COPD were recently published in Finland (6) and the national evidence-based guidelines one year later. We can only hope that these programmes will make the treatment regimes more uniform and shorten the hospital episodes for COPD especially in southern Finland, which would result in cost cuts. The seasonal variation in the duration of COPD treatment can be used to predict the need for hospital beds and to time the closedown of wards. Both the number of admissions of COPD patients and the duration of hospital episodes decrease during the light Finnish summer. Do any other disease show similar trends?

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