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Chapter 4

Increase in hospital admission rates for heart failure in the Netherlands, 1980-1993

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ABSTRACT

Objective - To study the trend in hospital admission rates for heart failure in the Netherlands from 1980 to 1993.

Design - All hospital admissions in the Netherlands with a principal discharge diagnosis of heart failure were analysed. In addition, individual records of heart failure patients from a subset of seven hospitals were analysed to estimate the frequency and timing of readmissions.

Results - The total number of discharges for men increased from 7,377 in 1980 to 13,022 in 1993, and for women from 7,064 to 12,944. From 1980 through 1993 age adjusted discharge rates rose 48% for men and 40% for women. Age adjusted in-hospital mortality for heart failure decreased from 19% in 1980 to 15% in 1993. For all age groups in-hospital mortality for men was higher than for women. The mean length of hospital stay in 1993 was 14.0 days for men and 16.4 days for women. A review of individual patient records from a 6.3% sample of all hospital admissions in the Netherlands indicated that within a two year period 18% of the heart failure patients were admitted more than once and 5% more than twice.

Conclusions - For both men and women a pronounced increase in age adjusted discharge rates for heart failure was observed in the Netherlands from 1980 to 1993. Readmissions were a prominent feature among heart failure patients. Higher survival rates after acute myocardial infarction and the longer survival of patients with heart disease, including heart failure may have contributed to the observed increase. The importance of advances in diagnostic tools and of possible changes in admission policy remains uncertain.

INTRODUCTION

Heart failure is a complex clinical syndrome representing a common and important health problem.¹ In 1988 the direct medical costs of heart failure in the Netherlands were estimated at £182 million, corresponding to 1% of the total health care budget for that year.² The prognosis of a patient with heart failure is poor. In the Framingham heart study 75% of men and 60% of women died within five years after the diagnosis of heart failure.³ Despite its importance, reliable estimates of the incidence and prevalence of heart failure in the general population are surprisingly scarce. This may be attributed to the atypical symptoms of the early stages of heart failure, the ongoing debate on the definition of heart failure, and the lack of a gold standard to assess the presence of heart failure.⁴ Hospital based registries provide some insight into the occurrence of heart failure in the population. Increases in age adjusted discharge rates for heart failure in the United States, Sweden, and Scotland have been reported in recent years.⁵⁻⁸ A recently developed model predicts a further increase in the number of heart failure patients in the Netherlands in the coming decades.⁹ We describe the trend in hospital admissions for heart failure in the Netherlands from 1980 to 1993. Furthermore, we assessed the frequency and timing of readmissions for heart failure during a two year period in a subset of seven hospitals.

PATIENTS AND METHODS

Population figures were obtained from the office of Statistics Netherlands, Voorburg, the Netherlands. The number of hospital discharges for heart failure by five year age groups were derived from the National Medical Register of SIG Health Care Information, Utrecht, the Netherlands. From 1986 onwards all hospitals (university and general) in the Netherlands participated in this register. In 1980, the starting year of our analysis, 95% of all hospital admissions in the Netherlands were recorded. Based on this coverage we used appropriate multiplying factors to estimate the yearly number of hospital discharges in the Netherlands before 1986. All records contain a principal diagnosis coded according to *International Classification of Diseases Clinical Modification* (9th revision),¹⁰ age and gender of the patient, status at discharge (dead or alive), and length of stay. We used the following codes to identify discharges for heart failure: heart failure (428.x), hypertensive heart disease (402.x), and myocardial degeneration (429.1). Only admissions with a first-listed (principal, main) discharge diagnosis of heart failure were included in this analysis. In-hospital mortality (as a percentage) was calculated by

dividing the number of hospital admissions with a discharge status of dead by the total number of hospital admissions for heart failure.

To calculate the mean age at admission we assumed that all persons were admitted at, on average, the midpoint of each five year age category. Age adjusted discharge rates were calculated by direct standardisation using the 'new' European Standard Population as a standard.¹¹ Tests for linear trend were performed with Poisson regression.¹²

Furthermore, because the registry does not provide data on individual patients, we conducted a survey to obtain individual records of patients with heart failure to estimate the contribution and timing of readmissions. Seven hospitals (two university and five general) participated on a voluntary basis. This survey spanned a two year period from 1991 to 1992 and covered 6.3% of all hospital admissions for heart failure in that period. Time to readmission was analysed using Kaplan-Meier curves. Separate curves for readmission were constructed in patients with one, two, or three previous hospital admissions, respectively. End points were the dates of readmission and the starting points were the dates of discharge. Patients who died during their stay in the hospital were excluded from the subsequent readmission analysis.

RESULTS

Table 1 lists the total number of discharges for heart failure, the mean length of stay, and the mean age at admission. The total number of hospital discharges for heart failure rose from 7,377 in 1980 to 13,022 in 1993 for men, and from 7,064 to 12,944 for women. The contribution of heart failure to the total number of hospital discharges in the Netherlands in 1993 was 1.7%. The *International Classification of Diseases* code 428 (heart failure) was by far the most common (98.8% in 1993) of the codes we combined for this study. The mean age at admission increased slightly during the study-period (table 1).

Table 1. Number of hospital discharges for heart failure, mean length of stay, and mean age at admission in the Netherlands from 1980 through 1993.

Year	Men			Women		
	no of discharges	mean length of stay (days)	mean age at admission (yr)	no of discharges	mean length of stay (days)	mean age at admission (yr)
1980	7,377	19.1	71.2	7,064	24.3	75.0
1981	7,626	18.9	71.5	7,382	22.7	75.3
1982	8,504	18.4	71.6	7,868	22.5	75.6
1983	8,917	17.4	71.8	8,445	21.5	75.8
1984	9,143	17.1	72.1	9,113	20.6	76.0
1985	9,927	16.6	72.1	9,501	19.9	76.4
1986	10,471	16.7	72.1	10,143	19.7	76.9
1987	11,085	16.3	71.9	10,348	19.0	76.6
1988	11,472	16.1	72.1	10,849	19.5	76.8
1989	11,698	15.4	72.2	11,308	18.5	76.9
1990	12,420	15.0	72.1	11,548	18.0	76.9
1991	12,522	14.8	72.2	12,015	17.5	76.8
1992	12,432	14.4	72.1	11,936	16.9	76.9
1993	13,022	14.0	72.5	12,944	16.4	77.4

Source: SIG Health Care Information.

On average women were 4.5 years older than men. There was a marked and steady increase in the age adjusted discharge rates for both men and women (figure 1). From 1980 to 1993 the age adjusted discharge rates for heart failure increased by 48% in men and by 40% in women. Analysis of age-specific discharge rates showed that the rise in the number of discharges was more pronounced in the older age groups (figure 2). The test of trend was significant ($p < 0.05$) in all age groups. In every age group the risk of hospital admission was higher for men than for women.

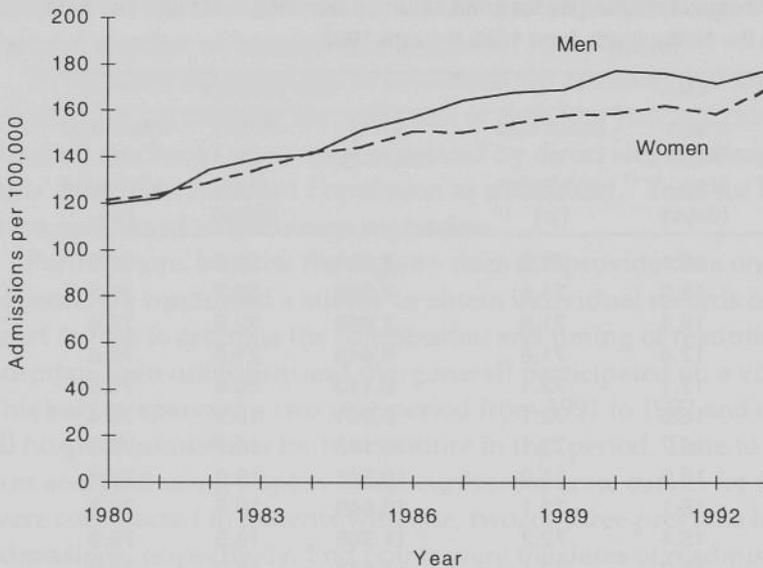


Figure 1. Age adjusted discharge rates for heart failure in men and women in the Netherlands, 1980-1993. Source: SIG Health Care Information. The 'new' European Standard Population was used as a standard.

In 1993 the mean length of hospital admission for patients with heart failure was 14.0 days for men and 16.4 days for women. The length of hospital stay declined steadily from 21.6 days in 1980 to 15.2 days in 1993. Slightly longer hospital stays were observed with increasing age (table 2). In all age groups women stayed longer in the hospital than men, on average 1.6 days. During the study period the difference in length of stay between men and women decreased.

15.3% of all patients with a principal discharge diagnosis of heart failure in 1993 died in the hospital. In-hospital mortality was strongly age related. After stratification for age, in-hospital mortality for men was higher than for women in all age groups (figure 3). During the study period age adjusted in-hospital mortality decreased from 19.9% in 1980 to 15.5% in 1993 in men, and from 17.8% to 14.9% in women.

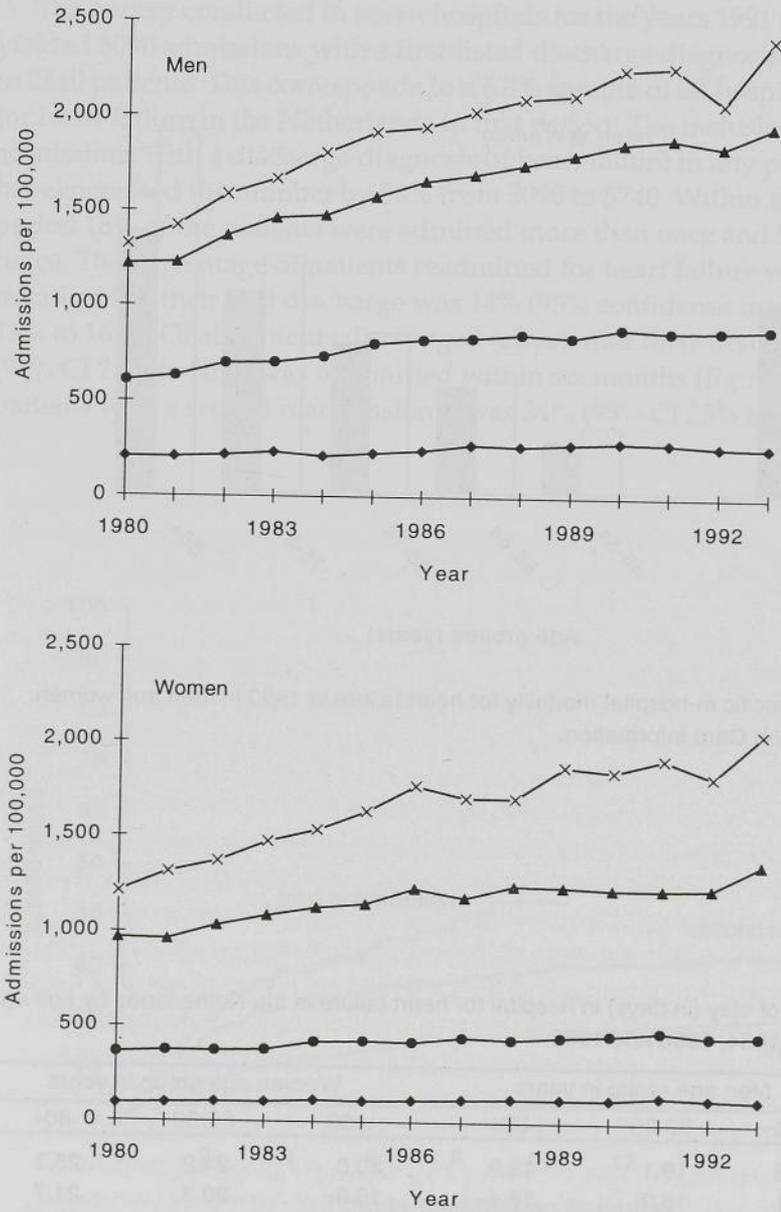


Figure 2. Age-specific discharge rates for heart failure in men (upper panel) and women (lower panel) in the Netherlands, 1980-1993. Age groups in years: ◆=55-64, ●=65-74, ▲=75-84, x=85 and over. Source: SIG Health Care Information.



Figure 3. Age-specific in-hospital mortality for heart failure in 1993 in men and women. Source: SIG Health Care Information.

Table 2. Length of stay (in days) in hospital for heart failure in the Netherlands by age and gender in 1980, 1984, 1988 and 1993.

Year	Men age group in years			Women age group in years		
	<60	60-80	80+	<60	60-80	80+
1980	17.8	19.1	19.9	20.8	24.2	25.1
1984	15.1	16.9	18.4	16.8	20.3	21.7
1988	15.1	15.9	17.1	16.4	19.2	20.1
1993	13.4	13.8	14.8	14.0	16.0	17.1

Source: SIG Health Care Information.

The survey conducted in seven hospitals for the years 1991 and 1992 yielded 3090 admissions with a first-listed discharge diagnosis of heart failure in 2440 patients. This corresponds to a 6.3% sample of all hospital admissions for heart failure in the Netherlands in that period. The inclusion of hospital admissions with a discharge diagnosis of heart failure in any position would have increased the number by 86% from 3090 to 5740. Within the two year period 18% of the patients were admitted more than once and 5% more than twice. The percentage of patients readmitted for heart failure within six months after their first discharge was 14% (95% confidence interval (CI) 13% to 16%). Of all patients discharged (alive) after their first readmission 26% (95% CI 21% to 30%) was readmitted within six months (figure 4), of all patients with a second readmission it was 34% (95% CI 25% to 43%).

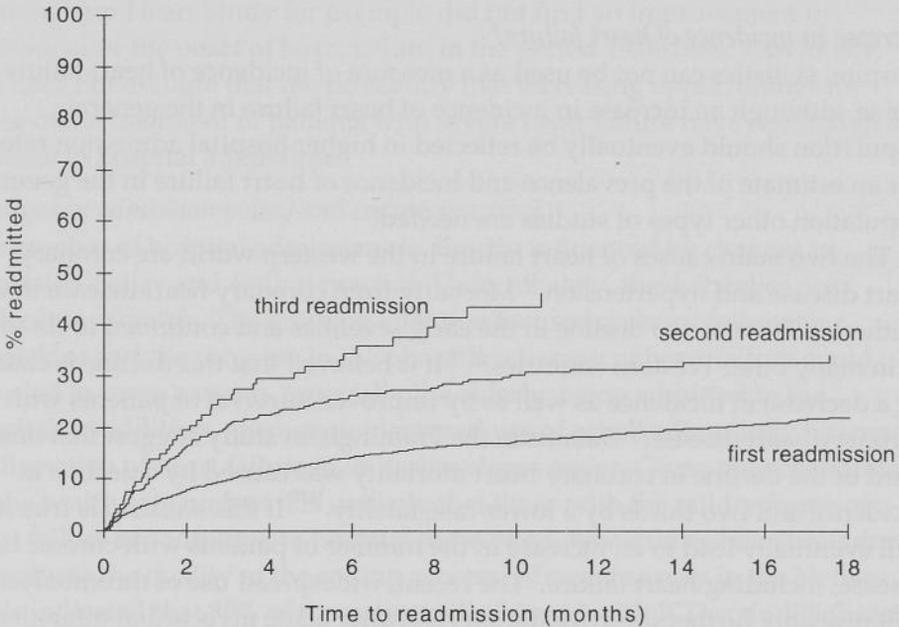


Figure 4. Separate curves (Kaplan-Meier) of the time to readmission for heart failure in patients with one, two, and three previous hospital admissions for heart failure. Individual data on 2,440 patients from a survey in seven hospitals during a two year period. Men and women combined.

DISCUSSION

This study shows a pronounced increase in age adjusted discharge rates for heart failure for both men and women in the Netherlands during the past 14 years. Similar increases have been reported in the United States of America, Sweden, and Scotland.⁵⁻⁸ Compared with Scotland there was a difference in the absolute rate (1990: 212/100,000 in Scotland versus 160/100,000 in the Netherlands), but time trends were very similar. From 1980 to 1990 the crude discharge rate in Scotland increased 63%,⁸ compared to 57% in the Netherlands. Explanations for the discrepancy in absolute rate could be differences in the age structure of the two countries, differences in admission policy, differences in the place of heart failure among the list of discharge diagnoses, and a true difference in prevalence of heart failure between the two countries.

We will discuss three possible explanations for the rise in age adjusted discharge rates for heart failure. These are an increase in the incidence of heart failure, the longer survival of heart failure patients, and changes in admission policy and coding practice.

Increase in incidence of heart failure?

Hospital statistics can not be used as a measure of incidence of heart failure per se, although an increase in incidence of heart failure in the general population should eventually be reflected in higher hospital admission rates. For an estimate of the prevalence and incidence of heart failure in the general population other types of studies are needed.

The two main causes of heart failure in the western world are coronary heart disease and hypertension.¹³ Mortality from coronary heart disease in the Netherlands started to decline in the early seventies and continued to do so, as in many other Western countries.¹⁴⁻¹⁶ It is believed that this decline is caused by a decrease in incidence as well as by improved survival of patients with coronary heart disease.¹⁷ Data from the Framingham study suggest that one third of the decline in coronary heart mortality was caused by a decline in incidence and two thirds by a lower case fatality.^{18,19} If this scenario is true it will eventually lead to an increase in the number of patients with chronic heart disease, including heart failure.⁹ The recent, widespread use of thrombolysis will probably further improve the survival after acute myocardial infarction, but at the same time will increase the number of patients having an impaired cardiac reserve/left ventricular function and who are therefore at a higher risk of developing heart failure.^{17,20}

As in the United States there has been a decline in prevalence of hypertension in the Netherlands during the last decades,²¹ making it an unlikely

contributor to the suggested increase in incidence of heart failure. However, from 1987 the percentage of people treated for hypertension has started to decline in the Netherlands,²² unlike the United States of America where a steady increase was observed over the past three decades.²³ The importance of the control of hypertension in the prevention of heart failure remains uncertain. Yusuf *et al* argued that the treatment of hypertension does not prevent heart failure, but merely postpones its onset.²⁴

Longer survival of patients with heart failure?

During the past decade several advances have been made in the treatment of heart failure,²⁵ most recently the introduction of angiotensin-converting enzyme (ACE) inhibitors. Although a recent meta-analysis demonstrated an impressive 23% reduction in mortality in trials of ACE inhibitors in heart failure, the gain in life expectancy is measured in months rather than years.²⁶ Furthermore, because it takes time to translate observed benefits in clinical trials to larger groups of heart failure patients,²⁷ ACE inhibitors are unlikely to have had a substantial effect on survival during our study period. The Framingham Heart Study for example did not find an improvement in survival after the onset of heart failure in the period 1948-1988.³ Obviously, this does not exclude that the possibility that increasing opportunities for tailor-made treatment of patients with severe heart failure have resulted in an increase in hospital admissions.

Changes in admission policy and coding practice?

The number of hospital admissions is directly influenced by changes in admission policy and coding practice. Unfortunately, these changes are difficult to quantify. The growing attention focused on heart failure by physicians and the progress in the pharmacotherapy of heart failure could have led to more patients, especially the elderly, being admitted to the hospital. In addition, the more widespread use of echocardiography has made confirmation of heart failure in its earlier stages easier. Given the constraints on the health care budget it is unlikely that those with the milder forms of heart failure are admitted to hospital more often. Few studies have been done to evaluate the quality of the coding process. A recent survey in the Netherlands indicated that 80% of the patients discharged with ICD code 428 (heart failure) fulfilled the Framingham criteria for heart failure.²⁸

Heart failure is characterised by long hospital admissions and frequent readmissions. This adds to the importance of heart failure in terms of costs. Despite a continuous decrease, the mean length of stay for heart failure is still appreciably longer than for acute myocardial infarction (15.2 days compared with 11.6 days in 1993).

Within a two year period 18% of the patients were admitted more than once. The proportion of patients that returned to the hospital increased with every new admission (figure 4). Our survey yielded a conservative estimate of the number of readmissions in patients with heart failure. First of all, readmissions to a different hospital could not be detected. Secondly, admissions before our fixed time period (1991-1992) were not taken into account. Therefore, admissions marked as a first admission in our survey might really have been readmissions.

In conclusion, age adjusted discharge rates for heart failure in the Netherlands increased by 48% for men and by 40% for women in the period 1980 to 1993. Readmissions within a short period of time are a typical feature of heart failure patients. In view of the expected rise in the number of persons above the age of 65 years and the progress in medical care a further increase in the number of hospital admissions for heart failure is likely. More efforts are needed to prevent and delay the development of heart failure in high risk patients, and more research is needed into the factors influencing the decision to (re)admit patients with heart failure to hospital.²⁹

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