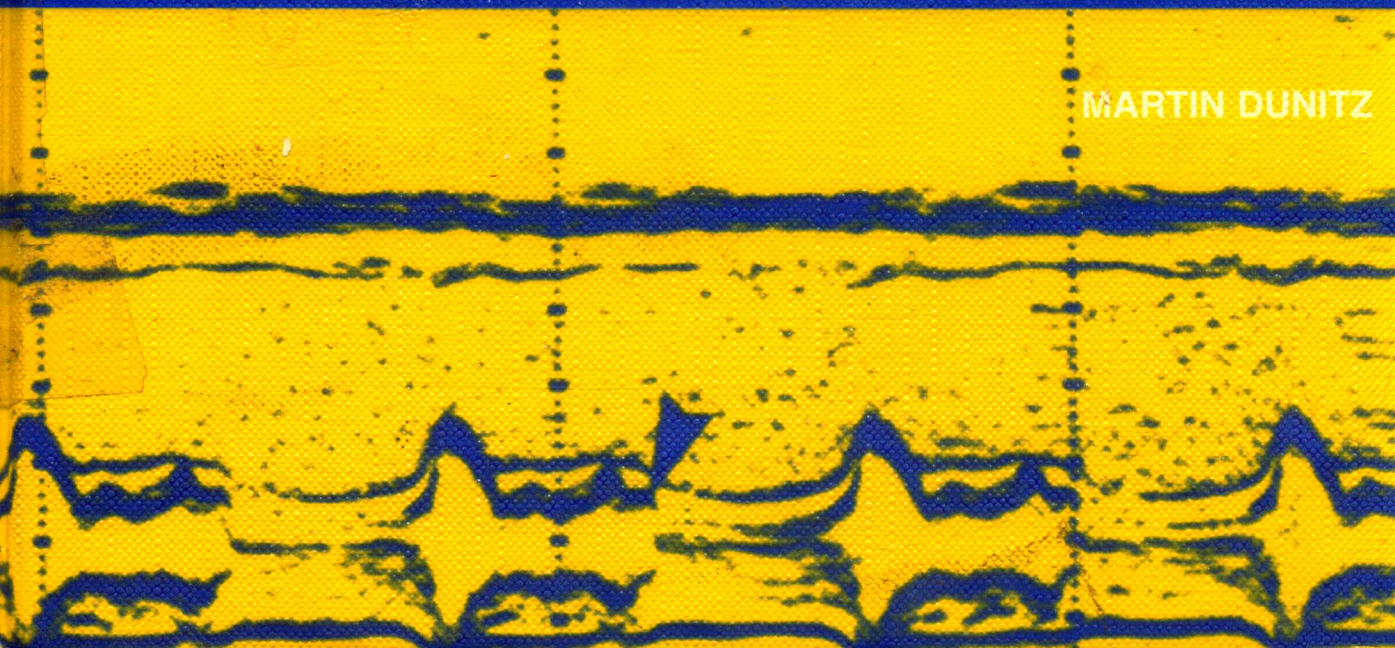
Heart Failure in Clinical Practice

SECOND EDITION

Edited by
John JV McMurray
John GF Cleland



MARTIN DUNITZ

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Preface

Few areas in cardiovascular medicine have advanced so rapidly as heart failure. Since the first volume in this series was published in 1994 we have learnt much more about what is clearly becoming the most important chronic cardiac condition afflicting the developed world. An international panel of authorities have helped us review this period of rapid change. We believe that the result is a comprehensive and timely overview of the subject. Our outstanding team of over 40 authors have provided contributions on subjects as diverse as the epidemiology and molecular biology of heart failure. New mediators such as adrenomedullin and new treatments such as beta-blockers and aldosterone antagonists are discussed in detail.

We hope you will find this volume as stimulating to read as it has been for us to edit.

John JV McMurray
John GF Cleland

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SECTION I

EPIDEMIOLOGY, CAUSES AND CONSEQUENCES OF CORONARY HEART FAILURE

1

Epidemiology of heart failure: what does the future hold?

Arend Mosterd and Arno W Hoes

Introduction

Cardiovascular mortality rates have declined significantly in most industrialized countries over the past three decades.[1,2] Nevertheless, cardiovascular disease remains one of the most important causes of morbidity and mortality in Western society, especially as the average age of the population increases.[2–4] Heart failure is rapidly becoming one of the most prevalent cardiovascular disorders and the incidence of heart failure is expected to increase.[5] It appears that the declining fatality rate of acute coronary events,[6] resulting in a larger group of persons at increased risk of developing chronic cardiovascular disease, contributes to the rise of heart failure. This paradox is further explained by the observation that treatment of hypertension may actually postpone rather than prevent the onset of heart failure.[7]

The prognosis of heart failure is poor[8] and the economic impact of heart failure on health services is considerable because of long-term pharmacological treatment and frequent hospitalizations associated with the syndrome. This financial burden is set to increase further as the prognosis of patients with heart failure is improved by medical and surgical interventions[9–12] and the proportion of elderly people in the population increases.

The importance of heart failure as a public health problem predominantly relates to the prevalence of the syndrome, in particular that of more severe stages. The prevalence is determined by the incidence and the survival following the onset of heart failure. This chapter will address recent trends in the epidemiology of heart failure, discuss a recently developed prediction model for heart disease (including heart failure) to arrive at suggestions for future heart failure research.

The syndrome

Heart failure is a clinical syndrome that largely defies definition. It develops as a consequence of cardiac disease, and is recognized clinically by a constellation of various signs and symptoms produced by complex circulatory and neurohormonal responses to cardiac dysfunction. Objective evidence of cardiac dysfunction has to be present, in addition to symptoms and signs (typically breathlessness, fatigue and ankle swelling), to satisfy the definition of heart failure according to the European Society of Cardiology Task Force on Heart Failure.[13] The epidemiology of heart failure has been described in detail elsewhere.[14] Briefly, the prevalence increases steeply with age (from 1–2% in persons aged 50–60 years to over 10% in those aged 80 years and over) and the prognosis is poor (30% mortality within 1 year, increasing to 60–70% at 5 years). The Framingham Heart

Study reported that approximately 50% of all deaths in heart failure were 'sudden' (i.e. death within 1 hour of onset of symptoms).[15] Recent trials of pharmacological therapy in heart failure reported similar results; the remainder, with few exceptions, being cardiovascular, with the majority being attributable to progressive pump failure.[14] Coronary artery disease and hypertension (either singly or together) account for the vast majority of cases of heart failure in the developed world. The Framingham Heart Study reported hypertension as the sole or contributory cause of heart failure in over 70% of cases.[16] Other community-based studies could not confirm such an important aetiological role for hypertension.[14] Most probably this is related to a recent reduction of the importance of hypertension as a cause of heart failure.[17]

Asymptomatic left ventricular dysfunction is an important prelude to the development of overt heart failure; 30% of asymptomatic participants in the Studies of Left Ventricular Dysfunction (SOLVD) Prevention Trial, with ejection fractions below 0.35, developed symptomatic heart failure within 3 years.[18]

Trends in prevalence, incidence and prognosis of heart failure

Epidemiological data on heart failure in the general population are scarce, let alone information on trends in prevalence, incidence and prognosis. Surveillance data from four general practices around Nijmegen, the Netherlands, indicate a slight increase in the prevalence of GP-diagnosed heart failure in men from 1985 to 1995 (0.6 to 0.9%), whereas prevalence in women (1.1%) and incidence for both genders remained stable.[4]

Information on secular trends can be obtained from the Framingham study, because of the long follow-up period and the uniform case definition throughout this period. The incidence of heart failure in men 50–59 years of age in the Framingham Heart Study declined from 16 per 1000 per year in the 1950s to 6 per 1000 per year in the 1970s.[19] No improvement in survival has been noticed over four decades,[8] but the potential effect of the relatively recent introduction of angiotensin-converting enzyme (ACE) inhibitor therapy on survival has not been examined yet. A recent study from Rochester, Minnesota, found no significant difference in the incidence of heart failure between 1981 and 1991.[20] Similarly, no improvement of prognosis could be demonstrated in this community-based study.

Trends in hospitalizations and mortality for heart failure

To study hospitalization and mortality trends, the World Health Organization (WHO) International Classification of Diseases codes are usually applied.[21] The reliability of existing registries of death causes and hospital discharge diagnoses has been questioned, as well as the diagnosis of heart failure. However, a recent investigation of hospitalizations for heart failure in the Netherlands documented that 80% of cases coded as heart failure fulfilled the Framingham heart failure criteria.[22]

Hospitalizations for heart failure

Hospital morbidity data are readily obtainable but relate, however, only to those individuals who require hospital treatment and therefore do not necessarily reflect the incidence or prevalence of the condition within the community. Any change in the number of patients admitted

or discharged from hospital over time may relate more to changes in the perceived usefulness of inpatient assessment and treatment, and changes in awareness of the condition, than to any real change in incidence or prevalence. The accuracy of available data may also vary within and between countries and over time.[23]

In Scotland, the number of hospital discharges with heart failure coded as the primary diagnosis rose by 60% between 1980 and 1990, to 210 per 100 000 inhabitants per annum.[24] A further increase in the overall rate of discharges for heart failure to 535 per 100 000 population was described recently.[25] A similar increase has been recorded in Sweden for the years 1970–1986: counting only one admission per year for any individual, there was an 80% increase in discharges for heart failure in men, and a 130% increase in women,[26] was observed, with an even more marked increase in those aged over 75 years. Data from the Netherlands suggest an increase of the same magnitude.[27] The hospitalization rates in the Netherlands (177 and 169 per 100 000, for men and women respectively, in 1993) were lower than those in Scotland (Figure 1.1). This may be attributed largely to the higher prevalence of coronary heart disease and the higher proportion of persons 75 years or older in Scotland. In addition, the ICD 9 codes 425.4 (primary cardiomyopathy), 425.5 (alcoholic cardiomyopathy) and 425.9 (secondary cardiomyopathy, unspecified) were not included in the Dutch data.

In the United States, congestive heart failure was the primary discharge diagnosis in about 790 000 hospitalizations in 1991 and constituted the leading 'diagnostic related group' among hospitalized patients aged over 65 years of age;[28] more than double the number observed in 1978, and more than five times the number in 1970.[29] This reflects a year-on-year age-adjusted increase in hospitalizations

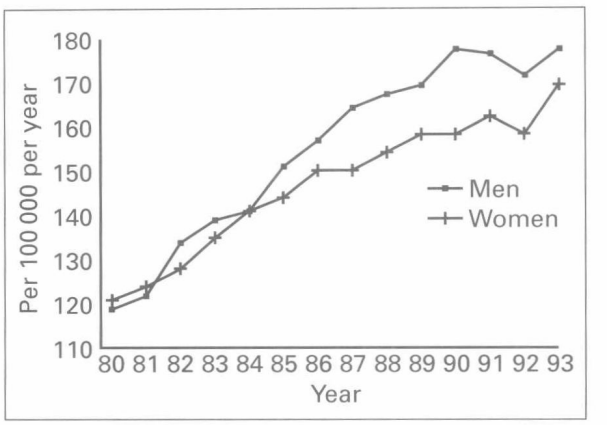

Figure 1.1
Hospitalization rates for heart failure, the Netherlands 1980–1993.[27]

from 82 per 100 000 inhabitants in 1970 to 281 per 100 000 in 1990. The method of reimbursement for medical expenses throughout that period of time changed with the introduction of 'diagnostic related groups' in 1983 and this may have affected the absolute numbers to some degree, but is unlikely to explain such a massive and steady increase.

The most likely explanation for the rise in age-adjusted discharge rates for heart failure is a combination of an increase in the incidence of heart failure and longer survival of heart failure patients; the former primarily due to improved survival of patients with coronary heart disease (in particular acute myocardial infarction) and the latter to improvements in heart failure management.[6,9] Changes in admission policy and coding practice may also influence discharge rates. Given the constraints on the health care budget, however, it is unlikely that milder forms of heart failure are admitted to the hospital more often.

A high readmission rate is typical of patients with heart failure.[30] A survey in the Netherlands, carried out in 1991–1992, indicated that

16% of patients were readmitted with heart failure within 6 months of their first admission.[27] An increase in the readmission rate has been noted in Scotland: 17.3% of patients with heart failure were admitted twice or more in 1983, increasing to 22.3% in 1990.[24] Given this frequent rehospitalization of patients with heart failure, the use of the number of hospital discharges rather than the number of individual patients discharged may overestimate the size of the problem. The Swedish study,[26] however, demonstrated an age-adjusted increase in the number of heart failure admissions, even after exclusion of readmissions.

In-hospital mortality in men in the Netherlands declined from 19.8% in 1980 to 15.4% in 1993. For women these figures are 17.4% and 15.1%, respectively.[27] Between 1980 and 1990, case fatality in Scotland dropped from 22.3% to 16.2% for men and from 23.5% to 19.6% in women.[24] In the United States, in-hospital mortality declined from 11.3% in 1981 to 6.1% in 1993.[31]

Heart failure mortality

In the United States, the absolute number of deaths ascribed to congestive heart failure increased from 27 415 in 1980 to 46 484 in 1995.[32] For persons aged 65 years or older, age-adjusted death rates for heart failure increased during 1980–1988 and declined after 1988 (from 117 per 100 000 persons standard population in 1988 to 108 in 1995). It was hypothesized that this could be attributed to an inproved survival of patients with heart failure.

Similarly, in Canada an increase in absolute number of deaths with a primary diagnosis of heart failure was accompanied by a decline in age-adjusted death rates for heart failure between 1980 and 1990.[32]

A recent report from Scotland indicated that death from heart failure is substantially underestimated by official statistics.[34] Notwithstanding an increased proportion of coronary deaths related to heart failure, age-adjusted mortality rates for heart failure declined substantially between 1979 and 1992. Again, this decline suggests an improved survival of patients with heart failure.

In the Netherlands, age-adjusted death rates for heart failure (the most frequently listed cause of death) increased from 20 per 100 000 for both men and women in 1979 to 38 and 48 per 100 000 in 1994 for men and women, respectively. A temporal peak in the period 1982–1986 to rates higher than those observed in 1994 is hard to explain.[4]

Mortality data from other countries is limited. In the United Kingdom the death certificate explicitly forbids heart failure to be entered as the primary cause of death, and instead the underlying pathological process is specified, for example coronary heart disease.

Trends in risk factors for heart failure

Risk factors for the development of heart failure in the general population have been examined in the Framingham Heart Study and the Study of Men Born in 1913.[17,35,36] Not surprisingly, factors indicative of the presence of cardiovascular disease greatly increase the risk of occurrence of heart failure. Coronary heart disease confers a four-fold increased risk. Following myocardial infarction, 14–20% of patients will develop heart failure within 5–6 years.[37] Progressive dilatation of the left ventricle within 4 weeks of myocardial infarction greatly increases the chance of heart failure.[38] Hypertensive cardiovascular disease with electrocardiographic evidence of left ventricular hypertrophy carries an even higher risk of development of heart failure, increasing the risk more than fifteen-fold.