

Heart failure: preventing disease and death worldwide

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World Heart Failure Alliance: Global Heart Failure Awareness Programme



Executive Summary Heart failure is a life-threatening disease and addressing it should be considered a global health priority. At present, approximately 26 million people worldwide are living with heart failure. The outlook for such patients is poor, with survival rates worse than those for bowel, breast or prostate cancer. Furthermore, heart failure places great stresses on patients, caregivers and healthcare systems. Demands on healthcare services, in particular, are predicted to increase dramatically over the next decade as patient numbers rise owing to ageing populations, detrimental lifestyle changes and improved survival of those who go on to develop heart failure as the final stage of another disease.

It is time to ease the strain on healthcare systems through clear policy initiatives that prioritize heart failure prevention and champion equity of care for all. Despite the burdens that heart failure imposes on society, awareness of the disease is poor. As a result, many premature deaths occur. This is in spite of the fact that most types of heart failure are preventable and that a healthy lifestyle can reduce risk. Even after heart failure has developed, premature deaths could be prevented if people were taught to recognize the symptoms and seek immediate medical attention. Public awareness campaigns focusing on these messages have great potential to improve outcomes for patients with heart failure and ultimately to save lives.

Compliance with clinical practice guidelines is also associated with improved outcomes for patients with heart failure. However, in many countries, there is considerable variation in how closely physicians follow guideline recommendations. To promote equity of care, improvements should be encouraged through the use of hospital performance measures and incentives appropriate to the locality. To this end, policies should promote the research required to establish an evidence base for performance measures that reflect improved outcomes for patients.

Continuing research is essential if we are to address unmet needs in caring for patients with heart failure. New therapies are required for patients with types of heart failure for which current treatments relieve symptoms but do not address the disease. More affordable therapies are desperately needed in the economically developing world. International collaborative research focusing on the causes and treatment of heart failure worldwide has the potential to benefit tens of millions of people.

Change at the policy level has the power to drive improvements in prevention and care that will save lives. It is time to make a difference across the globe by confronting the problem of heart failure.

A call to action: policy recommendations. We urge policymakers at local, national and international levels to collaborate and act on the following recommendations.

Promote heart failure prevention

- Support the development and implementation of public awareness programmes about heart failure. These should define heart failure in simple and accessible language, explain how to recognize the symptoms and emphasize that most types of heart failure are preventable.
- Highlight the need for healthcare professionals across all clinical disciplines to identify patients with illnesses that increase the risk of heart failure and to prescribe preventive medications.
- Prioritize the elimination of infectious diseases in parts of the world where they still cause heart failure.

Improve heart failure awareness amongst healthcare professionals

- Encourage the development and use of heart failure education programmes for all appropriate healthcare professionals. These should aim to improve the prevention, diagnosis, treatment and long-term management of heart failure and raise awareness of clinical practice guidelines.

Ensure equity of care for all patients with heart failure

- Provide a healthcare system that delivers timely access to diagnostic services and treatment of heart failure, as well as a seamless transition to long-term management.
- Ensure that the best available and most appropriate care is consistently provided to all patients with heart failure through efficient use of resources.

Support and empower patients and their caregivers

Provide resources for the education and practical support of patients with heart failure and their families or other caregivers, empowering them to engage proactively in long-term care.

Promote heart failure research

- Fund and encourage international collaborative research to improve understanding of the patterns, causes and effects of modern day heart failure and how the disease can be prevented across the globe.
- Fund and encourage research into new and more affordable therapies and medical devices for all types of heart failure.
- Fund and encourage research into evidence-based healthcare performance measures that reflect improved clinical outcomes for patients with heart failure.

Keywords Chronic heart failure; Acute heart failure; Epidemiology; Therapy; Awareness

Introduction

The prevention of disease and death due to heart failure needs to be made a global health priority. Despite the increasingly large numbers of people living with and dying from heart failure, awareness of the disease is low amongst the public, politicians and even some healthcare professionals. Although there is no cure for heart failure, many cases are preventable, and most patients can be treated effectively to improve quality of life and survival. Policymakers have a responsibility to ensure that as many people as possible benefit from the available measures for prevention, diagnosis, treatment and long-term management of heart failure. At the same time, research should be supported in areas in which there are urgent unmet needs.

An international approach is needed to identify the most effective ways of addressing the problem of heart failure in different parts of the world and to incorporate the necessary measures into everyday practice. To this end, the Heart Failure Association of the European Society of Cardiology has launched the Global Heart Failure Awareness Programme. Heart failure groups across the globe will be involved in the programme to ensure sharing of knowledge, experience and recommendations across countries and continents.

This white paper is a core component of the inaugural phase of the Global Awareness Programme. It examines the worldwide burden of heart failure, highlights the challenges of dealing with the disease and makes evidence-based recommendations for policy change (Figure 1). Policy initiatives at local, national and international levels have the potential to reduce deaths due to heart failure and improve quality of life for patients.

The global burden of heart failure

Heart failure is a serious condition in which the heart is unable to pump enough blood to meet the needs of the body. Although often life threatening, the typical symptoms of heart failure (breathlessness, swollen limbs and fatigue) are usually less dramatic than those associated with a heart attack. In economically developed countries, up to one person in five is expected to develop heart failure at some point in their life¹ and even more people will be affected as family members, friends or healthcare professionals.

Patient perspective²

When you have heart problems, you always worry [that] the next breath is your last one. That's something you never know.

Heart failure survival rates remain poor across the globe

Across the globe, 17–45% of patients admitted to a hospital with heart failure die within 1 year of admission and the majority die within 5 years of admission (Figure 2).^{3–24}

In recent years, survival rates for patients with heart failure have improved in many parts of the world, in parallel with the introduction of modern evidence-based therapies and patient management systems.^{3,25–31} Nevertheless, about 2–17% of individuals admitted to a hospital with heart failure die while in a hospital (Figure 2). Survival rates are better for those treated in outpatient clinics, who typically have less severe symptoms than those treated in a hospital.^{22,32} However, even the latest therapies may only relieve symptoms in many patients, without slowing the progression of their disease or prolonging life.^{33,34} This is because heart failure can arise from a number of different underlying problems with the structure or function of the heart, some of which are more difficult to treat than others (see Section on Preventing Heart Failure in High-risk Groups).

Despite improvements in care over the past 20 years, the outlook for patients with heart failure remains poor, and survival rates are worse than those for bowel, breast or prostate cancer.^{35–37}

Heart failure is common, and patient numbers are increasing

About 26 million adults worldwide are living with heart failure,³⁸ leading some to describe it as a global pandemic.³⁹ In comparison, 32 million are living with cancer⁴⁰ and 34 million with HIV/AIDS.⁴¹ In many countries, population-based studies have found that about 1–2% of people have

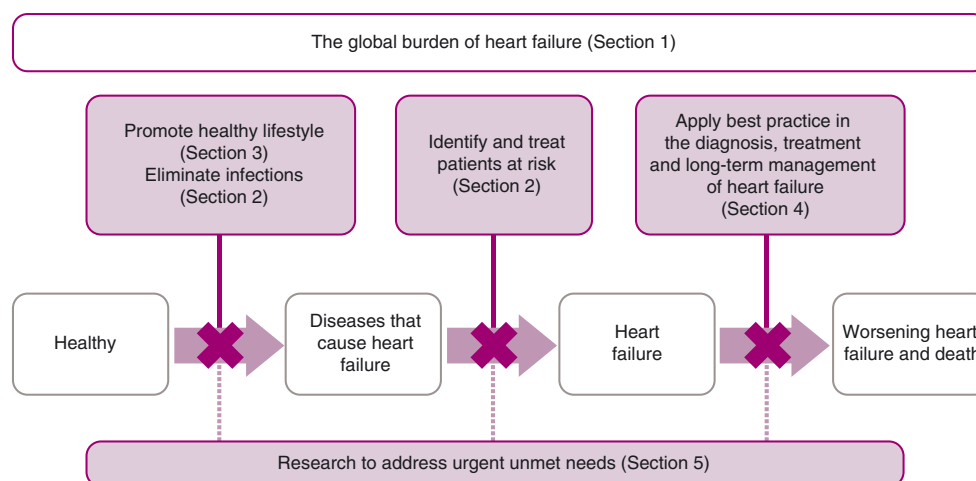


Figure 1 Heart failure: preventing disease and death worldwide.

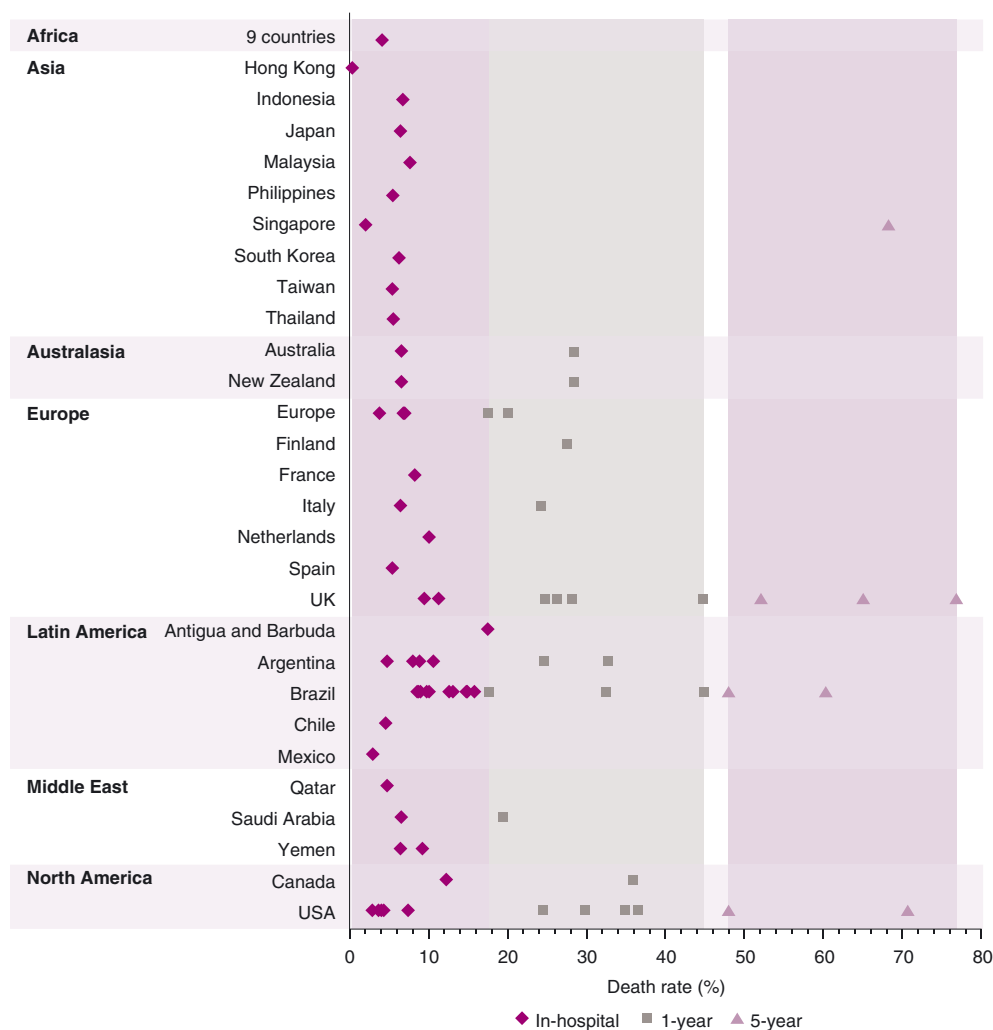


Figure 2 Death rates for patients hospitalized with heart failure across the globe.^{3–14,16–24,47,48} Each symbol represents data from a published study. Vertical shaded areas show the range in reported death rates within each time frame. Horizontal shaded areas show regions. The data categorized as 'Europe' is from the EuroHeart Failure Survey (24 countries),²¹ the EuroHeart Failure Survey II (30 countries)²³ and the ESC-HF pilot survey (12 countries).²² The data are not age adjusted.

heart failure, and similar or higher proportions have been reported in single-centre studies (Figure 3).^{4,8,9,11,42–46}

Heart failure becomes more common with increasing age. In North America and Europe, few patients with heart failure are 50 years of age or younger^{50–52} and more than 80% are 65 years of age or older.³⁸ The number of patients with heart failure is predicted to increase in countries with ageing populations.⁵³ Japan, in particular, has the most rapidly ageing population of all economically developed nations.⁵⁴ In the USA, there were 5.8 million patients living with heart failure in 2012, and this is expected to rise to 8.5 million by 2030.⁴⁵ Another contributing factor to these increasing numbers is the improvement in treating heart attacks and other cardiovascular diseases that damage or place an extra burden on the heart. More patients with these conditions are surviving now than did in the past, but those who survive are at high risk of going on to develop heart failure.³⁹

In economically developing areas, such as parts of Latin America and Asia, the numbers of patients with heart failure are also increasing.^{55–58} The increase is largely a result of the shift towards a Western-type life-style and its associated diseases, for example, conditions such as diabetes increase the risk of developing heart failure (see Section on Preventing Heart Failure in High-risk Groups). This is despite reductions in the number of cases caused by Chagas disease in urban areas of Latin America⁵⁸ and reductions in the number of cases of Davies disease (a disorder in which the heart muscle becomes rigid) in tropical areas.⁵⁹

Infections remain a common cause of heart failure in many parts of the world and can strike at any age. Heart failure is not a disease of the elderly in sub-Saharan Africa, where half of patients hospitalized with the disease are 55 years of age or younger.⁵ Patients in the Asia Pacific

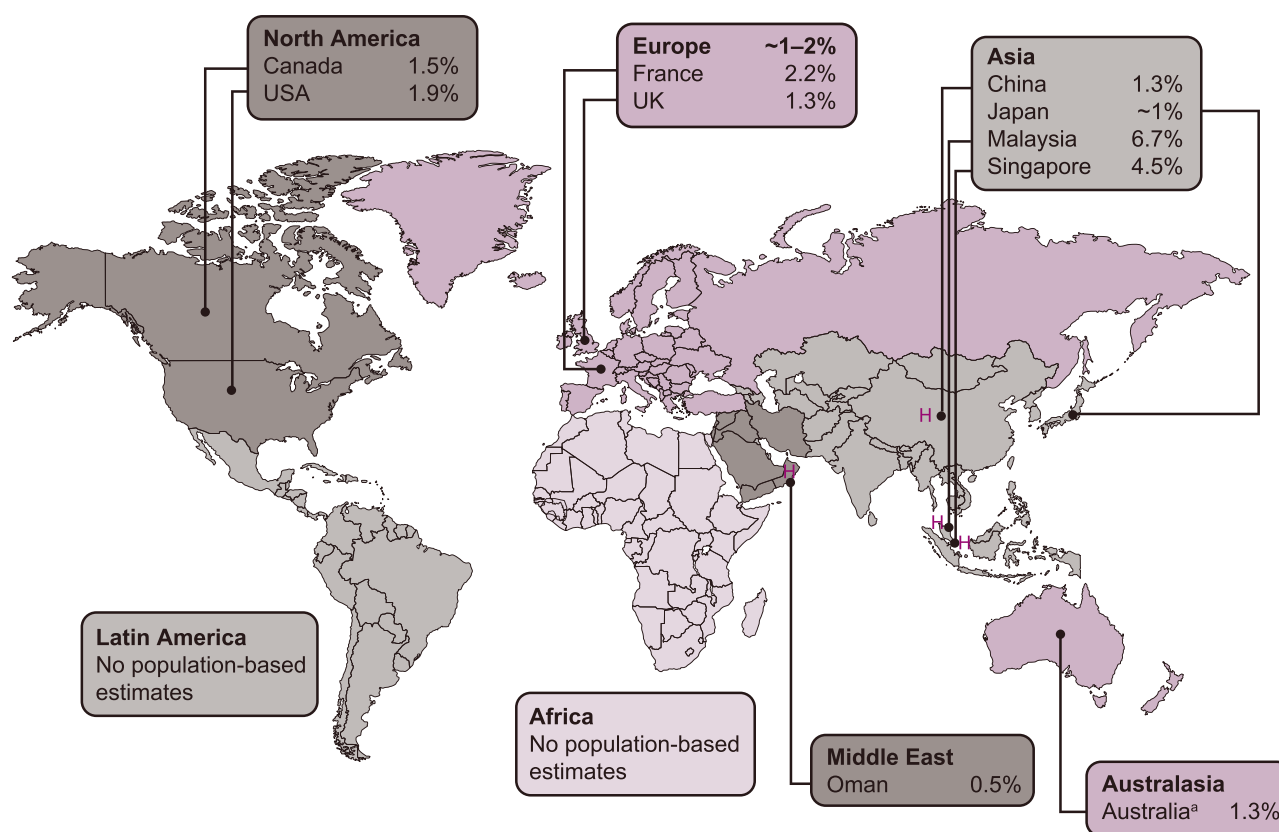


Figure 3 Proportion of the population living with heart failure in individual countries across the globe.^{4,8,9,11,42–46a} Heart failure or swollen limbs. Estimates based on a single centre or hospital are indicated by an H. No population-based studies have reportedly been conducted to estimate the proportion of the population living with heart failure in Africa⁴⁹ or Latin America.¹³

region also tend to be younger than those in Western regions.⁶⁰ Rheumatic fever due to preventable bacterial infections is a prominent cause of heart failure in Africa, Asia, Australasia and Latin America.⁶¹ HIV infection is also a major contributor to heart-related disease across the world.⁶² In areas of Latin America where Chagas disease is common, nearly half of all heart failure cases are a direct result of this preventable parasitic infection.⁶³

In tropical areas, Davies disease has historically been a common cause of heart failure. The underlying reasons for the development of Davies disease have not been fully established but candidates include childhood malnutrition, dietary toxins and inflammation, as well as infections. In the Kerala region in south India in recent years, the number of new cases of Davies disease has declined in parallel with improvements in socioeconomic and health status.⁵⁹

Heart failure exacts severe economic, social and personal costs

Globally, the increasing burden of heart failure is taking its toll on society, in particular on patients, caregivers and healthcare systems.

As a primary diagnosis, heart failure accounts for about 1–4% of all hospital admissions in economically developed countries (Figure 4).^{14,64–67} This is likely to be an underestimate because heart failure may be recorded as a secondary diagnosis, or may even go unrecorded, especially in the large number of patients who have other cardiovascular diseases.⁶⁸ Country-wide information is sparse in other regions,⁵⁵ highlighting the need to set up new national registries to quantify accurately the burden of heart failure.

Caring for patients with heart failure comes at a high economic cost and accounts for about 1–3% of total healthcare expenditure in North America,⁶⁹ Western Europe⁷⁰ and Latin America.⁵⁸ In comparison, the total global expenditure on all healthcare goods and services in 2010 was in the region of \$6.5tn.^{71,72} In Germany, the total medical costs attributable to heart failure were estimated at €2.9bn in 2006. This figure includes costs for inpatient, outpatient and day care services, as well as drugs, devices and other medical products.⁷⁰ In the USA, the total hospital, physician, prescription and home healthcare costs associated with heart failure were estimated at \$20.9bn in 2012 and are projected to rise to \$53.1bn by 2030.⁴⁵ The 2012 figure is comparable with

the annual capital spend required to ensure clean, safe drinking water for the entire nation.⁷³

The lengthy and repeated hospital stays that are typically required by patients with heart failure account for the majority of this economic burden.^{45,70} Across the globe, the average length of hospital stay is about 5–10 days.^{3,5,6,11,12,14,19,20,24,43} Over the past two decades, the length of stay has become shorter in Europe, North America and Australasia.^{3,5,11,43} Nevertheless, in Europe and North America, about a quarter of patients admitted to a hospital with heart failure are readmitted within a month and up to two-thirds within a year, usually for recurrence of heart failure.¹¹ Individuals who are readmitted with worsening or recurrent symptoms of heart failure are at a high risk of terminal decline.⁷⁴ Hospital readmission can improve survival rates amongst patients with worsening heart failure; however, identifying those for whom long-term monitoring is a suitable alternative may be a more efficient use of resources (Section on Future Directions in Care: Urgent Unmet Needs).⁴

Heart failure markedly affects patients' quality of life. Fear, anxiety and depression are common,⁷⁵ and work, travel and day-to-day social and leisure activities are

difficult for those with breathlessness and extreme fatigue.⁷⁶ The emotional, physical and financial costs are also high for caregivers looking after a family member with heart failure.⁷⁷

Patient perspective⁷⁸

I'm not depressed... not really depressed... it's just a low feeling and it's not a happy feeling, and you just never feel your life's worth anything at times.

Caregiver perspectives⁷⁹

At night, when he's lying in bed and I don't hear him breathe for a while, it gives me the nerves. Then I start counting. And suddenly I hear him breathing again. Then I think, oh dear, one morning I will wake up and then he's gone. I don't mean to complain but if you are used to going out and now you have to stay home all the time, you know all the time. My daughter lives around the corner and I go out a lot with her, with the dog, to keep my mind off things... I dare not stay away much longer. My daughter wants me to come along to go to the seaside and we will also take the dog with us, but I am afraid to go. To go out for a whole day is much too long.

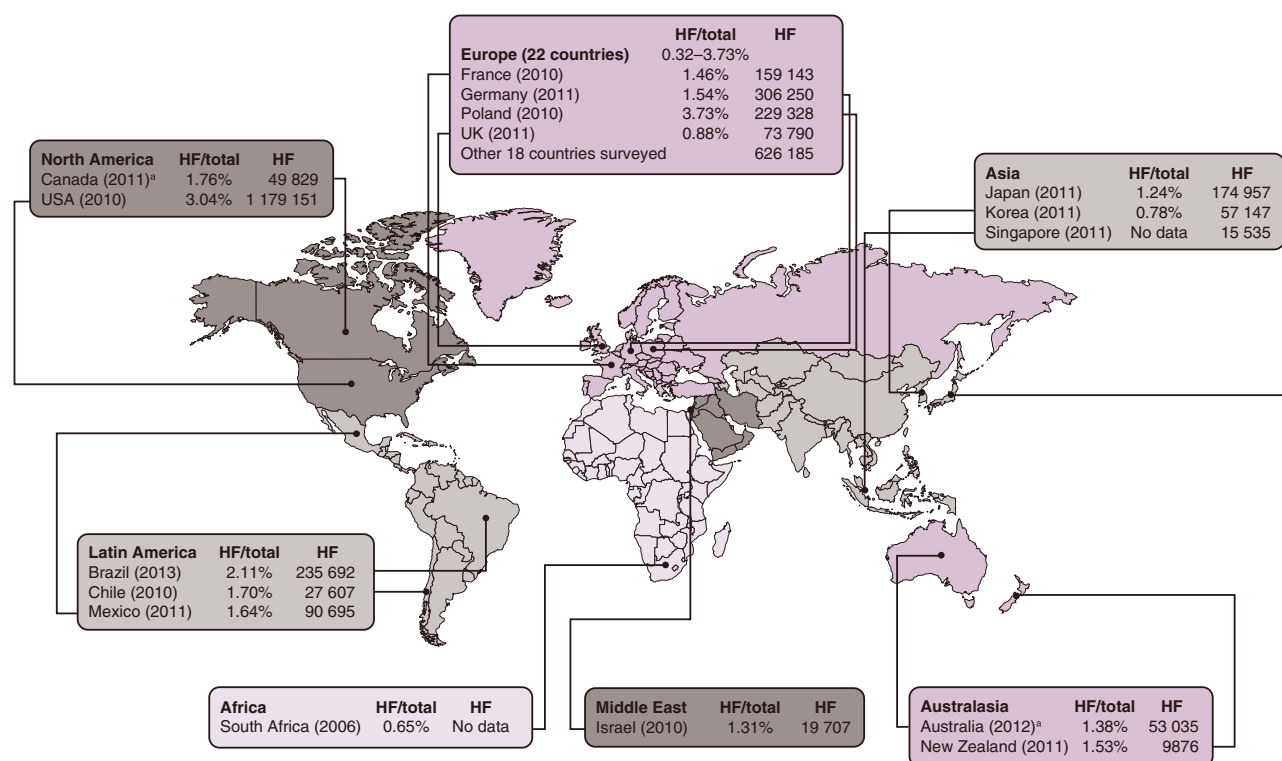


Figure 4 Proportions and numbers of hospital admissions with heart failure as the primary diagnosis in countries across the globe.^{14,64–67} HF, number of hospital admissions with heart failure as the primary diagnosis; HF/total, hospital admissions with heart failure as a primary diagnosis as a proportion of total hospital admissions. Data for South Africa are from a single cohort in Soweto. ^aHF/total from 2010, the most recent year for which both data sets were available.

Heart failure causes large numbers of deaths and widespread ill health and exacts huge economic and social costs—and the problem is becoming worse. Now is the time for coordinated public heart failure awareness programmes and strategic and political initiatives to improve care across the globe.

Preventing heart failure in high-risk groups

Preventing heart failure is of paramount importance. Once established, the deterioration in the heart's condition can often be treated but typically cannot be reversed. Policymakers should highlight the need for healthcare professionals across all clinical disciplines to identify patients with illnesses that increase the risk of heart failure and prescribe preventive medications. Equity of access to preventive medications should be provided for those at greatest risk of developing heart failure, regardless of age, sex or income. Policymakers should also prioritize the elimination of particular infectious diseases in parts of the world where they still cause heart failure.

What causes heart failure?

The term 'heart failure' describes a situation in which a person's heart cannot pump enough blood around the body

but does nothing to explain why this condition arises. The clinical picture is complex because there are many possible causes of heart failure, and some are illnesses in their own right (Figure 5). Many cases of heart failure can be regarded as the end stage of other underlying illnesses and could be prevented if patients with these illnesses were identified and treated appropriately at an earlier stage.⁸⁰

The heart is a remarkably adaptable organ. To cope with problems that increase the demands placed on it, the heart muscle is able to remodel itself to maintain output in the short term. However, if this remodelling continues in the long term, it can lead to abnormalities and eventually to heart failure. For example, pumping activity may decrease and valves may malfunction as the heart enlarges, dilates and stiffens. Sooner or later, these changes will manifest as overt symptoms of heart failure, unless the process of deterioration can be halted or delayed.

For most patients with heart failure, quality of life can be dramatically improved by therapies that relieve symptoms. For many patients, modern evidence-based medications or devices are available that slow or halt the progress of heart disease and improve survival. However, no therapies have been shown to prolong life for nearly half of all patients—those who have heart failure with preserved ejection fraction (HFPEF) (Section on Future Directions in Care: Urgent Unmet Needs).

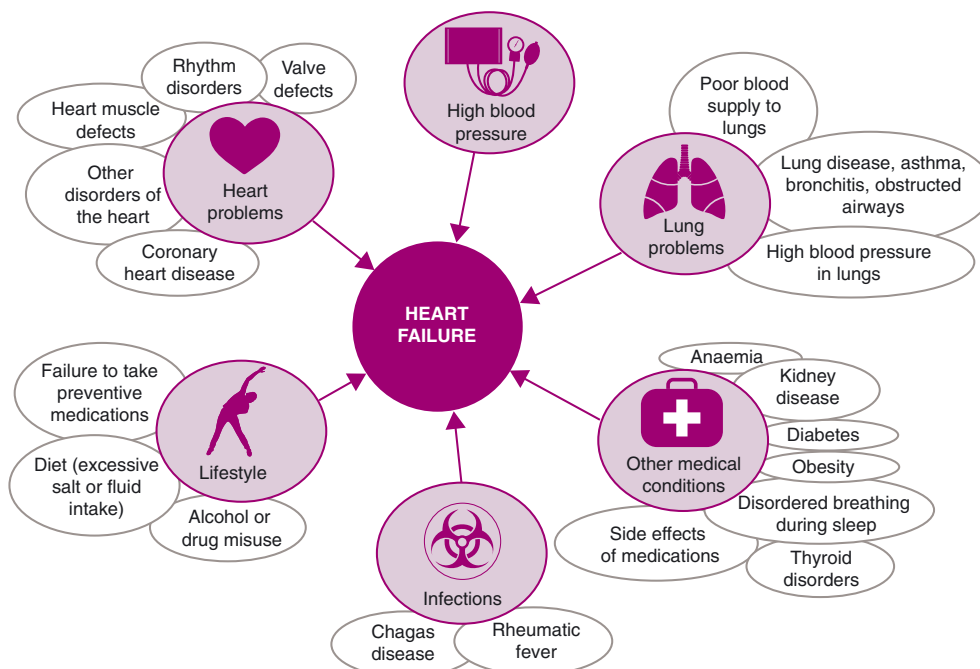


Figure 5 Common causes of heart failure. Adapted from Cowie *et al.*, improving care for patients with acute heart failure: before, during and after hospitalization, 2014,¹¹ with permission from Oxford PharmaGenesis™ Ltd.

How can heart failure be prevented?

The fact that treatment is not always effective in prolonging life means that prevention of heart failure should be prioritized by policymakers. This is particularly important for groups at high risk of developing this condition. Many people have existing illnesses that place them at risk of heart failure. Healthcare professionals treating such patients should adopt a broad approach that includes encouraging positive lifestyle changes that reduce the risk of heart failure (see Section on Improving Public Awareness of Heart Failure) and prescribing preventive therapies as appropriate. Medications that control blood pressure, heart rhythm and cholesterol levels are effective in preventing heart failure in the large number of people who have conditions such as high blood pressure, coronary heart disease, kidney disease and diabetes.⁸¹ Pacemakers and heart valve replacement can also prevent heart failure in the small number of people who have particular heart rhythm or valve disorders.⁸² The range of illnesses that predispose patients to heart failure is extremely wide. Healthcare professionals across all clinical disciplines should be educated to identify patients with illnesses that increase the risk of heart failure and prescribe preventive medications. This will ensure that as many people as possible benefit from available therapies.

Patients receiving long-term preventive therapies need to be assessed regularly at the cost of healthcare providers.⁸¹ In addition, those with chronic conditions, such as coronary artery disease or Chagas disease, should be evaluated periodically and monitored for changes to the heart. Patients with breast cancer are another group who would benefit from such monitoring. Several existing and new cancer treatments are toxic to the heart,^{83,84} and it is important for healthcare professionals to be aware of the need to assess and manage the associated risks.⁸⁵

Bacterial infections that cause heart disease have been largely eliminated in economically developed countries, owing to the use of antibiotics. In other regions, bacteria and tropical parasites cause a substantial proportion of heart failure cases, many of which could be prevented if appropriate therapies were used.^{86–88} The potential benefits of policy initiatives aimed at eliminating infectious diseases therefore extend to preventing heart failure in many parts of the world. In particular, continuing global efforts are warranted to eradicate Chagas disease, building on the progress that has been made in Latin America over the past two decades.⁸⁹

Identifying and treating patients at risk of developing heart failure

Preventive treatment could be started earlier by identifying people with early signs of abnormal heart muscle

remodelling. Large-scale screening programmes, such as those that have enabled earlier treatment for bowel, cervical and breast cancer, are unfortunately not possible because there is no simple diagnostic test for heart failure (see Section on The Need to Apply Best Practice).⁹⁰ Early changes in the structure or function of the heart can be detected using medical imaging technology; it is not practical, however, to perform these complex procedures in the enormous number of individuals with illnesses that lead to heart failure and certainly not in the general population.⁹⁰ In the future, advanced genetic tests and statistical modelling of at-risk groups may be available that consider the multitude of potential causes of heart failure, and these may allow specific individuals to be identified for in-depth screening (see Section on Future Directions in Care: Urgent Unmet Needs).⁸²

Targeting preventive medications towards individuals at greatest risk of heart failure could increase cost-effectiveness, allowing more people to benefit. Further research in these areas is ongoing and should continue to be supported by public and private funds. In addition, awareness programmes should be aimed towards everyone with medical conditions that predispose to heart failure. These should include education about the symptoms of heart failure and the benefits of positive lifestyle changes. The same messages are important for public awareness programmes (see Section on Improving Public Awareness of Heart Failure).

Preventing heart failure in the elderly and socioeconomically disadvantaged: unique challenges

Preventing heart failure in the elderly is becoming a more pressing healthcare priority as populations age.⁹¹ Heart failure is the most common reason for hospital admission in people over 65 years of age in economically developed regions (see Section on The Global Burden of Heart Failure).^{3,11,92,93} Elderly patients hospitalized with heart failure are mainly women.⁹⁴ Although a number of studies of heart failure patients have indicated that survival rates are better in women than in men, recent research has shown that the long-term prospects for women are not as good as previously thought.⁹⁵ Initiatives aimed at improving heart failure prevention should therefore include strategies for reaching out to older people, particularly older women.

In economically developed countries, heart failure is both more common and more likely to be the cause of death in people with low socioeconomic status than in the rest of the population.^{29,96} This is still the case after adjusting for differences in age, medication use and the proportion of people with other heart-related diseases.⁹⁶ It has been suggested that housing stability, social

support, substance abuse, language proficiency and distance to hospital may play a role.⁹⁷ More elderly women than men live alone and in poverty in the USA and often lack the social support of their families or communities. Social support can help people to seek medical attention if symptoms emerge and to change their lifestyles to reduce the risk of heart failure (Section on Improving Public Awareness of Heart Failure).⁹⁸

In rapidly developing countries, governments face the double challenge of prioritizing the elimination of infectious diseases in resource-poor or rural settings whilst not neglecting the diseases emerging in urban areas as a result of a shift towards a Western-type lifestyle.⁵⁷ That elderly, isolated, female or poor people are amongst those most likely to have heart failure has done little to raise the profile of the disease. It is time to improve awareness of heart failure via mass campaigns funded by governments and industry.

Improving public awareness of heart failure

Large numbers of premature deaths occur through ignorance of the causes and symptoms of heart failure. There is a pressing need for public awareness programmes that define heart failure in simple and accessible language, explain how to recognize the symptoms and emphasize the need for urgent medical attention. The other important messages are that most types of heart failure are preventable, and a healthy lifestyle can reduce risk. Policymakers should support the development and implementation of public awareness programmes focusing on these messages.

Public awareness of heart failure symptoms is dangerously low

Delaying hospital treatment by as little as 4–6 h after symptoms of heart failure appear can increase the chances of death,^{99–101} yet patients typically do not seek treatment for hours or even days after developing symptoms.¹⁰² Public education about the symptoms of heart failure and the need to contact a healthcare provider as soon as symptoms appear is essential to ensure that patients benefit fully from the available therapies and care.

When asked what the reasons were for their delay in seeking treatment, many patients who delayed for longer than the average reported that they 'did not think symptoms were heart related' and that symptoms were 'not that severe at first'.¹⁰³ In another large European survey, only 3% of the public were able to identify heart failure from a list of typical symptoms, compared with 28% for heart attack and 48% for stroke. Most patients wrongly regarded

heart failure as not serious or as a normal consequence of ageing.¹⁰⁴ In low-income and middle-income countries such as Indonesia, patients may not seek treatment straight away because they live far from a hospital or lack health insurance, but ignorance of heart failure symptoms is also a major reason for delay.¹² Another factor is depression, which affects 20–40% of patients with heart failure. A delay of more than 72 h between the appearance of heart failure symptoms and hospitalization is reportedly more than twice more likely in patients with depressive symptoms than in those without.¹⁰⁵ This underscores the need for public awareness programmes to be combined with social support initiatives for those most at risk.

Patient perspective²

I did at times start having queasy feelings and pains in my one side, and it happened once or twice when driving. I pulled off the road, but I didn't do anything about it. All of a sudden, I was developing sleep apnea or wasn't breathing right but sloughed it off until I could hardly breathe at all the last few days. I did ignore the original symptoms. The last day, I woke up and couldn't breathe well and told my kid to get me to the hospital. I was unconscious when I got to the hospital.

A healthy lifestyle reduces the risk of heart failure

Cost-effective awareness, education and support programmes to reduce the risk of heart failure should be at the forefront of public health directives.⁹⁰ Lifestyle interventions could have substantial power to improve world health, because obesity, diabetes, cigarette smoking and high blood pressure all dramatically increase the likelihood of heart failure.⁹⁰ In the USA alone, it has been estimated that a 30% reduction in the proportion of people classed as obese would prevent about 44 000 cases of heart failure every year, with an annual saving of nearly \$500m in healthcare expenditure.¹⁰⁶ Similarly, it has been estimated that a 5% reduction in the number of people with diabetes in the USA would prevent about 30 000 heart failure cases every year.¹⁰⁷ Being severely overweight has been shown to double the risk of heart failure and smoking to increase it by about 50%.³⁸

It is a sad fact that our improved understanding of these risk factors has not prevented an explosion in the numbers of people who are obese or who have diabetes or high blood pressure. Renewed commitment to public education about the importance of healthy diet and weight, regular exercise and avoiding smoking should be a priority for policymakers.

In low-income and middle-income countries, lifestyle-based interventions to prevent heart failure have been

calculated to be more cost-effective than pharmaceutical interventions.¹⁰⁸ The urgent need to address lifestyle risk factors globally is recognized by the United Nations,¹⁰⁹ including in regions such as sub-Saharan Africa, where non-infectious diseases associated with a Western-type lifestyle are not yet the leading causes of death or illness.¹¹⁰ Given the already increasing numbers of patients with heart failure in economically developing regions, governments should be encouraged to combine lifestyle-based preventive measures with their programmes for tackling famine and pestilence.¹¹¹ Regulating the aggressive marketing of high-calorie processed food by larger global corporate businesses, especially to school children and teenagers, could be considered.

The need to apply best practice

Compliance with clinical practice guidelines is often associated with improved outcomes for patients with heart failure. However, in many countries, there is considerable variation in how closely hospitals follow the national guideline recommendations for heart failure. In response, policymakers should champion equity of care for all patients. First, it is important to encourage heart failure education programmes that raise awareness of guidelines amongst all appropriate healthcare professionals. Second, improvements in care should be encouraged through the use of performance measures and incentives appropriate to the locality. Funding is needed for research into evidence-based healthcare performance measures that reflect improved clinical outcomes for patients with heart failure. By driving improvements in care, policymakers can provide a healthcare system that delivers timely access to diagnosis and treatment of heart failure, followed by a seamless transition to long-term management.

Guidelines worldwide agree on the key stages in heart failure care

Clinical practice guidelines aim to help healthcare professionals make evidence-based decisions about the care of individual patients. Guidelines have been published by many governmental and professional bodies across the globe (*Figure 6*).^{58,63,80,112–124} Each of these aims to summarize and evaluate the available evidence for using particular medical interventions for particular patients. Guidelines may differ, though, in what evidence is included, how it is assessed and whether an intervention is considered appropriate for care in the relevant country or region.

The published guidelines therefore make different specific recommendations, but all agree that there are three essential stages of care for patients with heart failure:

- *Diagnosis* should be timely and accurate.
- *Treatment* should be appropriate to each patient and available urgently, if necessary.
- Long-term management should include follow-up, monitoring and support.

Smooth transitions between these stages are also crucial for ensuring that patients with heart failure are managed optimally throughout their healthcare journey. Depending on the severity of their symptoms and the services and facilities available in their communities, patients can follow many different and complex pathways through healthcare systems (*Figure 7*).¹¹ Best practice involves a seamless system of care that embraces both hospital and community.

International consensus recommendations could help to identify the best ways to improve practice in diagnosis, treatment and long-term management. For example, although the published guidelines agree on which diagnostic tools are useful, they disagree on which should be used for all patients with suspected heart failure and in what order.¹²⁵ A consensus recommendation leading to greater clarity about best practice should be encouraged, with endorsements from credible local bodies.

Best practice in heart failure care involves compliance with guidelines

Survival rates increase and readmission rates fall when patients with heart failure are cared for in hospitals that comply with clinical practice guidelines.^{126–128} Nevertheless, considerable variation in the quality of heart failure care and clinical outcomes between different hospitals has been demonstrated in several countries.^{46,129–132} Before discussing ways of encouraging compliance with guidelines, this section presents evidence to show that there is room for improvement at all three stages of heart failure care.

Best practice in diagnosis requires appropriate facilities and knowledge

Diagnosing heart failure can be challenging, even for trained professionals. Not all patients with heart failure have the typical symptoms, and the same symptoms can be experienced by patients who do not have heart failure. Making an accurate diagnosis requires a range of diagnostic tools and information, in conjunction with clinical judgement and expert knowledge (*Figure 8*).

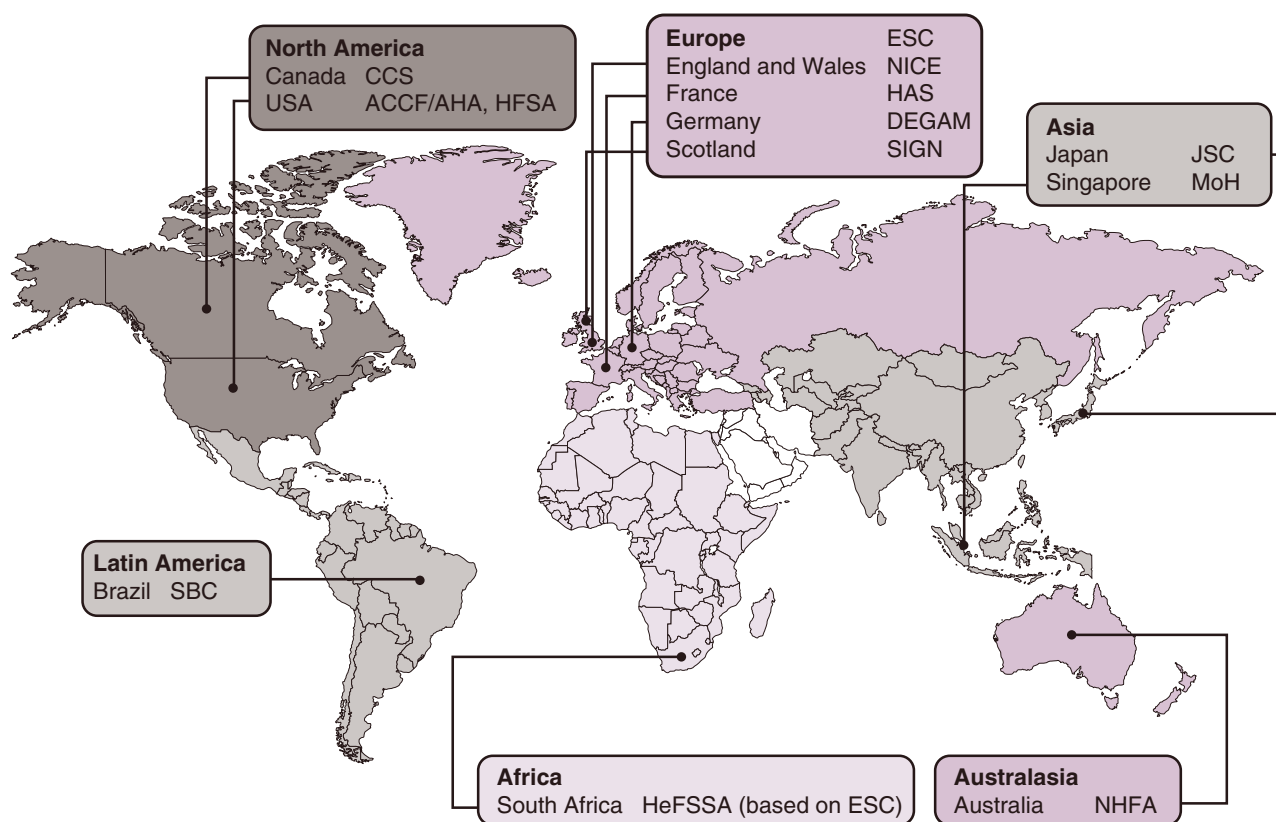


Figure 6 Clinical practice guidelines for heart failure across the globe.^{58,63,80,112–124} ACCF, American College of Cardiology Foundation; AHA, American Heart Association; DEGAM, Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin (German College of General Practitioners and Family Physicians); CCS, Canadian Cardiovascular Society; ESC, European Society of Cardiology; HAS, Haute Autorité de Santé (French National Authority for Health); HeFSSA, Heart Failure Society of South Africa; HFSA, Heart Failure Society of America; JSC, Japanese Circulation Society; MoH, Ministry of Health; NHFA, National Heart Foundation of Australia; NICE, National Institute for Health and Care Excellence; SBC, Sociedade Brasileira de Cardiologia (Brazilian Society of Cardiology); SIGN, Scottish Intercollegiate Guidelines Network.

Not all hospitals and care centres have a full range of diagnostic tools available, especially in resource-poor settings.¹¹¹ Furthermore, even when facilities are available, they are not always used. For example, all published guidelines agree that diagnosis should involve ultrasound imaging to assess heart function, but 10–25% of patients admitted to hospital with a primary diagnosis of heart failure in Europe and the USA do not undergo ultrasonography.¹³³

Many patients are not initially seen by an expert in heart failure because of where they enter the healthcare system. Those with severe symptoms, such as breathlessness at rest, are most often assessed by paramedics or emergency doctors in hospital, whereas those with less obviously life-threatening symptoms are likely to go to their family doctor or an outpatient clinic (Figure 7). Education programmes are needed to raise awareness of clinical practice guidelines amongst healthcare professionals from a wide range of specialties who may be the first to encounter patients with undiagnosed heart failure.

All suitable patients should receive recommended evidence-based therapies

All published guidelines recommend the use of modern evidence-based medications and devices that have been shown to benefit patients with heart failure. For example, there are medications that have been shown to improve survival in patients who have left ventricular systolic dysfunction (LVSD).⁸⁰ LVSD is weak pumping activity in the compartment of the heart that supplies blood to the body; it occurs in about half of patients with heart failure. In patients with heart rhythm problems, and in some patients with LVSD, implanted devices that continuously monitor the activity of the heart and automatically deliver the right type of electrical stimulation can dramatically improve survival.⁸⁰

Despite clear recommendations regarding evidence-based medications, many patients with heart failure do not receive a prescription for potentially beneficial medication, because prescribers do not always comply with the guidelines. In a survey of hospital

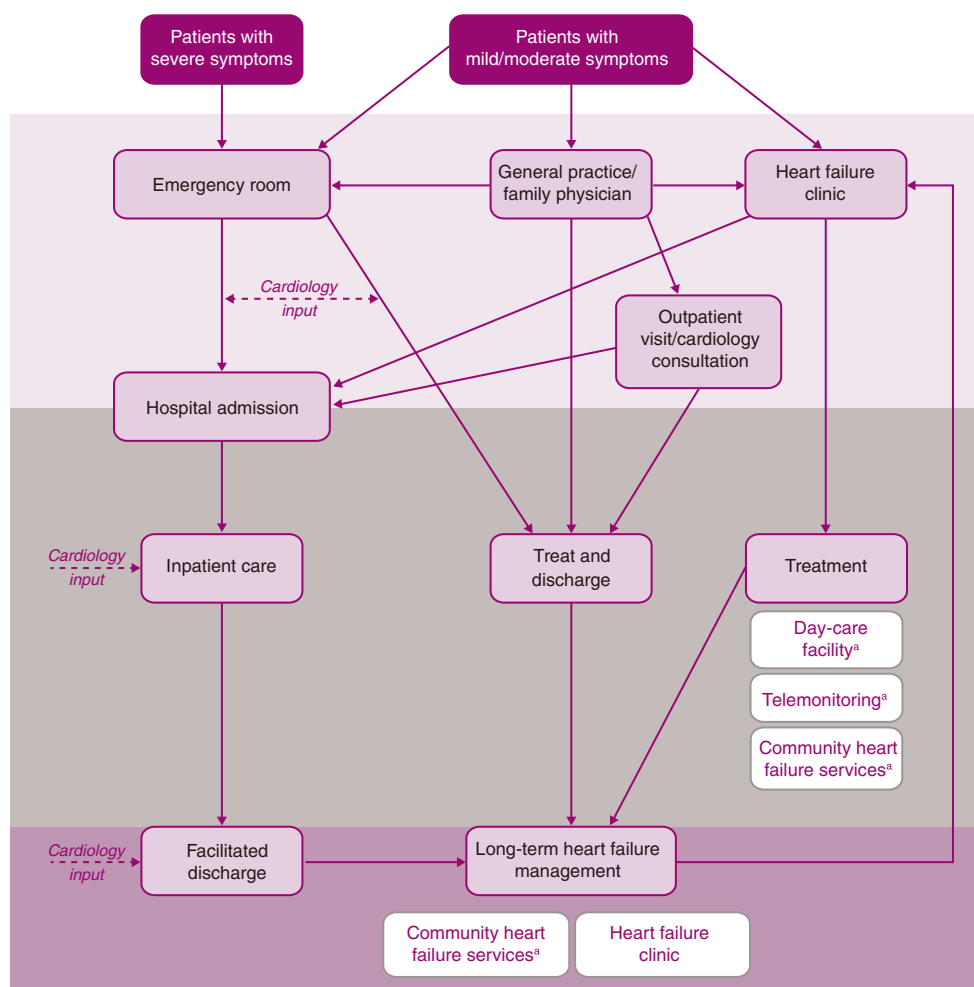


Figure 7 The healthcare journey for patients with heart failure depends on symptoms at presentation and the availability of healthcare services.^{11a} Possible future provision in some regions. Shading indicates the three essential stages of heart failure care: diagnosis in light purple, treatment in grey and long-term management in dark purple. Adapted from Cowie *et al.*, improving care for patients with acute heart failure: before, during and after hospitalization, 2014,¹¹ with permission from Oxford PharmaGenesis™ Ltd.

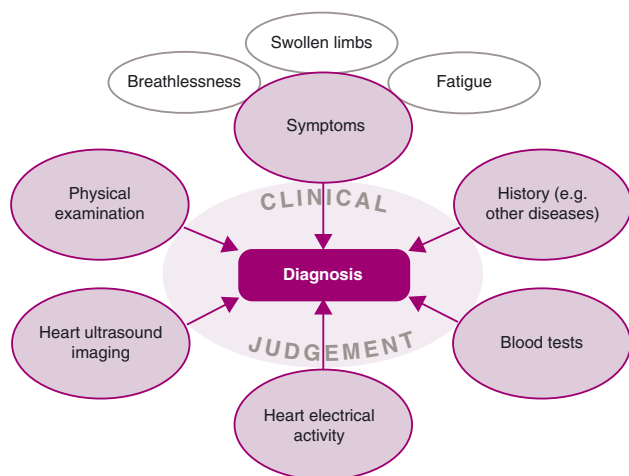


Figure 8 Diagnosing heart failure.

discharges in the USA, more than a quarter of patients with heart failure who should have been given appropriate medication did not receive a prescription.¹²⁷ In Europe, prescription rates for recommended medications are also low, and when they are prescribed, the doses specified are often below those recommended.^{128,134} In Africa, the available information indicates that fewer than half of patients admitted to hospital with heart failure receive preventive medications, and a specific combination of drugs shown to be effective in African Americans is seldom used.⁵ There is scope for policymakers to incentivize improved prescribing of evidence-based medications to suitable patients.

Guideline recommendations for heart failure medications are based on evidence from clinical trials conducted mainly in Europe and the USA.⁸⁰ In other parts of the

world, the underlying causes of heart failure vary, and it is not safe to assume that medications will be equally effective in all patient populations. Further clinical research to investigate the effectiveness of heart failure medications in different groups of patients across the world should be supported.¹³⁵

Long-term patient management is as important as diagnosis and treatment

Diagnosis and initial treatment mark only the start of the healthcare journey for a patient with heart failure. Guidelines recommend a seamless transition to a management programme for long-term care that incorporates follow-up, monitoring and support. However, surveys have reported that most hospitals in the USA had fewer than half of 10 key recommended practices in place and fewer than 3% had all 10 in place.¹³⁶ In Europe, only 7 of 26 countries reported having heart failure management programmes in more than 30% of their hospitals.¹³⁷ Even when in place, such programmes are not always used.¹³⁸ As well as hospitals, community heart failure clinics and specialist nursing services have important roles to play in the long-term management of patients (see Section on Future Directions in Care: Urgent Unmet Needs). Uptake of recommended management practices should be encouraged alongside initiatives to improve diagnosis and treatment of patients with heart failure.

Encouraging compliance: measuring and improving quality of care

Measuring performance and incentivizing improvement are key parts of bringing patient care into line with guidelines. Policymakers need to be aware, however, that not all performance measures currently in use necessarily reflect improved clinical outcomes for patients with heart failure.¹³⁹ As well as recording survival and rehospitalization rates of patients with heart failure, an ideal measure would also capture how efficiently resources are used.¹¹ Performance measures should be tailored to reflect local circumstances, particularly in low-income and middle-income countries where it would be unrealistic to offer every potentially beneficial therapy.¹⁴⁰

Audits, registries and professional initiatives

Audits enable quality of care and outcomes for patients to be compared, so that informed, evidence-based improvements can be made. For example, the UK's annual National Heart Failure Audit collects information about every adult hospitalized with heart failure in England and Wales. Examples of success include a hospital that improved its heart failure inpatient survival rates from 77%

(below average) to above average (94%) by introducing a specialist heart failure team. Another hospital improved survival of inpatients with heart failure (from 87% to 92%) and reduced 30 day readmission rates (from 24% to 15%) by increasing compliance with several guideline recommendations for diagnosis, treatment and long-term management.⁴⁶

Registries are the main source of real-world data on severity, causes, treatment, long-term management and outcomes for patients hospitalized with heart failure. They are less comprehensive than audits, because they do not attempt to include every patient. Although the majority of registries are set up only to collect data, it has been suggested that the feedback provided by the benchmarked reports produced by some registries can lead to improvements in guideline adherence. For example, both the use and the prescription at discharge of drugs that control heart rate increased by about 30% over the 3 years that data were submitted to the first major registry of patients with heart failure (the ADHERE registry in the USA).³⁹

To date, most data collected in registries is from North America or Western Europe; however, the underlying causes of heart failure are different in other parts of the world. Heart failure registries therefore need to be set up in more regions to improve global understanding of how heart failure develops and how it can be prevented. Country-level registries such as HEARTS in Saudi Arabia (the first in an Arab population)²⁴ and CHART-2 in Japan¹⁴¹ have already contributed to the overall picture, and the major multi-national GULF CARE and ASIAN-HF registries have now been established in the Middle East and Asia, respectively. Each of these multi-country databases is set to contain information on approximately 5000 patients, and results of the first analyses from the GULF CARE survey are expected shortly.

Professional initiatives can offer advice and support for improving compliance with guidelines. For example, in the USA, hospitals can join the 'Get with the Guidelines—Heart Failure' programme run by the American Heart Association. Hospitals sign up to use a performance improvement tool that records data and assists with decision-making, and good performers receive public recognition. A survey of hospitals taking part in the programme showed that improved discharge and transitional care processes reduced 30 day readmission rates for patients with heart failure, although other strategies examined in the survey were not associated with improved patient outcomes.¹⁴²

Financial incentives and penalties

Improvements in hospital performance can be encouraged by imposing financial penalties or offering financial rewards (known as 'pay-for-performance'). For example, hospitals in the USA have been obliged since 2001 to

report on performance measures related to heart failure care,¹⁴³ and the Medicare budget of a hospital can be reduced if standards are not met. Many countries impose penalties on hospitals for all readmissions within 30 days of discharge. These penalties are designed to reduce preventable readmissions, but there is concern that they may unfairly punish hospitals with good survival rates and that they may in fact reflect variations in standards of community care after discharge rather than care in a hospital.¹⁴⁴ Incentives for good performance can also be offered outside of hospitals. For example, in the UK, primary care physicians can sign up to the Quality and Outcomes Framework,¹⁴⁵ which includes heart failure indicators, targets and payment points.¹⁴⁶

Care pathways

Compliance can be encouraged through the use of care pathways, which are guideline-based systematic plans for the care of particular patients over a specific time period. Care pathways have been shown to improve survival amongst hospital patients with heart failure, but there is no 'one size fits all' pathway suitable for use in all healthcare organizations.¹⁴⁷ Acute heart failure care 'bundles' are being adopted in Scotland. These short checklists focus on improving diagnosis (via expert review), improving treatment (via evidence-based prescription) and improving long-term management (via referral to a heart failure nurse service); initial results show promise in improving survival rates.¹⁴⁸

What are the implications for policymakers?

Improving the performance of healthcare services by providing incentives and management systems that encourage compliance with guidelines is a powerful tool for policymakers. It is not necessarily safe to assume, however, that patients with heart failure will enjoy longer life and a reduced chance of hospital readmission as a result of even nominally successful performance improvement programmes. Just as medications and devices have to be tested in clinical trials to show that they are effective and safe, it has been argued that management strategies should also be supported by robust scientific evidence before they are mandated by organizations that pay for healthcare.¹⁴⁹

Policymakers should fund and encourage activities that build an evidence base for driving improved care and outcomes for patients with heart failure. There is a pressing need for research into evidence-based healthcare performance measures that reflect improved clinical outcomes for patients with heart failure. In parallel, more widespread data collection via audits or registries should be implemented where country-level initiatives are not already in place.

Future directions in care: urgent unmet needs

There are urgent unmet needs at all stages of heart failure care (Figure 9).

In addition to the policy measures discussed in previous sections, it is crucial to support international collaborative research into the causes, diagnosis, treatment and long-term management of heart failure across the globe. In economically developing nations, there is both a desperate need and a growing market for affordable therapies. Industry should be encouraged to take up this opportunity. Policymakers can also make a substantial difference by encouraging seamless transitions to long-term management. Resources should be provided for the education and practical support of patients with heart failure and their families or other caregivers, empowering them to engage proactively in managing long-term care.

Diagnosis: improved tools for medical decision-making in heart failure

Blood tests exist that are useful for ruling out a diagnosis of heart failure, but they cannot positively identify patients who do have heart failure.⁸⁰ Diagnosis therefore remains complex and relies on the clinical judgement of an experienced healthcare professional (Section on The Need to Apply Best Practice). A new specific and sensitive blood test could make diagnosis of heart failure quicker, easier and more accurate. A suitable blood test could also enable large numbers of people to be screened for early signs of heart failure (Section on Preventing Heart Failure in High-risk Groups). Continued support is warranted for basic scientific research aimed at discovering the molecular signatures in the blood of different types of heart failure.

In the future, statistical methods known as risk stratification could be used to identify patients who need treatment most urgently.¹⁵⁰ Patients have a high risk of dying from heart failure if they are admitted to hospital with very high or very low blood pressure, low blood oxygen levels, poor kidney function or a history of coronary heart disease. However, assessing any of these parameters in isolation is not accurate enough to drive decisions about a patient's care. Risk stratification involves entering several parameters into a statistical model to generate a profile of the treatment and follow-up most suitable for an individual patient. This has the potential to improve efficiency by enabling high-risk patients to be identified for intensive treatment in hospital, whilst others are safely discharged or treated as outpatients.¹⁵⁰ Further development of risk stratification methods to make them suitable for widespread adoption should be supported.

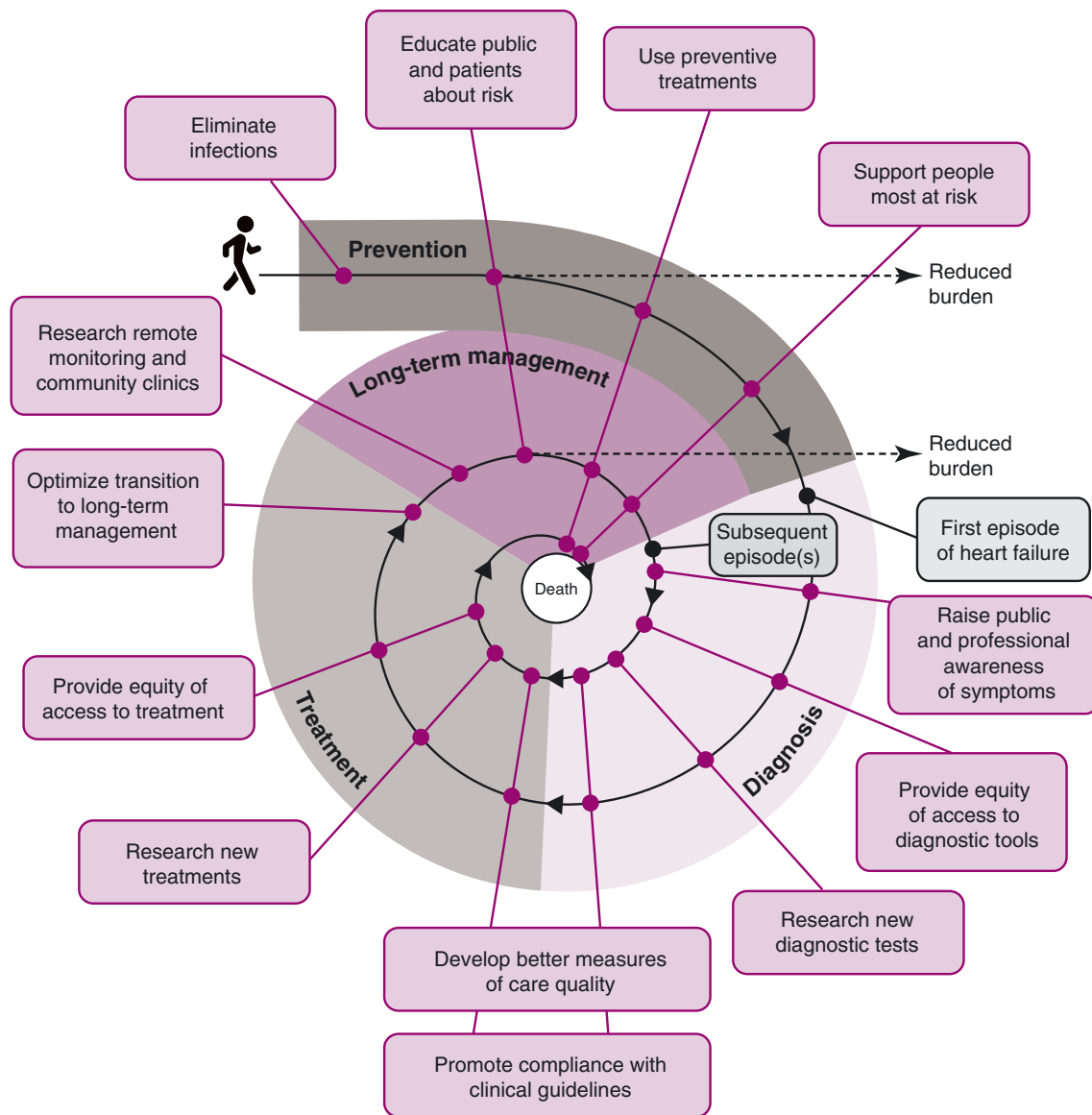


Figure 9 Unmet needs in the prevention, diagnosis, treatment and long-term management of heart failure.

Treatment: new options are needed for many patients with heart failure

Although symptoms can usually be relieved, modern heart failure therapies do not prolong life in about half of all patients. New therapies are needed for patients who have HFPEF (refer to the succeeding texts for a description), acute heart failure, advanced heart failure and certain heart muscle disorders. This highlights the need for policymakers to encourage international collaborative research to improve the understanding of how heart failure develops and how it can be prevented. Additionally, more affordable therapies are required for the huge market in the economically developing world.

Heart failure with preserved ejection fraction

Nearly half of patients with heart failure have a form of disease known as HFPEF. Although symptoms can be controlled, no treatment has yet been shown to improve survival in patients with HFPEF, and death rates have remained unchanged over the past 20 years.¹⁵¹ Unlike most patients, those with HFPEF have no obvious reduction in the proportion of blood pumped out of the chamber of the heart that supplies blood to the body (the ejection fraction),³³ and many of them are elderly women with a history of high blood pressure.³⁴ HFPEF is a general term used to describe patients who probably have a variety of underlying diseases, despite all having similar symptoms. This has made it particularly difficult to find effective therapies to treat HFPEF and highlights the need

for more basic research into its causes.¹⁵¹ Governments and industry should continue to support the testing of existing medications in large-scale clinical trials and the development of new drugs for the treatment of HFPEF.

Acute heart failure

Patients with acute heart failure experience a rapid worsening of symptoms, which often leads to emergency hospitalization. Therapies for acute heart failure have generally changed little over the past two decades, despite ongoing research.¹¹ Options are limited to drugs that relieve breathlessness and reduce fluid build-up by increasing urine production or dilating blood vessels. Drugs that act directly on the heart muscle to increase the force of contractions can have adverse effects and are used only in critically ill patients when the oxygen supply to vital organs is dangerously low. None of these medications does anything to address the underlying cause or causes of heart failure, leaving patients at a high risk of death after discharge from a hospital.¹⁵² Despite the difficulties of conducting clinical research in an emergency setting, governments and industry should continue to support development of new medicines for treating acute heart failure.

Advanced heart failure

As a weakening heart tries to maintain its function, the adaptive remodelling changes in the heart muscle initially maintain heart output but eventually lead to a vicious cycle of worsening heart failure as the heart becomes more and more abnormal. Patients in this debilitating stage of the disease are usually repeatedly hospitalized for recurrent episodes of acute heart failure, any one of which could result in death. For patients with worsening HFPEF, nothing can currently be performed to slow their decline.

In the past, clinical trials have focused on treating heart failure either during a single hospital admission or outside a hospital. The unique features of patients with advanced heart failure mean that clinical trials need to extend beyond a single hospital admission. Encouraging such research would provide evidence to support the use of current and new therapeutic options in this group of extremely vulnerable patients.^{153,154}

Patients who have heart failure and other diseases

Many patients with heart failure also have other medical conditions, such as kidney disease, lung disease or diabetes. These illnesses are particularly common in individuals with heart failure who are elderly or have been hospitalized.¹⁵⁵ Many heart failure medications may not be suitable for patients who also have other medical conditions. This is because the drugs used to treat different diseases may interfere with one another, or a drug suitable for treating one disease may worsen the other.⁸⁰ New

therapies are usually tested in young patients who have only heart failure, but they may not have been shown to work in the real world, where many patients have several overlapping diseases.¹³³ This underscores the need to support basic clinical research into the underlying diseases that lead to heart failure so that new therapies can be tested in specific groups of patients most likely to benefit.

Heart failure during and after pregnancy

Worldwide, an increasing number of women are recognized as having heart problems when they become pregnant. Symptoms of heart failure can appear during the last month of pregnancy or within a few weeks of giving birth. There is a need to build an evidence base to support recommendations about how to prevent and treat this complex condition, especially in economically developing countries.¹⁵⁶

Overlooked heart muscle disorders

Some patients in Africa have specific types of irreversible heart muscle disease that are not known to occur elsewhere and are very poorly understood.¹⁵⁷ Heart muscle disorders that are uncommon in the rest of the world have also been identified in Japan.⁵⁷ Furthermore, there is no evidence base for treating heart failure caused by Chagas disease, and the causes of Davies disease are still not understood. The scope of heart failure research therefore needs to extend beyond the causes of disease that are common in Western countries.

Affordable heart failure therapies

The costs of caring for an individual patient with heart failure have increased substantially over the past three decades as new therapies have been proved to be effective. However, it is unrealistic for healthcare systems in all parts of the world to offer every potentially beneficial evidence-based therapy.¹⁴⁰ As well as ensuring that resources are used efficiently and cost-effectively, policymakers should fund research into more affordable therapies and medical devices for the huge market in the economically developing world.

Long-term management: innovation could save lives and money

In most patients, heart failure is a long-term disease that involves one or more episodes of hospitalization. New strategies for long-term monitoring and management of patients outside a hospital may improve quality of life and survival rates while reducing the number and frequency of readmissions.

New approaches to long-term management outside a hospital

Remote monitoring could help to identify life-threatening deterioration that requires patients to return to a hospital rapidly. It could also allow individuals to leave hospital earlier than at present, without placing them at extra risk.¹⁵⁸ Technologies being tested include telemonitoring devices (some of which are surgically implanted) and telephone support (either automated or person to person).¹⁵⁹ Despite the promise of these approaches, it is not yet clear whether they improve survival.¹⁶⁰ Policymakers should encourage more research before recommending telemonitoring.

Care by specialist clinics or teams after discharge from hospital has been shown to increase survival rates amongst patients and to deliver cost savings by reducing hospital readmissions.^{161,162} Community clinics specializing in heart failure can provide patients with access to teams of healthcare professionals and up-to-date diagnostic facilities and therapies outside hospital. Specialist nurses are key members of such teams and are instrumental in delivering long-term care.¹⁶³ It is not the location but the quality of care that produces results, and healthcare providers should be aware that new community clinics are most likely to benefit patients when they complement existing hospital services.

Palliative care services aim to improve quality of life for patients and their families through a holistic approach that addresses psychological, social and spiritual needs. This type of approach can play an important role in facilitating emotionally difficult discussions between patients and healthcare professionals. However, at present only a minority of patients with heart failure are referred to palliative care services.¹⁶⁴ Incorporating palliative care into management pathways could aid decision-making by improving communication between healthcare professionals, patients and their families.¹¹

The importance of encouraging patient self-care

Any programme aimed at improving long-term management should recognize that patients with heart failure have a key role to play in their own care. Self-care comprises maintenance, monitoring and management (Figure 10). Maintenance involves taking medication as prescribed, exercising regularly and eating a healthy diet. Monitoring involves keeping watch on symptoms and weight (which can provide a warning sign of increasing fluid accumulation). Management involves responding to changes in symptoms, by adjusting doses of certain medications if they have been prescribed for 'use as needed' (e.g. drugs that increase urine production to reduce fluid accumulation), or by seeking medical attention if symptoms worsen.¹⁶⁵

A worldwide survey has revealed the need to improve patient self-care. Most patients reported taking their medication as prescribed but few reported monitoring their weight or taking exercise regularly.¹⁶⁶ Education programmes are a priority but need to be designed carefully because patients with greater knowledge of heart failure have been reported to be more likely to delay seeking treatment.¹⁶⁷ This may reflect false optimism and a lack of understanding that controlling the symptoms of heart failure does not slow the progression of the disease. The education medium also needs to be considered carefully. Short video clips, text messages and social media could be used to deliver simple but accurate messages. With 6 billion people now estimated to own a mobile phone,¹⁶⁸ technology may provide an important way of reaching the remote and socioeconomically disadvantaged.

Educating people about how to support a partner, family member or friend with heart failure is also an important part of promoting self-care. Patients are more likely to engage in beneficial self-care behaviours if they have someone to help them than if they are socially isolated. This emphasizes the need to improve community support for socioeconomically disadvantaged patients and

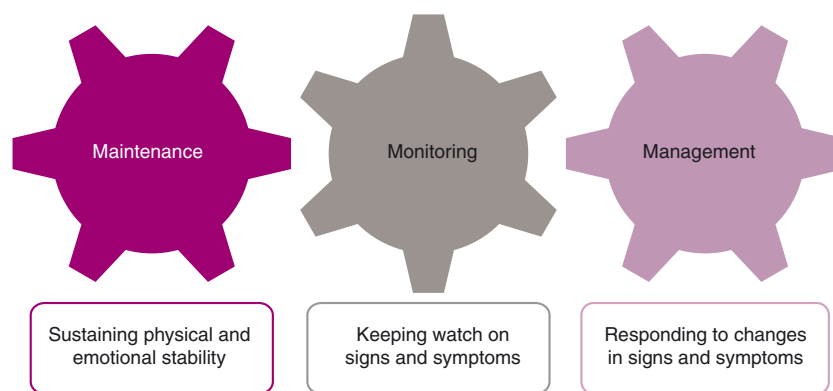


Figure 10 The three components of patient self-care.¹⁶⁵ Reproduced from Cowie *et al.*, improving care for patients with acute heart failure: before, during and after hospitalization, 2014,¹¹ with permission from Oxford PharmaGenesis™ Ltd.

those who live alone.¹⁶⁹ Policymakers should provide resources for the education and support of individuals with heart failure and their caregivers, empowering them to engage proactively in managing long-term care.

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Conflict of interest

None declared

References

- Lloyd-Jones DM, Larson MG, Leip EP *et al.* Lifetime risk for developing congestive heart failure: the Framingham Heart Study. *Circulation* 2002;**106**:3068–72.
- Rodriguez KL, Appelt CJ, Switzer GE *et al.* 'They diagnosed bad heart': a qualitative exploration of patients' knowledge about and experiences with heart failure. *Heart Lung* 2008;**37**:257–65.
- Wasywich CA, Gamble GD, Whalley GA *et al.* Understanding changing patterns of survival and hospitalization for heart failure over two decades in New Zealand: utility of 'days alive and out of hospital' from epidemiological data. *Eur J Heart Fail* 2010;**12**:462–8.
- Blair JE, Huffman M, Shah SJ. Heart failure in North America. *Curr Cardiol Rev* 2013;**9**:128–46.
- Damasceno A, Mayosi BM, Sani M *et al.* The causes, treatment, and outcome of acute heart failure in 1006 Africans from 9 countries. *Arch Intern Med* 2012;**172**:1386–94.
- Robertson J, McElduff P, Pearson SA *et al.* The health services burden of heart failure: an analysis using linked population health data-sets. *BMC Health Serv Res* 2012;**12**:103. doi:10.1186/1472-6963-12-103.
- National University Heart Centre Singapore. Multi-centre study to examine new approach to treat patients with heart failure, 2014. Available from: www.nuhs.edu.sg/wbn/slot/news/ah01/a6a39c8fb_u4641.pdf (Accessed 28 February 2014).
- Al-Shamiri MQ. Heart failure in the Middle East. *Curr Cardiol Rev* 2013;**9**:174–8.
- Guo Y, Lip GY, Banerjee A. Heart failure in East Asia. *Curr Cardiol Rev* 2013;**9**:112–22.
- Overbeek JA, Penning-van-Beest FJA, Herings RMC *et al.* Recent in-hospital mortality trends among patients with heart failure in the Netherlands. *European Society of Cardiology*, 27–31 August 2011, Paris, France. Available from: <http://spo.escardio.org/eslides/view.aspx?eventid=48&fp=P1788> (Accessed 28 February 2014).
- Cowie MR, Anker SD, Cleland J *et al.* Improving care for patients with acute heart failure: before, during and after hospitalization. Oxford, UK: Oxford PharmaGenesis™; 2014. Available from: <http://www.oxfordhealthpolicyforum.org/AHFReport> (Accessed 16 April 2014).
- Siswanto BB, Radi B, Kalim H *et al.* Acute decompensated heart failure in 5 hospitals in Indonesia. *CVD Prev Control* 2010;**5**:35–8.
- Bocchi EA, Arias A, Verdejo H *et al.* The reality of heart failure in Latin America. *J Am Coll Cardiol* 2013;**62**:949–58.
- Ministério da Saúde (Ministry of Health). DATASUS—Brazil. Health information (TABNET) [Informações de Saúde (TABNET)], Available from: <http://tabnet.datasus.gov.br/> (Accessed 2 April 2014).
- Adhere Acute Decompensated Heart Failure National Registry. The ADHERE® international benchmark report: final report, January 1, 2006–March 31, 2009; 2009.
- Barretto AC, Del Carlo CH, Cardoso JN *et al.* Hospital readmissions and death from heart failure—rates still alarming. *Arq Bras Cardiol* 2008;**91**:335–41.
- Moleerergpoom W, Hengrussamee K, Piyayotai D *et al.* Predictors of in-hospital mortality in acute decompensated heart failure (Thai ADHERE). *J Med Assoc Thai* 2013;**96**:157–64.
- Sato N, Kajimoto K, Keida T *et al.* Clinical features and outcome in hospitalized heart failure in Japan (from the ATTEND registry). *Circ J* 2013;**77**:944–51.
- Hyun-Jai C, Sang Eun L, Hae-Young L *et al.* Lessons from acute decompensated heart failure patients in Korea (KorAHF) registry. 7th Asia Pacific Congress of Heart Failure and the Annual Scientific Meeting of Indonesian Heart Association. Bali, Indonesia. *Eur J Heart Fail* 2014;**16**(Suppl 1):1–41.
- Baselm OA, Bashin IA. Study of clinical epidemiology of heart failure cases admitted to Al-Gamhouria Teaching Hospital, Aden, Yemen. 7th Asia Pacific Congress of Heart Failure and the Annual Scientific Meeting of Indonesian Heart Association. Bali, Indonesia. *In: Eur J Heart Fail* 2014;**16**(Suppl 1):1–41.
- Cleland JG, Swedberg K, Follath F *et al.* The EuroHeart failure survey programme—a survey on the quality of care among patients with heart failure in Europe. Part 1: patient characteristics and diagnosis. *Eur Heart J* 2003;**24**:442–63.
- Maggioni AP, Dahlstrom U, Filippatos G *et al.* EURObservational Research Programme: regional differences and 1-year follow-up results of the Heart Failure Pilot Survey (ESC-HF Pilot). *Eur J Heart Fail* 2013;**15**:808–17.
- Nieminen MS, Brutsaert D, Dickstein K *et al.* EuroHeart Failure Survey II (EHFS II): a survey on hospitalized acute heart failure patients: description of population. *Eur Heart J* 2006;**27**:2725–36.
- AlHabib KF, Elasar AA, Alfaleh H *et al.* Clinical features, management, and short- and long-term outcomes of patients with acute decompensated heart failure: phase I results of the HEARTS database. *Eur J Heart Fail* 2014; doi: 10.1002/ehf.57.
- Bueno H, Ross JS, Wang Y *et al.* Trends in length of stay and short-term outcomes among Medicare patients hospitalized for heart failure, 1993–2006. *JAMA* 2010;**303**:2141–7.
- Chen J, Dharmarajan K, Wang Y *et al.* National trends in heart failure hospital stay rates, 2001 to 2009. *J Am Coll Cardiol* 2013;**61**:1078–88.
- Curtis LH, Greiner MA, Hammill BG *et al.* Early and long-term outcomes of heart failure in elderly persons, 2001–2005. *Arch Intern Med* 2008;**168**:2481–8.
- Schaufelberger M, Swedberg K, Koster M *et al.* Decreasing one-year mortality and hospitalization rates for heart failure in Sweden; data from the Swedish Hospital Discharge Registry 1988 to 2000. *Eur Heart J* 2004;**25**:300–7.
- Jhund PS, Macintyre K, Simpson CR *et al.* Long-term trends in first hospitalization for heart failure and subsequent survival between 1986 and 2003: a population study of 5.1 million people. *Circulation* 2009;**119**:515–23.
- Joffe SW, Webster K, McManus DD *et al.* Improved survival after heart failure: a community-based perspective. *J Am Heart Assoc* 2013;**2**:e000053. doi: 10.1161/JAHA.113.000053.

31. Roger VL, Weston SA, Redfield MM *et al.* Trends in heart failure incidence and survival in a community-based population. *JAMA* 2004;**292**:344–50.
32. Tavazzi L, Senni M, Metra M *et al.* Multicenter prospective observational study on acute and chronic heart failure: one-year follow-up results of IN-HF (Italian Network on Heart Failure) outcome registry. *Circ Heart Fail* 2013;**6**:473–81.
33. Beattie JM. Death by oxymoron? The enigma of heart failure with preserved ejection fraction. *Curr Opin Support Palliat Care* 2014;**8**:1–3.
34. Rigolli M, Whalley GA. Heart failure with preserved ejection fraction. *J Geriatr Cardiol* 2013;**10**:369–76.
35. Brenner H, Bouvier AM, Foschi R *et al.* Progress in colorectal cancer survival in Europe from the late 1980s to the early 21st century: the EURO-CARE study. *Int J Cancer* 2012;**131**:1649–58.
36. Coleman MP, Forman D, Bryant H *et al.* Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995–2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. *Lancet* 2011;**377**:127–38.
37. Siegel R, DeSantis C, Virgo K *et al.* Cancer treatment and survivorship statistics, 2012. *CA Cancer J Clin* 2012;**62**:220–41.
38. Bui AL, Horwich TB, Fonarow GC. Epidemiology and risk profile of heart failure. *Nat Rev Cardiol* 2011;**8**:30–41.
39. Ambrosy AP, Fonarow GC, Butler J *et al.* The global health and economic burden of hospitalizations for heart failure: lessons learned from HFF registries. *J Am Coll Cardiol* 2014;**63**:1123–33.
40. International Agency for Research on Cancer. Estimated cancer incidence, mortality and prevalence worldwide in 2012 (GLOBOCAN 2012) Lyon; 2012. Available from: http://globocan.iarc.fr/Pages/fact_sheets_population.aspx (Accessed 28 February 2014).
41. World Health Organization. Global health observatory: HIV/AIDS Geneva; 2014. Available from: <http://www.who.int/gho/hiv/en/> (Accessed 28 February 2014).
42. Okura Y, Ramadan MM, Ohno Y *et al.* Impending epidemic: future projection of heart failure in Japan to the year 2055. *Circ J* 2008;**72**:489–91.
43. Australian Institute of Health and Welfare. Cardiovascular disease: Australian facts 2011. Canberra, Australia: Australian Institute of Health and Welfare, 2011. Available from: <http://www.aihw.gov.au/publication-detail/?id=10737418510> (Accessed 28 February 2014).
44. Galinier M, Bouvet B, Rocchi M *et al.* What is the burden for hospitalizations in France in 2010? *European Society for Cardiology*, 25–29 August 2012, Munich, Germany. Available from: <http://spo.escardio.org/eslides/view.aspx?eventid=54&fp=P982> (Accessed 28 February 2014).
45. Heidenreich PA, Albert NM, Allen LA *et al.* Forecasting the impact of heart failure in the United States: a policy statement from the American Heart Association. *Circ Heart Fail* 2013;**6**:606–19.
46. Cleland J, Dargie H, Hardman S *et al.* National heart failure audit April 2012–March 2013. London: National Institute for Cardiovascular Outcomes Research; 2013. Available from: <http://www.hqip.org.uk/assets/NCAPOP-Library/NCAPOP-2013-14/UCL-HF-2013-Report-2013-ONLINE-v2.pdf> (Accessed 19 March 2014).
47. BREATHE Investigators. BREATHE registry—I Brazilian registry of heart failure. *Arq Bras Cardiol* 2014; In press.
48. AlHabib KF, Elasar AA, AlBackr H *et al.* Design and preliminary results of the heart function assessment registry trial in Saudi Arabia (HEARTS) in patients with acute and chronic heart failure. *Eur J Heart Fail* 2011;**13**:1178–84.
49. Damasceno A, Cotter G, Dzudie A *et al.* Heart failure in sub-Saharan Africa: time for action. *J Am Coll Cardiol* 2007;**50**:1688–93.
50. Go AS, Mozaffarian D, Roger VL *et al.* Heart disease and stroke statistics—2014 update: a report from the American Heart Association. *Circulation* 2014;**129**:e28–e292.
51. Townsend N, Wickramasinghe K, Bhatnagar P *et al.* Coronary Heart Disease Statistics (2012 Edition). London: British Heart Foundation; 2012. Available from: <http://www.bhf.org.uk/publications/view-publication.aspx?ps=1002097> (Accessed 21 October 2013).
52. Ceia F, Fonseca C, Mota T *et al.* Prevalence of chronic heart failure in South-western Europe: the EPICA study. *Eur J Heart Fail* 2002;**4**:531–9.
53. Mosterd A, Hoes AW. Clinical epidemiology of heart failure. *Heart* 2007;**93**:1137–46.
54. Shiba N, Shimokawa H. Chronic heart failure in Japan: implications of the CHART studies. *Vasc Health Risk Manag* 2008;**4**:103–13.
55. Sakata Y, Shimokawa H. Epidemiology of heart failure in Asia. *Circ J* 2013;**77**:2209–17.
56. Huffman MD, Prabhakaran D. Heart failure: epidemiology and prevention in India. *Natl Med J India* 2010;**23**:283–8.
57. Sasayama S. Heart disease in Asia. *Circulation* 2008;**118**:2669–71.
58. Bocchi EA, Braga FG, Ferreira SM *et al.* [III Brazilian guidelines on chronic heart failure]. *Arq Bras Cardiol* 2009;**93**:3–70.
59. Vijayaraghavan G, Sivasankaran S. Tropical endomyocardial fibrosis in India: a vanishing disease! *Indian J Med Res* 2012;**136**:729–38.
60. Atherton JJ, Hayward CS, Wan Ahmad WA *et al.* Patient characteristics from a regional multicenter database of acute decompensated heart failure in Asia Pacific (ADHERE International-Asia Pacific). *J Card Fail* 2012;**18**:82–8.
61. Bocchi EA. Heart failure in South America. *Curr Cardiol Rev* 2013;**9**:147–56.
62. Thienemann F, Sliwa K, Rockstroh JK. HIV and the heart: the impact of antiretroviral therapy: a global perspective. *Eur Heart J* 2013;**34**:3538–46.
63. Bocchi EA, Marcondes-Braga FG, Bacal F *et al.* Updating of the Brazilian guideline for chronic heart failure—2012. *Arq Bras Cardiol* 2012;**98**:1–33.
64. Organisation for Economic Co-operation and Development. Health care utilisation—Hospital discharges by diagnostic categories—All causes Available from: <http://stats.oecd.org/> (Accessed 28 February 2014).
65. Organisation for Economic Co-operation and Development. General statistics—country statistical profiles—total population, Available from: <http://stats.oecd.org/> (Accessed 28 February 2014).
66. Organisation for Economic Co-operation and Development. Health care quality indicators—primary care—congestive heart failure hospital admissions, Available from: <http://stats.oecd.org/> (Accessed 28 February 2014).
67. Stewart S, Wilkinson D, Hansen C *et al.* Predominance of heart failure in the Heart of Soweto Study cohort: emerging challenges for urban African communities. *Circulation* 2008;**118**:2360–7.
68. Khand AU, Shaw M, Gemmel I *et al.* Do discharge codes underestimate hospitalisation due to heart failure? Validation study of hospital discharge coding for heart failure. *Eur J Heart Fail* 2005;**7**:792–7.
69. Lloyd-Jones D, Adams RJ, Brown TM *et al.* Heart disease and stroke statistics—2010 update: a report from the American Heart Association. *Circulation* 2010;**121**:e46–e215.
70. Neumann T, Biermann J, Erbel R *et al.* Heart failure: the commonest reason for hospital admission in Germany: medical and economic perspectives. *Dtsch Arztebl Int* 2009;**106**:269–75.
71. World Health Organisation. Spending on health: a global overview (fact sheet N°319): World Health Organisation; 2012. Available from: <http://www.who.int/mediacentre/factsheets/fs319/en/> (Accessed 6 May 2014).
72. World Health Organisation. General statistical procedures used to construct WHO health expenditure database. World Health Organisation; 2012. Available from: <http://apps.who.int/nha/database/ResourcesPage.aspx> (Accessed 6 May 2014).
73. United States Environmental Protection Agency. Drinking water infrastructure needs survey and assessment: fifth report to congress United States Environmental Protection Agency; 2013. Available from: http://water.epa.gov/grants_funding/dwsrf/upload/epa816r13006.pdf (Accessed 19 March 2014).
74. Clark AL. What is heart failure? In McDonagh TA, Gardner RS, Clark AL, Dargie H, eds. *Oxford Textbook of Heart Failure*. Oxford: Oxford University Press, 2011.
75. Thomas JR, Clark AM. Women with heart failure are at high psychosocial risk: a systematic review of how sex and gender influence heart failure self-

- care. *Cardiol Res Pract* 2011;918973. doi: 10.4061/2011/918973.
76. Jeon YH, Kraus SG, Jowsey T *et al.* The experience of living with chronic heart failure: a narrative review of qualitative studies. *BMC Health Serv Res* 2010;10:77. doi: 10.1186/1472-6963-10-77.
 77. Stromberg A. The situation of caregivers in heart failure and their role in improving patient outcomes. *Curr Heart Fail Rep* 2013;10:270–5.
 78. Murray SA, Kendall M, Boyd K *et al.* Exploring the spiritual needs of people dying of lung cancer or heart failure: a prospective qualitative interview study of patients and their carers. *Palliat Med* 2004;18:39–45.
 79. Luttik ML, Blaauwbroek A, Dijkster A *et al.* Living with heart failure: partner perspectives. *J Cardiovasc Nurs* 2007;22:131–7.
 80. McMurray JJ, Adamopoulos S, Anker SD *et al.* ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: the task force for the diagnosis and treatment of acute and chronic heart failure 2012 of the European society of cardiology. Developed in collaboration with the heart failure association (HFA) of the ESC. *Eur J Heart Fail* 2012;14:803–69.
 81. Baker DW. Prevention of heart failure. *J Card Fail* 2002;8:333–46.
 82. Endoh M. Heart failure: management and prevention of heart failure based on current understanding of pathophysiological mechanisms. In Wakabayashi I, Groschner K, eds. *Interdisciplinary concepts in cardiovascular health*. Springer, 2014: 41–67. Available from: http://link.springer.com/chapter/10.1007/978-3-319-01074-8_3 (Accessed 25 February 2014).
 83. Ewertz M, Jensen AB. Late effects of breast cancer treatment and potentials for rehabilitation. *Acta Oncol* 2011;50:187–93.
 84. Senkus E, Jassem J. Cardiovascular effects of systemic cancer treatment. *Cancer Treat Rev* 2011;37:300–11.
 85. Lenihan DJ, Esteve FJ. Multidisciplinary strategy for managing cardiovascular risks when treating patients with early breast cancer. *Oncologist* 2008;13: 1224–34.
 86. Hidron A, Vogenthaler N, Santos-Preciado JI *et al.* Cardiac involvement with parasitic infections. *Clin Microbiol Rev* 2010;23:324–49.
 87. Pillai HS, Ganapathi S. Heart failure in South Asia. *Curr Cardiol Rev* 2013;9:102–11.
 88. Bloomfield GS, Barasa FA, Doll JA *et al.* Heart failure in sub-Saharan Africa. *Curr Cardiol Rev* 2013;9:157–73.
 89. Andrade JP, Marin-Neto JA, Paola AA *et al.* I Latin American guidelines for the diagnosis and treatment of Chagas cardiomyopathy. *Arq Bras Cardiol* 2011;97:1–48.
 90. Schocken DD, Benjamin EJ, Fonarow GC *et al.* Prevention of heart failure: a scientific statement from the American Heart Association councils on epidemiology and prevention, clinical cardiology, cardiovascular nursing, and high blood pressure research; quality of care and outcomes research interdisciplinary working group; and functional genomics and translational biology interdisciplinary working group. *Circulation* 2008;117:2544–65.
 91. Jugdutt BI. Prevention of heart failure in the elderly: when, where and how to begin? *Heart Fail Rev* 2012;17:531–44.
 92. Rodriguez-Artalejo F, Banegas Banegas JR, Guallar-Castillon P. Epidemiology of heart failure. *Rev Esp Cardiol* 2004;57:163–70.
 93. Hall MJ, Levant S, DeFrances CJ. Hospitalization for congestive heart failure: United States, 2000–2010. *NCHS Data Brief* 2012:1–8.
 94. Nieminen MS, Harjola VP, Hochadel M *et al.* Gender related differences in patients presenting with acute heart failure. Results from EuroHeart Failure Survey II. *Eur J Heart Fail* 2008;10:140–8.
 95. Sakata Y, Miyata S, Nochioka K *et al.* Gender differences in clinical characteristics, treatment and long-term outcome in patients with stage C/D heart failure in Japan. Report from the CHART-2 study. *Circ J* 2014;78:428–35.
 96. Hawkins NM, Jhund PS, McMurray JJ *et al.* Heart failure and socioeconomic status: accumulating evidence of inequality. *Eur J Heart Fail* 2012;14:138–46.
 97. Calvillo-King L, Arnold D, Eubank KJ *et al.* Impact of social factors on risk of readmission or mortality in pneumonia and heart failure: systematic review. *J Gen Intern Med* 2013;28:269–82.
 98. McSweeney J, Pettey C, Lefler LL *et al.* Disparities in heart failure and other cardiovascular diseases among women. *Women's Health (Lond Engl)* 2012;8: 473–85.
 99. Peacock WFT, Fonarow GC, Emerman CL *et al.* Impact of early initiation of intravenous therapy for acute decompensated heart failure on outcomes in ADHERE. *Cardiology* 2007;107:44–51.
 100. Peacock WF, Emerman C, Costanzo MR *et al.* Early vasoactive drugs improve heart failure outcomes. *Congest Heart Fail* 2009;15:256–64.
 101. Maisel AS, Peacock WF, McMullin N *et al.* Timing of immunoreactive B-type natriuretic peptide levels and treatment delay in acute decompensated heart failure: an ADHERE (Acute Decompensated Heart Failure National Registry) analysis. *J Am Coll Cardiol* 2008;52:534–40.
 102. Gravely-Witte S, Jurgens CY, Tamim H *et al.* Length of delay in seeking medical care by patients with heart failure symptoms and the role of symptom-related factors: a narrative review. *Eur J Heart Fail* 2010;12:1122–9.
 103. Darling C, Saczynski JS, McManus DD *et al.* Delayed hospital presentation in acute decompensated heart failure: clinical and patient reported factors. *Heart Lung* 2013;42:281–6.
 104. Remme WJ, McMurray JJ, Rauch B *et al.* Public awareness of heart failure in Europe: first results from SHAPE. *Eur Heart J* 2005;26:2413–21.
 105. Johansson P, Nieuwenhuis M, Lesman-Leegte I *et al.* Depression and the delay between symptom onset and hospitalization in heart failure patients. *Eur J Heart Fail* 2011;13:214–19.
 106. Loehr LR, Rosamond WD, Poole C *et al.* The potentially modifiable burden of incident heart failure due to obesity: the atherosclerosis risk in communities study. *Am J Epidemiol* 2010;172:781–9.
 107. Avery CL, Loehr LR, Baggett C *et al.* The population burden of heart failure attributable to modifiable risk factors: the ARIC (Atherosclerosis Risk in Communities) study. *J Am Coll Cardiol* 2012;60:1640–6.
 108. Shroufi A, Chowdhury R, Anchala R *et al.* Cost effective interventions for the prevention of cardiovascular disease in low and middle income countries: a systematic review. *BMC Public Health* 2013;13:285. doi:10.1186/1471-2458-13-285.
 109. Beaglehole R, Bonita R, Horton R *et al.* Priority actions for the non-communicable disease crisis. *Lancet* 2011;377:1438–47.
 110. Mensah GA, Mayosi BM. The 2011 United Nations high-level meeting on non-communicable diseases: the Africa agenda calls for a 5-by-5 approach. *S Afr Med J* 2013;103:77–9.
 111. Sliwa K, Mayosi BM. Recent advances in the epidemiology, pathogenesis and prognosis of acute heart failure and cardiomyopathy in Africa. *Heart* 2013;99:1317–22.
 112. Mpe MT, Klug EQ, Silwa KS *et al.* Heart Failure Society of South Africa (HeFSSA) perspective on the European Society of Cardiology (ESC) 2012 chronic heart failure guideline. *S Afr Med J* 2013;103:660–7.
 113. Japanese Circulation Society. Guidelines for treatment of acute heart failure (JCS 2011). *Circ J* 2013;77:2157–201.
 114. Okuda S, Yano M. Guidelines for treatment of chronic heart failure (JCS 2010). *Nihon Rinsho* 2011;69(Suppl 9):595–604.
 115. Ministry of Health. Clinical practice guidelines—heart failure. Ministry of Health, Singapore; 2004. Available from: http://www.moh.gov.sg/content/dam/moh_web/HPP/Doctors/cpg_medical/withdrawn/cpg_Heart%20Failure-Aug%202004.pdf (Accessed 25 February 2014).
 116. National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand (Chronic Heart Failure Guidelines Expert Writing Panel). Guidelines for the prevention, detection and management of chronic heart failure in Australia—updated October 2011; 2011. Available from: http://www.heartfoundation.org.au/SiteCollectionDocuments/Chronic_Heart_Failure_Guidelines_2011.pdf (Accessed 4 December 2013).
 117. National Institute for Health and Care Excellence. Chronic heart failure: management of chronic heart failure in adults in primary and secondary care. NICE clinical guideline 108; 2010.

- Available from: guidance.nice.org.uk/cg108/ (Accessed 21 October 2013).
118. Scottish Intercollegiate Guidelines Network. Management of chronic heart failure: a national clinical guideline. Edinburgh, UK: SIGN; 2007. Available from: <http://sign.ac.uk/pdf/sign95.pdf> (Accessed 26 February 2014).
 119. Deutsche Gesellschaft für Allgemeinmedizin und Familienmedizin. Herzinsuffizienz: DEGAM Leitlinie Nr. 9. Düsseldorf: Omikron; 2006. Available from: http://www.degam.de/files/Inhalte/Leitlinien-Inhalte/Dokumente/DEGAM-S3-Leitlinien/LL-09_Langfassung_Herzinsuffizienz_1_E002B_Index.pdf (Accessed 26 February 2014).
 120. Haute Autorité de Santé. Insuffisance cardiaque à fraction d'éjection préservée HAS; 2012. Available from: http://www.has-sante.fr/portail/upload/docs/application/pdf/liste_ald_insuf_cardiaque_diastolique.pdf (Accessed 24 February 2014).
 121. Haute Autorité de Santé. Insuffisance cardiaque systolique. HAS; 2012. Available from: http://www.has-sante.fr/portail/upload/docs/application/pdf/liste_ald_insuf_card_systolique.pdf (Accessed 24 February 2014).
 122. Yancy CW, Jessup M, Bozkurt B *et al.* 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation* 2013;**128**: e240–e327.
 123. Lindenfeld J, Albert NM, Boehmer JP *et al.* HFSA 2010 comprehensive heart failure practice guideline. *J Card Fail* 2010;**16**: e1–194.
 124. McKelvie RS, Moe GW, Ezekowitz JA *et al.* The 2012 Canadian Cardiovascular Society heart failure management guidelines update: focus on acute and chronic heart failure. *Can J Cardiol* 2013;**29**: 168–81.
 125. National Guideline Clearinghouse. Guideline synthesis: diagnosis and evaluation of chronic heart failure (CHF). Rockville (MD): Agency for Healthcare Research and Quality; 2012. Available from: <http://www.guideline.gov/syntheses/synthesis.aspx?id=36850> (Accessed 25 February 2014).
 126. Komajda M, Lapuerta P, Hermans N *et al.* Adherence to guidelines is a predictor of outcome in chronic heart failure: the MAHLER survey. *Eur Heart J* 2005;**26**: 1653–9.
 127. Fonarow GC, Abraham WT, Albert NM *et al.* Association between performance measures and clinical outcomes for patients hospitalized with heart failure. *JAMA* 2007;**297**: 61–70.
 128. Frankenstein L, Rempis A, Fluegel A *et al.* The association between long-term longitudinal trends in guideline adherence and mortality in relation to age and sex. *Eur J Heart Fail* 2010;**12**: 574–80.
 129. Williams SC, Schmaltz SP, Morton DJ *et al.* Quality of care in US hospitals as reflected by standardized measures, 2002–2004. *N Engl J Med* 2005;**353**: 255–64.
 130. Lee DS, Johansen H, Gong Y *et al.* Regional outcomes of heart failure in Canada. *Can J Cardiol* 2004;**20**: 599–607.
 131. Stewart S, Demers C, Murdoch DR *et al.* Substantial between-hospital variation in outcome following first emergency admission for heart failure. *Eur Heart J* 2002;**23**: 650–7.
 132. Rohde LE, Clausell N, Ribeiro JP *et al.* Health outcomes in decompensated congestive heart failure: a comparison of tertiary hospitals in Brazil and United States. *Int J Cardiol* 2005;**102**: 71–7.
 133. Atherton JJ. Chronic heart failure: we are fighting the battle, but are we winning the war? *Scientifica* 2012;**2012**: 16. doi: 10.6064/2012/279731.
 134. Komajda M, Follath F, Swedberg K *et al.* The EuroHeart failure survey programme—a survey on the quality of care among patients with heart failure in Europe. Part 2: treatment. *Eur Heart J* 2003;**24**: 464–74.
 135. Johnson JA. Ethnic differences in cardiovascular drug response: potential contribution of pharmacogenetics. *Circulation* 2008;**118**: 1383–93.
 136. Bradley EH, Curry L, Horwitz LI *et al.* Contemporary evidence about hospital strategies for reducing 30-day readmissions: a national study. *J Am Coll Cardiol* 2012;**60**: 607–14.
 137. Jaarsma T, Stromberg A, De Geest S *et al.* Heart failure management programmes in Europe. *Eur J Cardiovasc Nurs* 2006;**5**: 197–205.
 138. Gravely S, Ginsburg L, Stewart DE *et al.* Referral and use of heart failure clinics: what factors are related to use? *Can J Cardiol* 2012;**28**: 483–9.
 139. Heidenreich PA, Hernandez AF, Yancy CW *et al.* Get with the guidelines program participation, process of care, and outcome for Medicare patients hospitalized with heart failure. *Circ Cardiovasc Qual Outcomes* 2012;**5**: 37–43.
 140. Rohde LE, Bertoldi EG, Goldraich L *et al.* Cost-effectiveness of heart failure therapies. *Nat Rev Cardiol* 2013;**10**: 338–54.
 141. Shiba N, Nochioka K, Miura M *et al.* Trend of westernization of etiology and clinical characteristics of heart failure patients in Japan—first report from the CHART-2 study. *Circ J* 2011;**75**: 823–33.
 142. Kociol RD, Peterson ED, Hammill BG *et al.* National survey of hospital strategies to reduce heart failure readmissions: findings from the Get with the guidelines—heart failure registry. *Circ Heart Fail* 2012;**5**: 680–7.
 143. The Joint Commission. Heart failure; 2014. Available from: http://www.jointcommission.org/heart_failure/ (Accessed 21 March 2014).
 144. Joynt KE, Jha AK. Thirty-day readmissions—truth and consequences. *N Engl J Med* 2012;**366**: 1366–9.
 145. National Institute for Health and Care Excellence. About the quality and outcomes framework (QOF); 2014. Available from: <http://www.nice.org.uk/aboutnice/qof/qof.jsp> (Accessed 21 March 2014).
 146. Health and Social Care Information Centre. Indicators for quality improvement; 2014. Available from: <https://mqi.ic.nhs.uk/Search.aspx?query=heart%25failure> (Accessed 21 March 2014).
 147. Kul S, Barbieri A, Milan E *et al.* Effects of care pathways on the in-hospital treatment of heart failure: a systematic review. *BMC Cardiovasc Disord* 2012;**12**: 81. doi: 10.1186/1471-2261-12-81.
 148. Mondoa C, Cappie J, Kennedy F *et al.* This bundle saves lives! Outcomes from a heart failure bundle in acute care. NHSScotland Event; 2013, Glasgow, UK. Available from: http://www.nhsscotlandevent.com/posters/Posters-2013/Effective/EF20_-_Catherine_Labinjoh.pdf (Accessed 21 March 2014).
 149. Butler J, Fonarow GC, Gheorghiade M. Need for increased awareness and evidence-based therapies for patients hospitalized for heart failure. *JAMA* 2013;**310**: 2035–6.
 150. Lee DS, Ezekowitz JA. Risk stratification in acute heart failure. *Can J Cardiol* 2014;**30**: 312–19.
 151. Burkhoff D. Mortality in heart failure with preserved ejection fraction: an unacceptably high rate. *Eur Heart J* 2012;**33**: 1718–20.
 152. Pollesello P. Drug discovery and development for acute heart failure drugs: are expectations too high? *Int J Cardiol* 2014;**172**: 11–13.
 153. Metra M, Ponikowski P, Dickstein K *et al.* Advanced chronic heart failure: a position statement from the Study Group on Advanced Heart Failure of the European Society of Cardiology. *Eur J Heart Fail* 2007;**9**: 684–94.
 154. Gheorghiade M, Vaduganathan M, Fonarow GC *et al.* Rehospitalization for heart failure: problems and perspectives. *J Am Coll Cardiol* 2013;**61**: 391–403.
 155. Braunstein JB, Anderson GF, Gerstenblith G *et al.* Noncardiac comorbidity increases preventable hospitalizations and mortality among Medicare beneficiaries with chronic heart failure. *J Am Coll Cardiol* 2003;**42**: 1226–33.
 156. Sliwa K, Bohm M. Incidence and prevalence of pregnancy-related heart disease. *Cardiovasc Res* 2014;**101**: 554–60.
 157. Sliwa K, Mocumbi AO. Forgotten cardiovascular diseases in Africa. *Clin Res Cardiol* 2010;**99**: 65–74.
 158. Palaniswamy C, Mishkin A, Aronow WS *et al.* Remote patient monitoring in chronic heart failure. *Cardiol Rev* 2013;**21**: 141–50.
 159. Pandor A, Gomersall T, Stevens JW *et al.* Remote monitoring after recent hospital discharge in patients with heart failure: a systematic

- review and network meta-analysis. *Heart* 2013;**99**:1717–26.
160. Anker SD, Koehler F, Abraham WT. Telemedicine and remote management of patients with heart failure. *Lancet* 2011;**378**:731–9.
 161. Thomas R, Huntley A, Mann M *et al.* Specialist clinics for reducing emergency admissions in patients with heart failure: a systematic review and meta-analysis of randomised controlled trials. *Heart* 2013;**99**:233–9.
 162. McAlister FA, Stewart S, Ferrua S *et al.* Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials. *J Am Coll Cardiol* 2004;**44**:810–9.
 163. Stamp KD, Machado MA, Allen NA. Transitional care programs improve outcomes for heart failure patients: an integrative review. *J Cardiovasc Nurs* 2014;**29**:140–54.
 164. Jaarsma T, Beattie JM, Ryder M *et al.* Palliative care in heart failure: a position statement from the palliative care workshop of the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 2009;**11**:433–43.
 165. Riegel B, Moser DK, Anker SD *et al.* State of the science: promoting self-care in persons with heart failure: a scientific statement from the American Heart Association. *Circulation* 2009;**120**:1141–63.
 166. Jaarsma T, Stromberg A, Ben Gal T *et al.* Comparison of self-care behaviors of heart failure patients in 15 countries worldwide. *Patient Educ Couns* 2013;**92**:114–20.
 167. Nieuwenhuis MM, Jaarsma T, van Veldhuisen DJ *et al.* Factors associated with patient delay in seeking care after worsening symptoms in heart failure patients. *J Card Fail* 2011;**17**:657–63.
 168. United Nations. Deputy UN chief calls for urgent action to tackle global sanitation crisis; 2013. Available from: <http://www.un.org/apps/news/story.asp?NewsID=44452#.U0LFEvldUmM> (Accessed 7 April 2014).
 169. Gallagher R, Luttik ML, Jaarsma T. Social support and self-care in heart failure. *J Cardiovasc Nurs* 2011;**26**:439–45.