

The Heart Failure Policy Network

European Parliament Own Initiative Report

Submission by the Heart Failure Policy Network

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The Heart Failure Policy Network's main recommendations for the European Parliament's Own Initiative Report on NCDs

The impact of heart failure (HF) on society is a fundamental concern for the EU. The syndrome is the leading cause of hospital admissions in people over the age of 65, and of all preventable hospital admissions in the EU. HF symptoms may limit a person's ability to work, travel and socialise, leading to a significant reduction in quality of life.

An effective response to HF will support the EU's commitments to the United Nations' Sustainable Development Goals and the World Health Organization's Non-Communicable Disease Global Monitoring Framework. Adopting specific actions on HF in EU and national policy will help to improve the health of people as they age. It will ensure that older people – a group disproportionately affected by HF – can continue to contribute to society from an economic, social and cultural perspective.

Multidisciplinary and integrated HF care should be considered in all strategies to build sustainable healthcare systems, reduce the burden on informal carers and counter the potential impact of ageing and workforce productivity losses.

Across Europe, we drastically under invest in cardiovascular disease relative to its strategic importance and other diseases areas, a pattern that is well established in other high-income countries as well. This must be carefully examined, assessed and brought to high level political attention.

Key actions for the European Parliament:

- 1. Support a dedicated intergovernmental session on HF at a suitable meeting of EU officials, national governments and their ministries of health.
- 2. Guide European institutions and stakeholders to a coherent, aligned response to HF by advocating to the Commission and Council for an EU-level Action Plan on cardiovascular disease, similar to the Beating Cancer Plan.
- 3. Lead a review of historical European Commission funding and involvement in health, comparing allocations to different disease areas, relative to burden, societal need and strategic relevance (e.g. admissions, mortality, role in health inequalities, opportunity cost, future projections) to ensure appropriate evidence-based allocation of public funds.
- 4. Showcase best-practice models of multidisciplinary and integrated HF care to support Member States in address long-term care challenges, including digital solutions to common challenges in HF care via telemedicine and telecare.



1 Heart failure impacts people's health, wellbeing and productivity as they age

HF changes lives forever – and millions of Europeans live with the syndrome

HF is a common condition, the prevalence of which is likely to grow. The syndrome occurs when the heart becomes too weak or stiff to pump enough blood to meet the body's needs.¹ More than 15 million people in Europe are estimated to be living with the syndrome, and people aged 65 and over account for more than 80% of HF cases.²⁻⁴ The number of people living with HF will continue to rise,^{3 5} as the population aged 65 and older is projected to grow by almost 50% in the next 30 years.⁶

The impact of HF is likely to exacerbate challenges such as loneliness and social isolation among vulnerable and excluded groups. HF symptoms may limit a person's ability to work, travel and socialise, leading to a significant reduction in quality of life.⁷ This may affect the person's mental health – in fact, one in in three people living with HF has experienced depression.⁸ ⁹The impact of HF on mental health extends to the person's informal carers, often partners or family members. They may themselves experience social isolation, loneliness and limitations in daily life.¹⁰

The prevalence and burden of HF have been deeply exacerbated by the COVID-19 pandemic.^{11 12} The pandemic has led to a sharp reduction in the routine availability of essential HF and cardiology services across Europe,^{13 14} which may have inadvertently caused avoidable hospitalisations and mortality among people living with HF. The backlog in HF care from the crisis period is stubborn and concerns grow that COVID-19 infection is linked to longer-term cardiovascular complications,¹⁵ suggesting that pre-pandemic projections of HF patients in future will need to rise

The impact of HF on our population is a fundamental concern for healthcare systems and workforce productivity

HF has a serious economic impact – it is a leading cause of hospitalisation and mortality in Europe. HF is the most common cause of preventable hospital admissions in all age groups, and of all hospital admissions in people over the age of 65.^{5 16} Within this older age group, HF is associated with lengthy hospital admissions, high readmission rates and increased risk of death.^{1 17 18} HF management and outcomes among older people are further complicated by issues such as frailty, cognitive impairment, other health conditions (comorbidities) and limited social support.^{1 17} HF is also a significant contributor to health inequalities – in some countries, the number of hospitalisations is seven times higher than in others.

As the population ages, HF hospitalisations will stretch our healthcare systems if we do not invest in prevention measures. In 2015, there were more than 1.7 million hospital admissions for HF in the EU, with a mean duration of 9.5 days.¹⁹ Hospitalisations and inpatient care account for up to 87% of HF costs.²⁰ In 2012, national healthcare costs for HF were estimated to have surpassed USD \$1 billion (approximately €781 million) each in France, Germany, Italy, the Netherlands and



Spain.²¹ These costs are likely to grow due to population ageing and the subsequent increase in the prevalence of HF.²²

HF generates significant costs to society and workforce productivity. One in four people with heart failure may not return to work in the year following a hospital stay.²³ In 2012, productivity losses and government support schemes for people living with HF cost an estimated €632 million in Spain, €943 million in Italy, €1.2 billion in France and €1.6 billion in Germany.²¹ These costs are compounded by demands on partners or other family members to provide care – in Spain, 37% of people living with HF require informal care, with an estimated annual cost of €12,870 per person.²⁴ Many older women are unpaid carers for their partners and families, which in turn affects their participation in the workforce and the adequacy of their pensions.²⁵



2 The right package of care can reduce the impact of heart failure on people, healthcare systems and society

There is much we can do to improve outcomes in HF and create a more sustainable system of prevention, care and support.

Critical areas for improvement include:

a) Diagnosis of HF

Early diagnosis of HF supports timely access to treatment and improves outcomes. Across Europe, HF diagnosis is hindered by poor recognition of symptoms and limited access to diagnostic tests.¹¹ Healthcare professionals may find it difficult to recognise symptoms such as breathlessness and extreme fatigue as signs of HF, particularly in older people with several comorbidities.²⁶ As a result, most people with HF are diagnosed in hospital, even though one in three had presented with symptoms to primary care in previous years.²⁷ Clinical guidelines recommend natriuretic peptide testing as a low-cost method to rule out HF,²⁸ saving unnecessary referrals to cardiology services and echocardiography, which may have long waiting times. Across Europe, however, there is limited reimbursement of this test, hindering its use.¹¹ Delays in diagnosed with HF in hospital are almost twice as likely to die as those diagnosed in the community.³⁰

Case study: implementation of a digital care HF pathway in Scotland

In Scotland, NHS Great Glasgow and Clyde developed a one-stop digital service that spans the entire HF pathway and incorporates innovative technologies.³¹

They created a dashboard that combines information from GP referrals, electronic health records and diagnostic data to facilitate the comprehensive management of people with HF. The service also uses new echo technology, such as the point-of-care handheld transthoracic echocardiogram, which can produce images to diagnose HFrEF and analyse them with AI.^{32 33}

b) Management of HF

Optimal HF treatment can reduce hospitalisations by one third.^{34 35} HF guidelines recommend that everyone with HF with reduced ejection fraction should receive the four cornerstone medications as soon as possible following diagnosis to improve outcomes.^{36 34 35} However, not all of the necessary medications are reimbursed across European countries.^{36 34 35}



c) Multidisciplinary and integrated models of HF care

Multidisciplinary and integrated models of HF care support people throughout their care journey and across healthcare settings. These models offer the type of long-term care and support needed to keep the ageing population healthy, independent and active. Best-practice care models have demonstrated real benefit, including better patient outcomes and a reduction in healthcare costs and the number and length of hospitalisations.¹¹ Mainstream practices often lag far behind those in centres of excellence, hindering access to best-practice care and contributing to inequality between Member States.³

HF management programmes should be led by specialists, such as cardiologists or HF nurses, with consistent communication between primary and hospital care teams.³ Support from HF specialists is essential for older people living with HF, but the development of this workforce is being undermined by poor funding and lack of formal accreditation. Many European countries face a shortfall in key healthcare professionals required for HF care, including specialists and primary care professionals.³⁷⁻⁴¹ This results in long waiting lists for people with HF before they can receive specialist care, with some people waiting for up to two years.⁴²

In addition, few countries recognise the HF specialist nurse role through formal accreditation.¹¹ HF specialist nurses are uniquely positioned to facilitate high quality HF care and can alleviate the burden on physicians by taking over medical tasks.⁴² HF specialist nurses provide much-needed care and support in the community for older people living with HF, who may not be able to attend hospital appointments due to frailty or other complex care needs.⁴³ Ongoing support in the community is particularly important for older people living with HF, who may not be able to perform essential self-care tasks.⁴⁴

Case study: integrated multidisciplinary management in Barcelona

The integrated HF management programme in the Barcelona Litoral Mar Integrated Health Area reduced hospital admissions and improved survival rates among older people living with HF (mean age of 78 years).^{43 45}

People admitted to hospital are seen by a cardiologist, who establishes or reviews the cause of HF and an appropriate treatment plan.⁴³ HF specialist nurses provide therapeutic education and assess the patient's cognitive, social, functional and frailty-related skills and needs.⁴⁵

Members of the hospital care team meet with primary care nurses on a weekly basis to coordinate care and discuss people being discharged from hospital.⁴⁵ All patients have a follow-up appointment with their HF care team within seven days of hospital discharge, with an option for home visits if needed. After that, people living with HF have access to home-based follow-up with primary care nurses or a combination of home- and hospital-based follow-up led by HF specialist nurses.⁴⁵



The Barcelona Litoral Mar Integrated Health Area also has outpatient HF units (day hospitals), primary care emergency centres and social care resources (e.g. palliative care units) to support seamless care transitions and reduce the risk of readmission following hospitalisation for HF.⁴⁵

d) IT infrastructure

Few EU Member States have the IT infrastructure needed to support the delivery of best-practice HF care. The integration of IT systems is essential to support older people living with HF, who may have more complex care needs and may see other specialists for their comorbidities.⁴⁶ Some European countries are in more advanced stages of developing collaborative IT systems, including electronic health records.¹¹ Using artificial intelligence algorithms with electronic health records can outperform current risk scores in the prediction of cardiovascular events.⁴⁷ These tools can facilitate the assessment of HF risk and support clinical decision-making.^{48 49} Still, overall, there is a need to invest in IT platforms that collect key HF parameters, share information, and enable collaboration and multidisciplinary working.

e) Telemedicine models of HF care

The use of healthcare technology can support the autonomy and independence of older people and informal carers. Use of smartphones, mobile apps, wearables and implantable devices enables remote monitoring of HF signs and symptoms and supports communication between the person living with HF and their care team.⁵⁰ This can improve access to care and reduce HF-related hospital admissions and mortality.⁵⁰ People living with HF should receive essential equipment, such as tablets and blood pressure monitors, to ensure the success of telemedicine models.⁵¹ Some older people and their carers may require additional training and support to use healthcare technologies, which should be provided by a member of their HF care team

The COVID-19 pandemic has acted as a major catalyst for the rapid uptake of telemedicine models.⁵² Many non-urgent outpatient services switched to remote and virtual consultations during the pandemic.⁵³ Most notably in the outpatient setting, virtual consultations were rapidly recommended over traditional care models.⁵⁴⁻⁵⁷ Telemedicine can lower heart failure care costs by 35%.⁵⁸ Post-pandemic, there may be an even stronger political will for the reimbursement of these care models.

Case study: a nurse-led telemedicine model in Denmark

The TeleCare North Heart Failure Trial, which was conducted in the North Denmark Region in 2016–17, examined the benefits of a nurse-led telemedicine intervention compared with routine care.⁵⁹ The mean age of participants was 70 years.

The programme provided education on HF to participants, who received the equipment necessary for self-monitoring at home, including devices to measure pulse rate and blood pressure, and a tablet for communication with their care team.⁵⁸ ⁶⁰ Self-care was supervised by hospital staff, who responded to any signs of HF exacerbation, ensuring rapid adjustment of medication in order to avoid hospital admission. The intervention aimed to facilitate transparent and patient-centred



collaboration between people living with HF, their families and healthcare professionals across care settings. The overall goal was to support self-monitoring and care adherence.

The programme achieved a 35% reduction in annual healthcare costs per person living with HF, mainly due to a decrease in hospitalisations.⁵⁸

3 What the EU can do to support Member States in heart failure

While each Member State faces its own unique challenges in supporting healthy and active ageing, several crucial actions are needed in most, if not all, countries to reduce the impact of HF on older people as well as on our healthcare systems, economies and societies.

We urge the European Parliament to:

- 1. Seek a dedicated European intergovernmental session on HF at a suitable meeting of EU officials, national governments and their ministries of health, aligned with the Commission and Presidencies of the Council of Ministers. The EU has a clear and urgent remit to raise awareness of HF and its relevance to an ageing population, as evidenced by the fact that few European countries have a dedicated strategy on HF.¹¹ Many policymakers are unaware of HF and its role in driving healthcare demands among older people. Fewer than 15% of national policymakers recognise HF as the leading cause of preventable hospitalisations.⁶¹ These low levels of awareness translate into low prioritisation of HF in long-term national healthcare plans and policies. As HF is a shared international concern, and expertise globally distributed, we recommend that consideration be made for invitations and collegiate action with non-Member States, (for example, aligned G20 nations)
- 2. Guide European institutions and stakeholders to a coherent, aligned response to CVD and HF by advocating for an EU-level Action Plan on cardiovascular disease. This plan should include a dedicated focus on HF, as justified by the comparative disease burden. Key stakeholders in HF, including patient organisations and professional societies, should be consulted in the developmental stages. The plan should encourage Member States to implement essential components of HF diagnosis and care. such as better use of modern diagnostic pathways, clinical delegation, accreditation of excellence and specialism, improved data sharing and multi-disciplinary working, and general adaption of prevention and care in the community setting. An EU-level Action Plan on cardiovascular disease is essential to meet the targets outlined in the United Nations' Sustainable Development Goals and the World Health Organization's Non-Communicable Disease Global Monitoring Framework.
- 3. Support Member States to address long-term care challenges by sharing best-practice models of multidisciplinary and integrated HF care. There



are numerous innovative solutions and best-practice care models in use by centres of excellence across Europe, which would benefit from wider implementation. Such models have demonstrated real benefit, including a reduction in the number and length of hospitalisations. This may be particularly important for Member States such as Lithuania and Slovakia where rates of HF hospitalisations are comparatively higher than others. The Commission should nominate best-practice models of HF care and present them to Member States with financial backing to help implement their widespread rollout.

- 4. Deploy the Parliament's scrutiny function to the allocation of EU funding in health, to better direct the balance of investment to strategic need in clinical research, patient involvement, and capacity building in Member States. Evidence from other industrialised countries shows that research into CVD is grossly and disproportionately lower than other disease, compared to the burden of ill health.
- 5. Identify and recommend to the commission priority areas for expanded research funding and implementation support in CVD. This should include funding from the EU4Health Programme, European Structural and Investment Funds and Horizon Europe. Evidence is clear that close consideration should be given to greater EU support to Member States in their efforts to expand, train and accredit the HF specialist workforce. Specialist support in the community is essential to protect the autonomy, independence and rights of older people who may have more complex care needs. This would reduce the dependency on informal carers and enhance both parties' participation in society. EU funding could increase investment in tools to support multidisciplinary communication across care settings, such as interoperable IT systems. Funding can support Member States to implement multidisciplinary and integrated HF care through the development of care protocols and clinical networks.
- 6. Explore digital solutions to common challenges in HF care as part of the Commission's work in telemedicine and telecare. These approaches can help support continued care of older people in remote areas or specialised institutes, such as nursing homes, and can reduce costs. Telemedicine should be part of integrated HF management programmes, tailored to the person's needs and preferences. These innovative tools must be accessible to the older people who need them, which will require investment in improving digital literacy for some. The COVID-19 pandemic has underscored the value of telemedicine in HF care. Widespread adoption of such models can help to alleviate unnecessary visits to care settings. Telemedicine offers promise to expand outpatient services but will require adequate preparation and lead-in times to ensure patient safety and effectiveness.



References

1. Ponikowski P, Voors AA, Anker SD, *et al.* 2016. 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur J Heart Fail* 18(8): 891-975

2. Dickstein K, Cohen-Solal A, Filippatos G, *et al.* 2008. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2008. *Eur J Heart Fail* 10(10): 933-89

3. Heart Failure Policy Network. 2018. *The* handbook of multidisciplinary and integrated heart failure care. London: HFPN

4. Ponikowski P, Anker SD, AlHabib KF, *et al.* 2014. Heart failure: preventing disease and death worldwide. *ESC Heart Fail* 1(1): 4-25

5. Cowie MR, Anker SD, Cleland JGF, *et al.* 2014. Improving care for patients with acute heart failure: before, during and after hospitalization. *ESC Heart Fail* 1(2): 110-45

6. United Nations Department of Economic and Social Affairs. 2019. *World population ageing 2019: Highlights*. New York: UN

7. Comín-Colet J, Anguita M, Formiga F, *et al.* 2016. Health-related Quality of Life of Patients With Chronic Systolic Heart Failure in Spain: Results of the VIDA-IC Study. *Rev Esp Cardiol (Engl Ed)* 69(3): 256-71

8. Macchia A, Monte S, Pellegrini F, *et al.* 2008. Depression worsens outcomes in elderly patients with heart failure: An analysis of 48,117 patients in a community setting. *Eur J Heart Fail* 10(7): 714-21

9. Lainscak M, Blue L, Clark AL, *et al.* 2011. Self-care management of heart failure: practical recommendations from the Patient Care Committee of the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 13(2): 115-26

10. Strömberg A. 2013. The Situation of Caregivers in Heart Failure and Their Role in Improving Patient Outcomes. *Curr Heart Fail Rep* 10(3): 270-75

11. Heart Failure Policy Network. 2020. *Heart failure policy and practice in Europe.* London: HFPN

12. Yonas E, Alwi I, Pranata R, *et al.* 2020. Effect of heart failure on the outcome of COVID-19 — A meta analysis and systematic review. *Am J Emerg Med*: https://doi.org/10.1016/j.ajem.2020.07.009:

13. Farmakis D, Mehra MR, Parissis J*, et al.* 2020. Heart failure in the course of a pandemic. *Eur J Heart Fail*: 10.1002/ejhf.1929:

14. Salzano A, D'Assante R, Stagnaro FM, *et al.* 2020. Heart failure management during the COVID-19 outbreak in Italy: a telemedicine experience from a heart failure university tertiary referral centre. *Eur J Heart Fail* 22(6): 1048-50

15. Long B, Brady WJ, Koyfman A, *et al.* 2020. Cardiovascular complications in COVID-19. *Am J Emerg Med* 38(7): 1504-07

16. WHO Regional Office for Europe. 2016. *Ambulatory care sensitive conditions in Portugal.* Copenhagen: WHO

17. Díez-Villanueva P, Alfonso F. 2016. Heart failure in the elderly. *Journal of geriatric cardiology : JGC* 13(2): 115-17

18. Vidán MT, Sánchez E, Fernández-Avilés F, et al. 2014. FRAIL-HF, a Study to Evaluate the Clinical Complexity of Heart Failure in Nondependent Older Patients: Rationale, Methods and Baseline Characteristics. *Clin Cardiol* 37(12): 725-32

19. Organisation for Economic Co-operation and Development, European Union. 2018. *Health at a Glance: Europe 2018: State of Health in the EU.* Paris: OECD Publishing

20. Giles L, Freeman C, Field P, *et al.* 2020. Humanistic burden and economic impact of heart failure - a systematic review of the literature. *F1000Research* 8: 859

21. Cook C, Cole G, Asaria P, *et al.* 2014. The annual global economic burden of heart failure. *Int J Cardiol* 171(3): 368-76

22. Gouveia M, Ascenção R, Fiorentino F, *et al.* 2020. Current costs of heart failure in Portugal and expected increases due to population aging. *Rev Port Cardiol* 39(1): 3-11



23. Rørth R, Wong C, Kragholm K, *et al.* 2016. Return to the Workforce After First Hospitalization for Heart Failure: A Danish Nationwide Cohort Study. *Circulation* 134(14): 999-1009

24. Delgado JF, Oliva J, Llano M, *et al.* 2014. Health care and nonhealth care costs in the treatment of patients with symptomatic chronic heart failure in Spain. *Rev Esp Cardiol (Engl Ed)* 67(8): 643-50

25. European Commission. 2021. *Green Paper on Ageing: Fostering solidarity and responsibility between generations.* Brussels: EC

26. Taylor CJ, Hobbs FDR, Marshall T, *et al.* 2017. From breathless to failure: symptom onset and diagnostic meaning in patients with heart failure—a qualitative study. *BMJ Open* 7(3): e013648

27. Bottle A, Kim D, Aylin P, *et al.* 2018. Routes to diagnosis of heart failure: observational study using linked data in England. *Heart* 104(7): 600-05

28. Ponikowski P, Voors A, Anker S, *et al.* 2016. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). *Eur Heart J* 37(27): 2129-200

29. Pumping Marvellous. 2020. *Heart failure: The hidden costs of late diagnosis.* West Sussex: Roche Diagnostics Limited

30. Lawson CA, Zaccardi F, Squire I, *et al.* 2019. 20-year trends in cause-specific heart failure outcomes by sex, socioeconomic status, and place of diagnosis: a population-based study. *The Lancet Public Health* 4(8): e406-e20

31. NHS. Transforming heart failure diagnosis pathway to improve the patient journey. Available from:

https://transform.england.nhs.uk/key-toolsand-info/digital-playbooks/cardiology-digitalplaybook/transforming-heart-failure-diagnosispathway-to-improve-the-patient-journey/ [Accessed 04/08/22]

32. ClinicalTrials.gov. Optimising a digital diagnostic pathway for heart failure in the community (OPERA) [online]. Available from:

https://clinicaltrials.gov/ct2/show/NCT0472420 0 [Accessed 22/07/22]

33. West of Scotland Innovation Hub. Early diagnostic heart failure (Opera) [online]. Available from:

https://www.woshealthinnovation.scot/exempla r-projects/early-diagnostic-heart-failure-opera/ [Accessed 22/07/22]

34. Mebazaa A, Davison B, Chioncel O, *et al.* 2022. Safety, tolerability and efficacy of uptitration of guideline-directed medical therapies for acute heart failure (STRONG-HF): a multinational, open-label, randomised, trial. *The Lancet* 400(10367): 1938-52

35. Feltner C, Jones C, Cene C, *et al.* 2014. Transitional care interventions to prevent readmissions for persons with heart failure: a systematic review and meta-analysis. *Ann Intern Med* 160(11): 774-84

36. The Heart Failure Policy Network. 2022. *From guidelines to action: opportunities for change following the 2021 ESC guidelines.* London: HFPN

37. Clark A. 2020. Interview with Marissa Mes and Ed Harding at The Health Policy Partnership (Secretariat for Heart Failure Policy Network) [videoconference]. 15/09/20

38. Pumping Marvellous. 2018. *Heart failure nurse audit.* Preston: The Pumping Marvellous Foundation

39. Uchmanowicz I. 2020. Interview with Stephanie Whelan at The Health Policy Partnership (Secretariat for Heart Failure Policy Network) [Videoconference]. 11/09/2020

40. Hetman P. 2020. Interview with Stephanie Whelan at The Health Policy Partnership (Secretariat for Heart Failure Policy Network) [Videoconference]. 11/09/2020

41. Lund Kristensen S. 2020. Interview with Sara C Marques and Stephanie Whelan at The Health Policy Partnership (Secretariat for Heart Failure Policy Network) [Videoconference]. 10/09/2020

42. Steiner B, Neumann A, Pelz Y, *et al.* 2023. Challenges in heart failure care in four European countries: a comparative study. *Eur J Public Health* 33(3): 448-54



43. Comín-Colet J, Verdu-Rotellar J, Vela E, *et al.* 2014. Efficacy of an integrated hospitalprimary care program for heart failure: a population-based analysis of 56,742 patients. *Rev Esp Cardiol (Engl Ed)* 67(4): 283-93

44. Vidán MT, Martín Sánchez F-J, Sánchez E, *et al.* 2019. Most elderly patients hospitalized for heart failure lack the abilities needed to perform the tasks required for self-care: impact on outcomes. *Eur J Heart Fail* 21(11): 1434-42

45. Comín-Colet J, Enjuanes C, Lupón J, *et al.* 2016. Transitions of care between acute and chronic heart failure: critical steps in the design of a multidisciplinary care model for the prevention of rehospitalization. *Rev Esp Cardiol (Engl Ed)* 69(10): 951-61

46. Stafford M, Steventon A, Thorlby R, *et al.* 2018. *Briefing: Understanding the health care needs of people with multiple health conditions.* London: The Health Foundation

47. Weng SF, Reps J, Kai J, *et al.* 2017. Can machine-learning improve cardiovascular risk prediction using routine clinical data? *PLoS One* 12(4): e0174944

48. Aljaaf AJ, Al-Jumeily D, Hussain AJ, *et al.* 2015. Predicting the likelihood of heart failure with a multi level risk assessment using decision tree. 2015 Third International Conference on Technological Advances in Electrical, Electronics and Computer Engineering (TAEECE); 29 April-1 May 2015

49. Choi DJ, Park JJ, Ali T, *et al.* 2020. Artificial intelligence for the diagnosis of heart failure. *NPJ Digit Med* 3: 54

50. Heart Failure Policy Network. 2020. *Spotlight on telemedicine in ongoing heart failure care.* London: HFPN

51. Heart Failure Policy Network. 2021. Preventing hospital admissions in heart failure: A European case study for building resilience and sustainability of healthcare systems. London: HFPN

52. Alliance for Heart Failure. 2020. *Written evidence submitted by the Alliance for Heart Failure (DEL0262).* United Kingdom: Alliance for Heart Failure

53. Heart Failure Policy Network. 2020. *Heart Failure and COVID-19: What does the*

pandemic mean for heart failure care? London: HFPN

54. Zhang Y, Coats AJS, Zheng Z, *et al.* 2020. Management of heart failure patients with COVID-19: a joint position paper of the Chinese Heart Failure Association & National Heart Failure Committee and the Heart Failure Association of the European Society of Cardiology. *Eur J Heart Fail* 22(6): 941-56

55. Fulchand S. 2020. Covid-19 and cardiovascular disease. *BMJ* 369: m1997

56. Kałużna-Oleksy M, Gackowski A, Jankowska EA, *et al.* 2020. The patient with heart failure in the face of the coronavirus disease 2019 pandemic: an expert opinion of the Heart Failure Working Group of the Polish Cardiac Society. *Kardiol Pol* 78(6): 618-31

57. European Society of Cardiology. 2020. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic. Brussels: ESC

58. Vestergaard AS, Hansen L, Sørensen S, *et al.* 2020. Is telehealthcare for heart failure patients cost-effective? An economic evaluation alongside the Danish TeleCare North heart failure trial. *BMJ Open* 10(1): e031670

59. Cichosz SL, Ehlers LH, Hejlesen O. 2016. Health effectiveness and cost-effectiveness of telehealthcare for heart failure: study protocol for a randomized controlled trial. *Trials* 17(1): 590

60. Healthcare Denmark. 2018. Denmark - a telehealth nation. Available from: <u>https://www.healthcaredenmark.dk/media/r2rpt</u> <u>q5a/telehealth-v1.pdf</u> [Accessed 15/07/20]

61. World Heart Federation. 2020. *Accelerate change together: heart failure review.* Geneva: World Heart Federation