



**The Heart  
Failure Policy  
Network**

# Heart failure and COVID-19

What does the pandemic mean  
for heart failure care?



December 2020

## About the Heart Failure Policy Network (HFPN)

The Heart Failure Policy Network (HFPN) is an independent, multidisciplinary network of healthcare professionals, advocacy groups, policymakers and other stakeholders from across Europe. HFPN was established in 2015 with the goal of raising awareness of unmet needs and seeking meaningful improvements in heart failure policy and care. To view our work so far, please visit: [www.hfpolicynetwork.org](http://www.hfpolicynetwork.org)

All members of the HFPN provide their time for free. All Network content is non-promotional and non-commercial. The Secretariat is provided by The Health Policy Partnership, an independent health policy consultancy based in London, UK.

## About this report

The evidence base on COVID-19 is in its infancy and continues to evolve every day. This report is based on desk research conducted in September–November 2020 and, inevitably, we expect new information on COVID-19 and heart failure to emerge in the coming months. As such, we present this document as an overview of what is currently known and understood on this topic, with an intention to stimulate debate and action among policymakers, clinicians and patient groups across Europe. We will be monitoring the research landscape as the situation evolves, and would welcome feedback from all stakeholders on their experiences of the pandemic's impact related to heart failure.

The Heart Failure Policy Network is an independent, multidisciplinary platform made possible with financial support from Vifor Pharma, Novartis Pharma and AstraZeneca. The content produced by the Network is not biased to any specific treatment or therapy. All outputs are guided and endorsed by the Network's members. All members provide their time for free.



# Contents

<b>Executive summary</b> .....	<b>4</b>
<b>1. Introduction</b> .....	<b>6</b>
<b>2. How COVID-19 affects the heart and people with heart failure</b> .....	<b>8</b>
<b>3. The impact of COVID-19 on heart failure care</b> .....	<b>12</b>
<b>4. Adaptations to heart failure care</b> .....	<b>16</b>
<b>5. The way forward: living with the new normal</b> .....	<b>22</b>
<b>6. Conclusion</b> .....	<b>26</b>
<b>References</b> .....	<b>27</b>

# Executive summary

**With much of Europe in the grips of a second wave of the COVID-19 pandemic,** it is crucial that heart failure (HF) services adopt standardised approaches and find innovative solutions to continue to provide timely, appropriate and high-quality care for people living with HF.

**We now know that COVID-19 is not ‘just another flu’ – it is more dangerous, especially for people living with cardiac conditions, such as HF.**<sup>1</sup> We live with a range of viruses that cause respiratory tract infections which already pose risks for people living with HF, such as increasing hospitalisations.<sup>2</sup> But research since the COVID-19 pandemic suggests this virus is more deadly.<sup>3</sup>

**Heart damage is a possible complication of COVID-19 and is associated with poorer outcomes.** People with pre-existing cardiovascular disease, including HF, have an increased risk of becoming severely ill from COVID-19.<sup>4-12</sup> This includes being more likely to require admission to intensive care.<sup>13-14</sup> In addition, some studies have found that COVID-19 can cause damage to the heart in a small number of otherwise healthy individuals without prior cardiovascular risk factors.<sup>6-11-15-16</sup>

**Risk of COVID-19 infection through contact with services must be balanced against the known imperatives to prevent irreversible cardiac harm if HF is not managed correctly.** Specialist-led care is the cornerstone of effective HF management,<sup>17-18</sup> and people with HF are at considerable risk of adverse outcomes if the quality of their ongoing care suffers.<sup>19-20</sup> The removal of HF services to augment intensive care capacity or observe social distancing may thus inadvertently cause avoidable mortality and hospitalisations in the HF population.

**HF is part of a wave of growing chronic disease that will continue long after COVID-19 has abated.** For many years, HF has been the leading cause of hospital admissions in people aged over 65.<sup>18</sup> Experts highlight the risk that the HF population will grow, as may the number of people living with more severe HF, due to service disruptions and cardiac damage from infection with COVID-19.<sup>1</sup>

**The pandemic has highlighted the existing weaknesses of our healthcare systems and the cost of years of inertia in HF care.**<sup>18</sup> Historically, people with HF have experienced delays in diagnosis and poor access to specialist-led multidisciplinary care, and these system failures are likely to become more pronounced unless HF is prioritised.

**Pressures from the pandemic make it imperative that we care for our HF healthcare professionals.** Many HF teams have come through a profoundly challenging period, faced with constant and difficult triage decisions and relentless physical and mental pressures, as well as risk of infection.<sup>21</sup> If we do not offer structured psychological support,<sup>22</sup> and if we simply expect these healthcare professionals to handle yet more crises without respite, we may lose them.



Without immediate and decisive policy action, the pandemic could have catastrophic repercussions for HF care. We have identified six areas that must be addressed as a matter of urgency.

**Six areas that must be addressed as a matter of urgency**



**Reinstating HF specialist teams**



**Prioritising timely diagnosis of HF**



**Supporting healthcare professionals to avoid burnout**



**Maximising the benefits of remote care models**



**Recognising the fundamental role of patient organisations**



**Driving forward research efforts on HF and COVID-19**

# 1. Introduction

**The COVID-19 pandemic is an unprecedented global health crisis, which has taken a heavy toll in Europe.** As of November 2020, more than 46 million people have been infected with over 1.1 million deaths globally since the first case of the disease was discovered in December 2019.<sup>23</sup> Relative to other areas of the world, Europe was affected early in the course of the pandemic and cases have been substantial. At the time of publication (December 2020), Europe accounted for 46% of overall cases and 30% of deaths.<sup>24</sup>

**COVID-19 may present with more severity in people with heart conditions.** People living with heart failure (HF) and other heart conditions are at high risk of severe COVID-19 symptoms<sup>4-12</sup> and admission to intensive care.<sup>13-14</sup> While evidence is still emerging, this is clearly due to the major cardiovascular burden generated by serious infection, and additional risks that the virus poses to the heart.

**At the beginning of the pandemic, official and expert guidance documents rapidly clarified that special precautions were needed to avoid viral transmission to people living with HF.**<sup>12</sup> Across Europe, people living with HF were advised to take extra precautions in terms of social distancing, and in some cases to adopt shielding measures, the most intensive level of social distancing.<sup>25</sup> Some countries have declared people with HF to be 'clinically vulnerable' and this risk assessment increases if HF exists alongside comorbidities such as diabetes and cancer, and also in the case of pregnancy.<sup>25-27</sup>

## Key terms

**Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)** – the virus responsible for the development of the COVID-19 disease.

**COVID-19 or 'coronavirus disease'** – the disease caused by the SARS-CoV-2 virus, which is currently declared a global pandemic (December 2020).

**Heart failure** – a serious chronic syndrome where the heart cannot pump enough blood to support the needs of other organs in the body.



## The COVID-19 pandemic has radically reshaped healthcare systems worldwide.<sup>28 29</sup>

Healthcare leaders described a ‘tsunami’ of critical cases presenting to the healthcare system within a relatively short period, overwhelming existing resources and demanding a range of other adaptive crisis measures without modern precedent. Many services have diverted resources, including HF specialists, to better accommodate the rapid surge of critically ill patients with COVID-19, while non-COVID-related services have been considerably scaled back.<sup>29</sup>

**HF services have been particularly disrupted by COVID-19.**<sup>21 30 31</sup> Anecdotal reports note that routine, non-urgent outpatient visits have been cancelled, and HF and cardiac patients are widely advised to avoid attending traditional care settings unless strictly necessary.<sup>12</sup> Many centres have moved to remote consultations with little or no preparation, making as much pragmatic use as possible of existing technologies such as telephones, smartphones and the internet.<sup>29 31 32</sup>

### Clinical stages of COVID-19 infection

COVID-19 is categorised into three key disease stages:<sup>33 34</sup>

- 1. Stage 1 (early infection):** characterised by flu-like symptoms including fever, dry cough, headache and a loss of smell and/or taste
- 2. Stage 2 (pulmonary phase):** the inflammatory response to COVID-19 affects the lungs, with symptoms such as shortness of breath, abnormal chest imaging and low oxygen levels
- 3. Stage 3 (hyperinflammation):** an excessive inflammatory reaction (known as a ‘cytokine storm’) ensues. The most severe stage of COVID-19 often manifests as acute respiratory distress syndrome, sepsis and heart failure.

While the majority of people (approximately 80%) experience mild symptoms indicative of stage 1 disease, some people develop severe disease.<sup>33</sup> It is reported that roughly 5% of patients will require critical care due to respiratory failure, septic shock or multiple organ dysfunction.<sup>33</sup>

### Potential complications affecting the heart during COVID-19 infection<sup>35</sup>

- Blood clots (venous thrombotic events)
- Irregular heartbeat (arrhythmia)
- Cardiac events such as heart attack (myocardial infarction)
- Injury to and inflammation of the heart muscle (myocardial injury and myocarditis)
- Other diseases of the heart that make it harder to pump blood (cardiomyopathy)

## 2. How COVID-19 affects the heart and people with heart failure

### COVID-19 can cause long-lasting damage to the heart

Although COVID-19 is most often associated with respiratory symptoms, it is becoming increasingly clear that the infection can impact the heart. Most of the published literature has described acute respiratory distress syndrome and pneumonia as dominant severe clinical manifestations.<sup>7</sup> However, COVID-19 is also associated with a range of cardiovascular complications, including inflammation of the heart muscle and HF.<sup>14</sup> Key cardiac biomarkers (particularly cardiac troponin and natriuretic peptide (NP) levels) are significantly elevated in people with COVID-19 admitted to intensive care and those who have died, which is an indication of possible cardiac damage as a result of contracting the virus.<sup>2,36-38</sup> In addition, many people have presented to hospital with cardiovascular symptoms such as heart palpitations and chest tightness, with or without respiratory symptoms.<sup>39</sup>

A growing concern is that COVID-19 may even cause damage to the heart in a small number of otherwise healthy people without prior cardiovascular risk factors.<sup>6,11</sup> Individual studies have found inflammation of the heart in people who have recovered from COVID-19, suggesting a possible damaging effect of the disease.<sup>6,11,15,16</sup>

COVID-19 may lead to the development of HF.<sup>9,37,40</sup> A study from Wuhan, China, found that approximately 23% of people hospitalised with COVID-19 were newly diagnosed with HF.<sup>10</sup> Another study from Washington, US, found as many as 33% of people admitted to intensive care were diagnosed with cardiomyopathy (disease of the heart muscle).<sup>41</sup> Over the longer term, the incidence and prevalence of HF is therefore likely to rise.<sup>1</sup>





## **COVID-19 has a considerable impact on people with existing heart disease, including HF**

**People with cardiovascular risk factors and pre-existing cardiovascular disease (CVD) have increased vulnerability to COVID-19.** Specifically, they have a heightened risk of severe infection with poor outcomes.<sup>4-12</sup> While the overall global mortality rates from COVID-19 are difficult to determine and constantly evolving, it is now thought that around 10% of people with pre-existing CVD who contract the virus die from the infection.<sup>6 40 42</sup> This appears to be much higher than earlier estimates of COVID-19 mortality for all cases.<sup>3</sup>

**People with HF are at an increased risk of poor outcomes from COVID-19** due to their low levels of immunity, general frailty and reduced cardiovascular ability to cope with infections<sup>6</sup> (see *Figure 1*, p. 11). COVID-19 may exacerbate HF, lead to more hospitalisations and increase the chance of admission to intensive care.<sup>6 43</sup> Data are still emerging, but individual studies across Europe note that 7–21% of the hospitalised COVID-19 population have pre-existing HF.<sup>44-46</sup> A large international observational study from 169 hospitals found a mortality rate from COVID-19 at 15.3% among people with congestive HF, compared with 5.6% among patients without HF.<sup>47</sup>

**The management of people with HF with concurrent COVID-19 infection can be challenging for clinicians.** Symptoms of COVID-19, such as breathlessness, fatigue and tachycardia (high heart rate), are similar to those of HF.<sup>12</sup> In addition, people with chronic HF often present with several comorbidities and at an advanced age, which may complicate the treatment pathway for patients with combined disease.<sup>48</sup> Effective care for people living with HF who develop severe COVID-19 has thus required close integrated working between cardiologists and other specialists, including experts in infectious disease, respiratory care and intensive care.<sup>49</sup>

## Common mechanisms responsible for cardiovascular injury in people with COVID-19

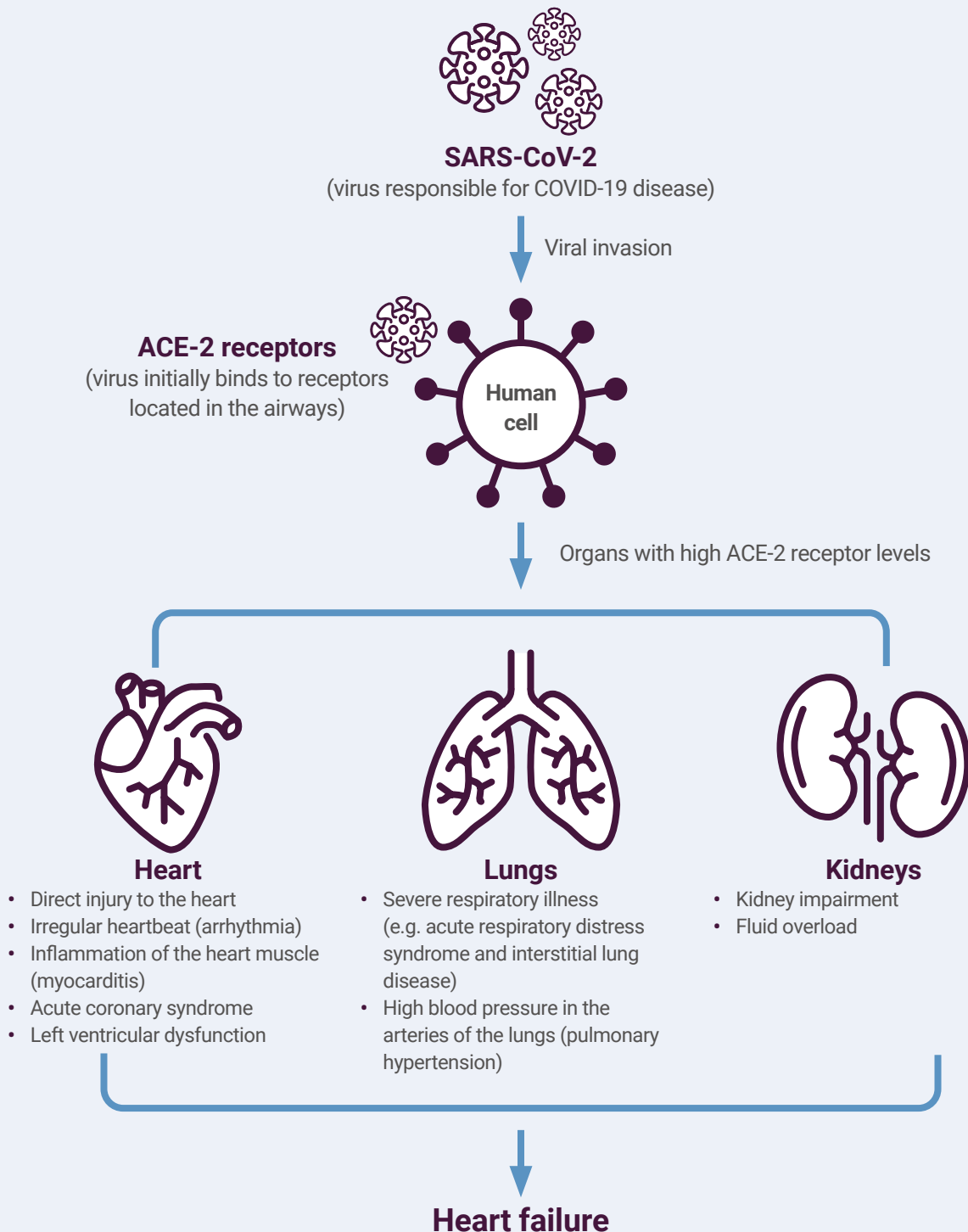
The exact mechanisms responsible for cardiovascular complications are still unclear.<sup>36 39</sup>

However, the following are some of the ways in which COVID-19 may cause poor cardiovascular outcomes:

- **Direct injury to the heart:** Angiotensin-converting enzyme 2 (ACE-2) is a type of enzyme present in multiple organs including the lungs, heart, kidneys and intestines. It plays a crucial role in regulatory processes such as maintenance of blood pressure and inflammation levels.<sup>7</sup> COVID-19 enters human cells by binding to ACE-2 receptors, altering ACE-2 signalling pathways and leading to injury of the heart.<sup>7 34 37 39 42 50</sup> A potential explanation for the higher risk of adverse outcomes in people with pre-existing CVD could be the higher than usual expression of ACE-2 receptors in these people.<sup>36</sup>
- **Systemic inflammation:** COVID-19 infection can sometimes trigger an excessive inflammatory reaction (known as a 'cytokine storm').<sup>7</sup> This can lead to multiple organ failure, including either new HF or a sudden worsening of chronic HF.<sup>6 7</sup> The virus can also cause kidney impairment (in approximately 15–29% of people), which may lead to fluid overload and an increased burden on the heart to pump blood; this may exacerbate chronic HF.<sup>6</sup>
- **Issues with blood clotting:** High rates of coagulation (the tendency of the blood to clot) have been reported in people with severe COVID-19 infection.<sup>51</sup> The formation of blood clots in the lungs (pulmonary embolism) is of significant concern, leading to reduced oxygen supply and increased pressure on the heart.<sup>6 34 51 52</sup>
- **Acute cardiac events:** People with cardiovascular risk factors and pre-existing CVD may have an increased risk of sudden cardiac events, such as unstable angina (reduced blood flow to the heart causing chest pain) and myocardial infarction (heart attack), as a result of COVID-19 infection.<sup>53</sup> This could be caused by a number of factors including increased demand placed on the heart and lungs, or rupture of existing plaques (fatty deposits) in the coronary arteries.<sup>34 54</sup>
- **Electrolyte imbalances:** Electrolytes are minerals in the body that have an electric charge. They have a role in balancing the amount of water in the body, as well as enabling nerves to transmit information. Electrolyte imbalances may occur in people with COVID-19 infection. Of particular concern is hypokalaemia (low potassium levels), which can increase vulnerability to abnormalities in heart rhythm, particularly among people with underlying cardiac disorders.<sup>7 55</sup>



**Figure 1. Potential contributing factors and mechanisms of new or worsening heart failure in people with COVID-19<sup>6 56</sup>**



### 3. The impact of COVID-19 on heart failure care

#### **The COVID-19 pandemic has disrupted the delivery of specialist HF services**

**COVID-19 has led to a sharp reduction in the routine availability of HF and cardiology services across Europe.**<sup>2 31 57</sup> Some commentators describe a devastating impact on HF care as a result.<sup>58</sup> Specialist-led care is the cornerstone of effective HF management,<sup>17 18</sup> but many HF specialist clinicians have been reassigned to general roles in acute or medical wards to look after people with COVID-19.<sup>2 12 58-61</sup> The majority of traditional HF clinics and cardiac rehabilitation services have been postponed or have switched to telephone or other remote consultations.<sup>29 58 62</sup>

**Such disruptions to services were arguably justified early in the pandemic.** It is important to note that the risk of infection from healthcare premises was a highly relevant concern when the pandemic first swept across Europe, based for example on the experience of hospitals in Lombardy, Italy, one of the first European regions to enter a state of emergency.<sup>63</sup> Some countries thus mandated service closures by law or national directives from ministries of health.<sup>31</sup> In other countries, individual clinics made independent decisions to close or adapt services, while instructing patients to avoid attending in person for anything but urgent procedures.<sup>2</sup>

#### **People with HF have experienced serious barriers to care**

**The result of these disruptions has been that many people with HF across Europe have missed out on essential services.**<sup>12 31 36</sup> This includes a sharp reduction in diagnostic capacity, elective surgeries, non-urgent procedures and day-care outpatient clinics.<sup>30 31 35 49 60 64</sup> In a UK survey of people with HF, 65% of respondents reported that their HF appointments were negatively impacted during the 'lockdown' period.<sup>65</sup> Following hospital discharge, many people have also struggled to access vital HF services in the community,<sup>58 66</sup> including cardiac rehabilitation.<sup>60 67 68</sup>



**Service disruptions, demand pressures and changing patient behaviours have led to widespread concerns that many people with HF are not receiving effective and timely guideline-recommended care.**<sup>31 36 69</sup> Optimisation of medications has suffered, and backlogs of people awaiting key diagnostic tests such as NP testing, electrocardiography (ECG) and echocardiography have delayed diagnosis and the initiation of vital treatment.<sup>58</sup> Echocardiograms have been restricted to urgent cases,<sup>29</sup> and medications may have been difficult to access in the community setting.<sup>30</sup> In England, a survey of cardiac patients by the British Heart Foundation found that the number of people who had to wait more than six weeks for a diagnostic echocardiogram was nearly 18 times higher than before the pandemic.<sup>70</sup> The same survey found that one third of people struggled to get the medicines they needed, and 40% had an elective procedure/test postponed or cancelled. In the case of one community HF team, new referrals dropped by 34%, driven in part by the low rate of NP testing across primary care.<sup>60</sup> Patients have stayed away from care services, often at serious risk to their health.

**Many people with HF have delayed seeking vital cardiology input.**<sup>71</sup> Significantly fewer patients have been diagnosed with new-onset HF since the beginning of the COVID-19 pandemic,<sup>69</sup> and there has been a reduction in the number of people presenting to hospitals across Europe with acute coronary syndromes and exacerbation of HF.<sup>69 72-74</sup> According to one centre-based study, emergency admissions for HF declined during the COVID-19 outbreak by 22–28%, accompanied by a 15–27% reduction in interventional treatments.<sup>75</sup> European studies have confirmed significant reluctance among people with HF to present to healthcare services, with people often waiting to seek medical attention until there is a significant deterioration of their condition.<sup>76 77</sup> Reasons for this may include fear of exposure to COVID-19 in healthcare settings, concerns that hospitals are too busy or not wanting to put extra pressure on health services, and the impact of public health messaging that advises people to stay at home.<sup>29 72</sup>

**Reduced uptake of services may come with a high cost for people with HF.** For example, delaying HF treatment, even for one month, carries a far greater risk of mortality.<sup>20</sup> Postponing cardiac rehabilitation after a major cardiac event may also lead to reduced fitness levels and poor uptake, attendance and completion of rehabilitation programmes.<sup>67</sup>

## **The threat of COVID-19 has a profound psychological impact on people living with HF**

**The introduction of social distancing measures across Europe has been particularly detrimental for people living with HF.** During the early phase of the pandemic, people with pre-existing heart conditions were advised to observe enhanced social distancing and, in some cases, 'shield' at home for a number of months.<sup>26 78 79</sup> Some people have reported receiving conflicting advice during this time, leading to confusion about their level of individual risk of COVID-19.<sup>65</sup>

**People with HF have reported developing emotional disorders as a result of the pandemic.** This may include fears for their health, anxiety and emotional stress reaction, which is likely exacerbated by disruption of HF services.<sup>12 65</sup> The easing of lockdowns is reported to have caused additional stress and anxiety for people with HF, who were encouraged to return to 'normality' while still being at an increased risk of severe infection.<sup>80</sup> It is likely that people's mental health will also be adversely affected during future waves of the pandemic.

**The physical and emotional impact of COVID-19 is likely to last for a long time.** For the many people with HF who have survived COVID-19, the virus and the treatment required to combat it will have a lasting impact on psychological and physical health. For example, anxiety, depression and post-traumatic stress disorder (PTSD) are common following a prolonged stay in critical care.<sup>81</sup> People may experience difficulties with activities of daily living, including personal care, domestic tasks and leisure activities.<sup>81</sup>

## **Disruption to cardiology services will have a major long-term impact on the whole HF community**

**The backlog of people with HF requiring specialist input is already a substantial long-term challenge.**<sup>29</sup> This is not least in light of the continuing need for social distancing and use of personal protective equipment (PPE), which will continue to change the way clinics operate and investigations are undertaken and may reduce the capacity per session.<sup>29</sup> In addition, people with HF who have recovered from COVID-19 will likely require a new care plan, including optimisation of medications and cardiology follow-up, adding to the pressure on already overstretched resources.<sup>81</sup>

**While the knock-on effects of service disruptions are difficult to quantify, they are a matter of serious concern.** Across Europe, research shows an alarming increase in non-COVID-19 deaths in areas with a high burden of COVID-19 infection.<sup>2</sup> This suggests that the disruption to regular services, and the consequent suboptimal management of chronic conditions, may have very serious consequences for people with HF.<sup>2</sup>



## **Healthcare services must prepare for a surge in HF patients, beyond those who require missed care interventions**

**A new cohort of people with HF may be waiting to present to healthcare services, for several reasons.** As COVID-19 can exacerbate heart diseases, it has been described as sometimes ‘unmasking’ previously hidden cardiac disorders.<sup>11 61</sup> Patients who were advised to stay at home with mild COVID-19 symptoms may experience cardiovascular complications once the pandemic subsides.<sup>28</sup> It is also predicted that, in the coming months, there will be a new spate of admissions or complications among patients who stayed at home with missed signs of HF exacerbation,<sup>28</sup> or those whose care was delayed by service disruptions.<sup>36</sup>

## **Care teams are stretched to the limit at a time when people with HF need them most**

**HF experts have described the tremendous physical and psychological pressures associated with being on the front line of the epidemic.** This involves dealing with many of the most severe cases and working with adapted care pathways and practices at short notice.<sup>28 29 32</sup> Other commentators describe the considerable distress to HF team members – along with physical and mental exhaustion – that resulted from the crisis workload (sometimes outside of their normal clinical remit) and the need to decide which patients should access life-saving intensive care in the face of limited resources.<sup>59</sup> This extraordinary level of strain is likely to affect performance and wellbeing,<sup>82</sup> and could have negative consequences for patient care.

**Healthcare professionals have made great sacrifices, including facing greater exposure through their role to risk of COVID-19 infection.**<sup>83 84</sup> One Italian study found that, despite the extensive use of appropriate PPE, five out of 20 nurses tested positive for COVID-19 in the first two weeks of the outbreak, as did three out of five social care workers and four out of 19 physicians.<sup>21</sup> A further study of 138 patients hospitalised with COVID-infected pneumonia in Wuhan, China found that 29% were healthcare workers.<sup>85</sup>

## **Clinical research has suffered – which may affect future treatments**

**COVID-19 has affected various aspects of HF clinical research activities,** which is likely to impact on innovations in treatment in the future.<sup>86</sup> Many clinical trials have been postponed, with challenges in recruiting new participants into current HF trials, for example.<sup>19 87</sup>

## 4. Adaptations to heart failure care

**COVID-19 has forced a rethink about how healthcare is delivered.** As the scale of the pandemic became clear, clinical leaders sought to respond with rapid adaptations and special measures, ranging from high-level international scientific guidance to local-level guidelines for practising teams, and sudden switches to remote care at scale.

### **Clinical guidance has been issued to assist in the co-management of HF and COVID-19**

**International and national guidance has sought to rapidly clarify optimal approaches to HF care in the pandemic environment.** In all cases, the critical importance of continuing to observe established guidelines for people with acute and late-stage HF was clearly stated, regardless of infection status.<sup>12</sup> Much of the guidance, therefore, clarified new working practices to reduce risk of infection (see *Box 1*). Given the inherent limitations of the available evidence and reliance on observation and anecdotal evidence, documents such as the European Society of Cardiology (ESC) guide for the diagnosis and management of CVD during the COVID-19 pandemic were released as ‘guidance’ rather than ‘guidelines’.<sup>25</sup> This emphasises their role as a short-term adaptive strategy to crisis management, rather than a replacement for existing scientific guidelines or a competitor to nationally mandated frameworks. Other adaptive strategies include the reclassification of cardiology patients, as seen in England (see *Box 2*).

#### **Box 1. Measures to reduce risk of COVID-19 infection via adapted practices in the hospital setting**

- Temperature checks for healthcare professionals prior to entering the ward; staff use of PPE<sup>12</sup>
- Stringent sanitation and hygiene regimes: routine handwashing and area disinfection; termination of air conditioning; spacing out of patient appointments; restrictions on visitors and other people accompanying patients into healthcare premises<sup>88</sup>
- New patient risk-profiling models, clarifying ‘obligatory’ (high-priority) HF patients for normal acute care, and non-acute cases for potential deferral or adapted services<sup>89</sup>
- Division of cardiac and HF teams between ‘hot’ and ‘cold’, with ‘hot’ teams handling urgent cases in the presence of COVID-19 infection and ‘cold’ teams handling cases without COVID-19<sup>49</sup>





### Box 2. Example of recategorisation of cardiology patients by NHS England during the COVID-19 pandemic<sup>89</sup>

- **Obligatory inpatients:** These patients will continue to require admission and ongoing management (e.g. people with myocardial infarction, severe HF or arrhythmia). Pathways must be expedited to allow rapid treatment and discharge.
- **Elective inpatients/day-case activity:** All elective admissions should be deferred unless absolutely necessary.
- **Outpatients:** The urgency of the appointment, requirement for diagnostics and need for face-to-face contact should be considered. Rapid-access clinics can prevent admission or facilitate early discharge. Where possible, appointments should be conducted remotely and non-urgent appointments deferred, particularly those requiring diagnostics for surveillance.

### Most non-urgent care is being delivered remotely

**Vast swathes of non-urgent outpatient appointments have been switched to remote and virtual consultations.** Most notably in the outpatient setting, virtual consultations were rapidly recommended over traditional care models.<sup>12 25 40 48</sup> Real-world practices followed suit,<sup>2 31 62</sup> influenced not only by HF-specific guidance but by pre-existing pandemic strategies (see *Table 1*). Reports suggest that in many countries, the majority of outpatients were moved to telephone or video consultations within days.<sup>60</sup> Commentators have noted that the pandemic is 'revolutionising' attitudes to remote care, adding that 'widespread scepticism has switched to near-universal enthusiasm and rapid adoption into routine care'.<sup>76</sup>

**Risk assessment was emphasised early on as an essential tool for clinical teams.** People with HF considered to be at intermediate or high risk, such as those with deteriorating symptoms or who had been recently discharged from hospital, were triaged for appropriate telephone, video or face-to-face consultations.<sup>58</sup>

**Table 1. Summary of common and guidance-based adaptations to outpatient and primary care settings**<sup>2 21 29 30 32 38 58 59 90 91</sup>

**Remote adaptations**

- Telephone and video calls with patients in lieu of clinic visits
- Reactive, 24/7 telephone and video advice lines, with email and online chat options
- ‘Virtual waiting rooms’ (i.e. waiting lists) to manage patient backlogs and ensure equitable access to staff
- Issuing of equipment to patients to enable self-assessment of heart rate and rhythm, blood pressure, oxygen levels and weight
- Post-discharge, issuing of ECGs and wearable devices to COVID-19-positive but stable patients
- Collation of data captured by implantable devices, such as pacemakers and cardioverter defibrillators
- Remote pre-screening of patients to assess urgency and suitability for remote care
- Mailing of medications or other essential items to patients via dedicated couriers
- Offering of clinic visits to patients describing decompensation (exacerbation of HF)
- Home-based cardiac rehabilitation programmes

**Multidisciplinary operations**

- Clinics set up as a ‘one stop’ with investigations on the same day e.g. echocardiogram, NP testing and follow-on intravenous interventions (iron, diuretics etc.) to minimise number of in-person attendances
- Home-based visits for face-to-face consultations
- Issuing of diuretics to HF community team, so that in the event the patient had no supply of their own or needed a different strength, the medication could be issued by the visiting HF nurse
- Clinical triage by senior clinicians (HF specialist nurses and consultants) to risk-stratify existing patient caseloads and new referrals, including widespread use of NP testing in primary care
- Rapid consultations between general practitioners (GPs) and HF specialist staff



### **Multidisciplinary care in specialist settings**

- Early supported discharge and links to local palliative care services as required
- Point-of-care ultrasound to assess heart function on dedicated COVID-19 wards (allowing more rapid diagnostics than would be likely if patients were referred to full echocardiogram) to assist providers with image acquisitions, which can then be read remotely by trained staff
- Closure of inpatient clinics with HF teams decamping to community setting

### **General**

- Education and empowerment of patients to perform routine self-care and engage with remote processes, including use of home monitoring equipment
- Proactive contact with recent patient lists to inform them of changes
- Advice and reassurance to all patients and education as to COVID-19 risk management (e.g. social distancing, frequent handwashing, use of face masks in public places, self-isolation)
- Outreach from patient groups to offer psychological and emotional support to people living with HF, as well as education on key issues such as remote monitoring and encouraging people to attend emergency departments, where appropriate

## Remote working has been a success for many HF teams

**While undoubtedly a compromise forced by necessity, many HF teams have reported successful elements of remote working.** Anecdotally, a range of voices in the HF community report that many patients have found remote consultations a convenient and acceptable model of care, and that good standards have been maintained by HF care teams.<sup>30</sup> This is reinforced by research conducted in Spain during the pandemic, which suggests that healthcare professionals find video consultations adequate for interactions with people living with chronic conditions such as HF, including patients who have not used the medium before.<sup>92</sup>

**Preliminary evaluations of local centres support this positive view of remote care delivery.** A study of 103 patients receiving remote care from an Italian HF team from March to May 2020 found positive outcomes, including responsiveness (half of all contacts led to a clinical decision), and COVID-19 safety (none of the patients were infected with COVID-19).<sup>31</sup> In fact, a comparison with an equivalent patient population in 2019 suggested that the remote service has actually achieved a decrease in hospital admissions.<sup>31</sup> In Spain, one centre reported that a new active surveillance protocol, making extensive use of telephone consultations and in-person access to HF units where urgently required, resulted in a 56.5% reduction in emergency hospital visits and a 46.9% reduction in hospital admissions, without an increase in mortality.<sup>32</sup>

## Cardiac rehabilitation has been a major focus for remote and home-based models

**Before the pandemic, research had already demonstrated the ability of remote cardiac rehabilitation to safely reduce hospitalisation and major events among cardiac patients.**<sup>93</sup> This includes, for example, initial assessment of patients' rehabilitation needs, personalised goal-setting by telephone or video consultation, and using web-based platforms and mobile apps to deliver cardiac rehabilitation in the home setting (see *Case study 1*).

**A number of cardiac rehabilitation centres have accelerated the use of remote approaches in recent months, especially online video.**<sup>64 67</sup> Policy documents have noted the potential value of remote cardiac rehabilitation and highlighted it as an important component of future resilience in the enduring presence of COVID-19.<sup>67</sup> Experts have also pointed out the potential of existing technologies (smartphones, tablets and laptops, voice calls and texts) to allow a range of audio and video interactions, including group sessions, to deliver educational materials and track patients.<sup>94</sup>



### Case study 1. Rehabilitation Enablement in Chronic Heart Failure (REACH-HF) manual<sup>95 96</sup>

The REACH-HF manual is a home-based self-help programme for people with HF, funded by the National Institute for Health Research (NIHR) in the UK. The programme includes a self-care manual, exercise plan, 'progress tracker' tool and 'friends and family' resource for carers. The manual is designed for use over a 12-week period, with the support of a cardiac nurse or facilitator.

The intervention has shown positive outcomes in clinical trials, including good adherence and improvements in quality of life and mental health.



## The move to remote care and telemedicine has not been without compromise

**As encouraging and comprehensive as best-practice centres have been, not all areas have been able to replicate the full suite of adaptations to care.** For example, as noted previously, many HF teams have been running with reduced capacity or have temporarily closed, with patients either on long waiting lists or moved suddenly into an already overwhelmed primary care setting.<sup>61</sup>

**There are limitations to what can be achieved with remote care delivery, not least given the very limited time to overcome historical unreadiness for this format of care.** Telephone-based assessments may have been the primary element of remote consultations, but many experts have noted serious limitations, resulting in fewer clinical data and imprecision, and concerns over equity of access to quality care.<sup>92</sup> In addition, many patients – especially older people – may face challenges with new technologies and prefer face-to-face appointments.<sup>65</sup> <sup>92</sup> Commentators in Italy have noted that, had an effective system of remote care already existed, patients may have been more likely to seek the care they needed during the pandemic, and that COVID-19 'could have represented a singular pilot context to boost e-health programmes and to understand patients' acceptance of such integrated assistance... [but] unfortunately, it highlighted major organisational gaps'.<sup>97</sup>

## 5. The way forward: living with the new normal

Care disruptions and diversion of healthcare resources from the pandemic have already had a considerable impact on people with HF, and there are numerous reports of suboptimal HF management across Europe. Unless decisive policy action is taken immediately to reverse this trend, the repercussions of the pandemic on HF morbidity and mortality could be catastrophic.

We urge governments and decision-makers to recognise the current and future burden of HF and prioritise the needs of people living with HF, albeit with adaptations that are required for the COVID-19 pandemic. We recommend that the measures outlined below are put in place as a matter of urgency.



### **HF specialist teams must be immediately reinstated**

Specialist-led care is the cornerstone of effective HF management. In situations where it is no longer possible to be treated on the premises of specialist HF clinics, patients must continue to have access to multidisciplinary teams, led by HF specialists, to ensure that remote support can continue. Innovation and design of care protocols will be essential, but fundamentally the most successful models of HF care are built around HF specialist teams, including specialist nurses, with carefully planned protocols.

Rapid access to HF services will be needed for high-priority HF patients, including those recently discharged, people with advance care plans and those receiving palliative care in the community. The risks that arise from attending clinics in person must be balanced against pragmatic concerns and the risk of denial of quality care.

We must also learn how to better leverage existing specialism across multiple healthcare providers and settings concurrently. For example, localities could adopt an HF lead clinician as a key point for clinical referrals and enquiries, giving support and advice across both primary and secondary care, to promote consistent, high-quality care.

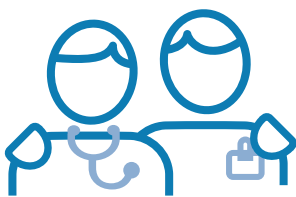


### **Timely diagnosis of HF must be prioritised, with appropriate use of diagnostic tools**

Ensuring the timely diagnosis of HF was already an area of significant concern across Europe, and even more so as a result of the COVID-19 pandemic. While existing European and national guidance on HF diagnosis should continue to be followed where possible, the use of certain tools, such as echocardiography, must be evaluated on a case-by-case basis and prioritised for those who need them most. Alternative tools, such as point-of-care ultrasound to help detect cardiac complications of COVID-19, could be considered to decrease staff exposure to infection and ease diagnostic bottlenecks.

Effective triaging systems can help to identify urgent referrals and progress them quickly through the diagnostic pathway. NP testing, in particular, should be scaled up in community settings to help rule out HF and reduce the demand on specialist diagnostic services. The concept of a 'one-stop' diagnostic HF clinic can minimise the need for repeated face-to-face clinic visits and reduce risk of exposure to COVID-19.

In the pandemic era as much as before, it is important that a wide range of healthcare professionals are aware of and able to recognise the symptoms of HF – and this should include being able to correctly differentiate between the symptoms of COVID-19 and new-onset HF.



### **Healthcare professionals must be supported to avoid burnout and continue to provide effective care for people living with HF**

More so than ever, we must protect and support healthcare workers across all settings so they can continue to provide high-quality and safe care to people living with HF. Given the heightened risk that COVID-19 infection poses to front-line healthcare professionals, it is vital that international guidelines around risk management are translated into actionable solutions that reflect local resources. These should include protocols around testing, the correct use of PPE, isolation and quarantining, and clear guidance for safe and timely transitioning back to work.

Furthermore, it is important that we recognise the huge physical and emotional strain that healthcare workers face, not only working on the front line of the pandemic, but in transitioning to different roles and adopting new ways of working. Support for self-care (i.e. regular rest breaks) and improved access to psychosocial assistance may play an important role in ensuring a strong workforce and ultimately improve outcomes for many people with HF.



### **The benefits of remote care models must be maximised**

Given their potential to be cost-effective and save time, widespread use of remote consultations to manage HF patients who do not require face-to-face visits should be maintained in the long term. Video consultations should be used where possible, so that the healthcare professional can see the patient and assess any physical symptoms. Remote care models should also make use of standalone home monitoring systems, implantable monitors, and data from pacemakers or defibrillators. Cardiac rehabilitation is a further obvious opportunity for remote working, which could simultaneously address significant historical issues.

Electronic health records that are accessible across settings will be essential tools to help monitor people living with HF remotely. Monitoring and evaluating the effectiveness of all remote working tools, with frequent adaptations to incorporate rapidly emerging knowledge, is vital to ensure effective organisation of HF care.

Remote working must be supported by clear guidance on the use of new care models, allocation of roles and responsibilities, and training on available technologies. Crucially, people with HF must be given advice and education on telemedicine, and empowered to monitor their vital signs and recognise symptoms of worsening condition in order to seek appropriate care. In circumstances where telemedicine is not appropriate, reassurance that hospitals and clinics are safe and open, even during a pandemic, will help to reduce patients' anxiety and fear regarding face-to-face appointments.





### **Patient organisations should be recognised for the enormous help they offer to people with HF and to healthcare systems**

It is vital that governments and healthcare systems work collaboratively with patient organisations to gain a more comprehensive understanding of the challenges faced by the HF community during this time, and to ensure that service redesign is truly person-centred. Patient groups can also play an important role in the provision of psychological and emotional support to people living with HF, as well as education on key issues such as remote monitoring and encouraging people to attend emergency departments, where appropriate.



### **We must continue to drive forward research efforts on HF and COVID-19**

Further epidemiological studies are required to investigate the true incidence of HF and the impact of lockdown measures on service use, e.g. hospital admissions. Monitoring and evaluating the effectiveness of new ways of working, such as remote care models, will help to inform HF service redesign. It is also vital to reinstate postponed clinical trials in HF, to ensure people with HF are given the best chance of effective treatments now and in the future.

## 6. Conclusion

The COVID-19 pandemic has exposed the current inequalities in our healthcare systems and offered hard lessons about the fragility of HF services. Yet it has also forced us to adapt and innovate at a rapid pace over the past few months, with examples emerging of effective and collaborative working models. We have also seen huge strengths in our systems and modern ways of working, including the pace of research, best-practice learning and communication across the whole HF community, from patients to clinicians and academics.

At the time of publication, it is clear that our societies will be living with COVID-19 for some time to come. However, we have always lived with HF, and will continue to do so indefinitely. In fact, we must prepare for the cohort of HF patients to expand as a result of people experiencing heart damage related to COVID-19. With an existing HF population of 15 million people in Europe, even a relatively small rise in the incidence of HF, or greater rates of crisis and exacerbation, will put hundreds of thousands of people at risk of hospitalisation, enduring disability and, potentially, death.

We cannot meaningfully 'beat' the COVID-19 pandemic if we do not also protect and support people with HF to best manage their condition – yet there are legitimate fears that we are failing to do so. People living with HF have seen unacceptable gaps in even basic elements of care. HF teams are under huge pressures, with significant backlogs of patients to deal with, and will still need to handle urgent HF cases, including those who are COVID-19-positive.

We still have a chance to meet a great deal of that need in the community, and to help prevent the onset of HF and its progression. We must keep innovating, while continuing to replicate proven approaches and expertise across our health systems and communities.

We are not the first to call for decision-makers and health system leaders to seize this moment to revolutionise HF care and protect our specialist teams for the challenges to come – rather, it is our honour to add our voice in full support.



# References

1. 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*: 10.1016/j.ajem.2020.07.009
2. 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
3. Rajgor DD, Lee MH, Archuleta S, *et al.* 2020. The many estimates of the COVID-19 case fatality rate. *Lancet Infect Dis* 20(7): 776-77
4. Sisti N, Valente S, Mandoli GE, *et al.* 2020. COVID-19 in patients with heart failure: the new and the old epidemic. *Postgrad Med J*: 10.1136/postgradmedj-2020-138080
5. Chen T, Wu D, Chen H, *et al.* 2020. Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. *BMJ* 368: m1091
6. Bader F, Manla Y, Atallah B, *et al.* 2020. Heart failure and COVID-19. *Heart Fail Rev*: 10.1007/s10741-020-10008-2
7. Bansal M. 2020. Cardiovascular disease and COVID-19. *Diabetes Metab Syndr* 14(3): 247-50
8. Poblador-Plou B, Carmona-Pérez J, Ioakeim-Skoufa I, *et al.* 2020. Baseline Chronic Comorbidity and Mortality in Laboratory-Confirmed COVID-19 Cases: Results from the PRECOVID Study in Spain. *Int J Environ Res Public Health* 17(14): 5171
9. Madjid M, Safavi-Naeini P, Solomon SD, *et al.* 2020. Potential Effects of Coronaviruses on the Cardiovascular System: A Review. *JAMA Cardiol* 5(7): 831-40
10. Zhou F, Yu T, Du R, *et al.* 2020. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet* 395(10229): 1054-62
11. Pesheva E. Coronavirus and the heart [Online]. [Updated 14/04/20]. Available from: <https://news.harvard.edu/gazette/story/2020/04/covid-19s-consequences-for-the-heart/> [Accessed 14/10/20]
12. 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
13. Li B, Yang J, Zhao F, *et al.* 2020. Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China. *Clin Res Cardiol* 109(5): 531-38
14. Long B, Brady WJ, Koifman A, *et al.* 2020. Cardiovascular complications in COVID-19. *Am J Emerg Med* 38(7): 1504-07
15. Rajpal S, Tong MS, Borchers J, *et al.* 2020. Cardiovascular Magnetic Resonance Findings in Competitive Athletes Recovering From COVID-19 Infection. *JAMA Cardiol*: 10.1001/jamacardio.2020.4916
16. Puntmann VO, Carerj ML, Wieters I, *et al.* 2020. Outcomes of Cardiovascular Magnetic Resonance Imaging in Patients Recently Recovered From Coronavirus Disease 2019 (COVID-19). *JAMA Cardiol*: 10.1001/jamacardio.2020.3557
17. 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
18. The Heart Failure Policy Network. 2018. *The handbook of multidisciplinary and integrated heart failure care*. London: HFPN
19. Anker SD, Butler J, Khan MS, *et al.* 2020. Conducting clinical trials in heart failure during (and after) the COVID-19 pandemic: an Expert Consensus Position Paper from the Heart Failure Association (HFA) of the European Society of Cardiology (ESC). *Eur Heart J* 41(22): 2109-17
20. Zaman S, Zaman SS, Scholtes T, *et al.* 2017. The mortality risk of deferring optimal medical therapy in heart failure: a systematic comparison against norms for surgical consent and patient information leaflets. *Eur J Heart Fail* 19(11): 1401-09
21. Agostoni P, Mapelli M, Conte E, *et al.* 2020. Cardiac patient care during a pandemic: how to reorganise a heart failure unit at the time of COVID-19. *Eur J Prev Cardiol* 27(11): 1127-32

22. Tomlin J, Dalglish-Warburton B, Lamph G. 2020. Psychosocial Support for Healthcare Workers During the COVID-19 Pandemic. *Front Psychol*: 10.3389/fpsyg.2020.01960
23. World Health Organization. 2020. WHO Coronavirus Disease (COVID-19) Dashboard. [Updated 13/10/20]. Available from: <https://covid19.who.int/> [Accessed 14/10/20]
24. World Health Organization. 2020. *Weekly epidemiological update: Coronavirus disease (COVID-19) 25 October 2020*. Geneva: WHO
25. Fulchand S. 2020. Covid-19 and cardiovascular disease. *BMJ* 369: m1997
26. Health Service Executive. People at higher risk from COVID-19. [Updated 25/09/20]. Available from: <https://www2.hse.ie/conditions/coronavirus/people-at-higher-risk.html> [Accessed 14/10/20]
27. NHS. 2020. Who's at higher risk from coronavirus. [Updated 2/12/20]. Available from: <https://www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/whos-at-higher-risk-from-coronavirus/> [Accessed 28/10/20]
28. Oliveros E, Brailovsky Y, Scully P, et al. 2020. Coronavirus Disease 2019 and Heart Failure: A Multiparametric Approach. *Card Fail Rev* 6: e22
29. Hasan S, Ur Rahman H, Patil A, et al. 2020. Impact of COVID-19 on cardiology services in a district hospital and adapting to the new normal. *Postgrad Med J*: 10.1136/postgradmedj-2020-138228
30. Allkins S, Masters J. 2020. Innovating heart failure services: an interview with Jayne Masters. *Br J Card Nurs* 15(6): 1-3
31. 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
32. Jiménez-Blanco Bravo M, Cordero Pereda D, Sánchez Vega D, et al. 2020. Heart Failure in the Time of COVID-19. *Cardiology* 145(8): 481-84
33. Radke RM, Frenzel T, Baumgartner H, et al. 2020. Adult congenital heart disease and the COVID-19 pandemic. *Heart* 106(17): 1302
34. Shaha KB, Manandhar DN, Cho JR, et al. 2020. COVID-19 and the heart: what we have learnt so far. *Postgrad Med J*: 10.1136/postgradmedj-2020-138284
35. Adam S, Zahra SA, Chor CYT, et al. 2020. COVID-19 pandemic and its impact on service provision: A cardiology prospect. *Acta Cardiol*: 10.1080/00015385.2020.1787636
36. Ganatra S, Dani SS, Shah S, et al. 2020. Management of Cardiovascular Disease During Coronavirus Disease (COVID-19) Pandemic. *Trends Cardiovasc Med* 30(6): 315-25
37. Tomasoni D, Italia L, Adamo M, et al. 2020. COVID-19 and heart failure: from infection to inflammation and angiotensin II stimulation. Searching for evidence from a new disease. *Eur J Heart Fail* 22(6): 957-66
38. Loungani RS, Rehorn MR, Newby LK, et al. 2020. A care pathway for the cardiovascular complications of COVID-19: Insights from an institutional response. *Am Heart J* 225: 3-9
39. Srivastava K. 2020. Association between COVID-19 and cardiovascular disease. *Int J Cardiol Heart Vasc* 29: 100583-83
40. 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
41. Arentz M, Yim E, Klaff L, et al. 2020. Characteristics and Outcomes of 21 Critically Ill Patients With COVID-19 in Washington State. *JAMA* 323(16): 1612-14
42. Goha A, Mezue K, Edwards P, et al. 2020. COVID-19 and the heart: An update for clinicians. *Clin Cardiol*: 10.1002/clc.23406
43. Petrilli CM, Jones SA, Yang J, et al. 2020. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. *BMJ* 369: m1966



44. Casas-Rojo JM, Antón-Santos JM, Millán-Núñez-Cortés J, et al. 2020. Clinical characteristics of patients hospitalized with COVID-19 in Spain: results from the SEMI-COVID-19 Registry. *Rev Clin Esp (English Edition)* 220(8): 480-94
45. Inciardi RM, Adamo M, Lupi L, et al. 2020. Characteristics and outcomes of patients hospitalized for COVID-19 and cardiac disease in Northern Italy. *Eur Heart J* 41(19): 1821-29
46. Karagiannidis C, Mostert C, Hentschker C, et al. 2020. Case characteristics, resource use, and outcomes of 10 021 patients with COVID-19 admitted to 920 German hospitals: an observational study. *Lancet Respir Med* 8(9): 853-62
47. Mehra MR, Desai SS, Kuy S, et al. 2020. Cardiovascular Disease, Drug Therapy, and Mortality in Covid-19. *N Engl J Med* 382(25): e102
48. European Society of Cardiology. 2020. *ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic*. Brussels: ESC
49. Stefanini Giulio G, Azzolini E, Condorelli G. 2020. Critical Organizational Issues for Cardiologists in the COVID-19 Outbreak. *Circulation* 141(20): 1597-99
50. Devaux CA, Rolain J-M, Raoult D. 2020. ACE2 receptor polymorphism: Susceptibility to SARS-CoV-2, hypertension, multi-organ failure, and COVID-19 disease outcome. *J Microbiol Immunol Infect* 53(3): 425-35
51. Kander T. 2020. Coagulation disorder in COVID-19. *Lancet Haematol* 7(9): e630-e32
52. Sakr Y, Giovini M, Leone M, et al. 2020. Pulmonary embolism in patients with coronavirus disease-2019 (COVID-19) pneumonia: a narrative review. *Ann Intensive Care* 10(1): 124
53. Bonow RO, Fonarow GC, O’Gara PT, et al. 2020. Association of Coronavirus Disease 2019 (COVID-19) With Myocardial Injury and Mortality. *JAMA Cardiol* 5(7): 751-53
54. Nishiga M, Wang DW, Han Y, et al. 2020. COVID-19 and cardiovascular disease: from basic mechanisms to clinical perspectives. *Nat Rev Cardiol* 17(9): 543-58
55. Lippi G, South AM, Henry BM. 2020. Electrolyte imbalances in patients with severe coronavirus disease 2019 (COVID-19). *Ann Clin Biochem* 57(3): 262-65
56. DeFilippis EM, Reza N, Donald E, et al. 2020. Considerations for Heart Failure Care During the COVID-19 Pandemic. *JACC Heart Fail* 8(8): 681-91
57. Blake I. Nearly half of heart patients find it harder to get medical treatment in lockdown. [Updated 5/06/20]. Available from: <https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2020/june/half-heart-patients-harder-get-medical-treatment-lockdown> [Accessed 13/10/20]
58. Heart Failure Hub Scotland. 2020. *NHS Scotland Heart Failure Transition and Recovery Plan in response to COVID-19*. Scotland: Heart Failure Hub Scotland
59. Hill L, Beattie JM, Geller TP, et al. 2020. Palliative care: Essential support for patients with heart failure in the COVID-19 pandemic. *Eur J Cardiovasc Nurs* 19(6): 469-72
60. Fersia O, Bryant S, Nicholson R, et al. 2020. The impact of the COVID-19 pandemic on cardiology services. *Open Heart* 7(2): e001359
61. Alliance for Heart Failure. 2020. *Written evidence submitted by the Alliance for Heart Failure (DEL0262)*. United Kingdom: Alliance for Heart Failure
62. Gorodeski EZ, Goyal P, Cox ZL, et al. 2020. Virtual Visits for Care of Patients with Heart Failure in the Era of COVID-19: A Statement from the Heart Failure Society of America. *J Card Fail* 26(6): 448-56
63. Remuzzi A, Remuzzi G. 2020. COVID-19 and Italy: what next? *The Lancet* 395(10231): 1225-28
64. Scherrenberg M, Frederix I, De Sutter J, et al. 2020. Use of cardiac telerehabilitation during COVID-19 pandemic in Belgium. *Acta Cardiol*: 10.1080/00015385.2020.1786625
65. Sankaranarayanan R, Hartshorne-Evans N, Redmond-Lyon S, et al. 2020. The Impact of COVID-19 on the Management of Heart Failure - A United Kingdom Patient Questionnaire Study. *medRxiv*: 10.1101/2020.10.03.20205328

66. British Society for Heart Failure. 2020. A Position Statement from the British Society for Heart Failure. Available from: <https://www.bsh.org.uk/wp-content/uploads/2020/06/The-Recovery-Plan-Final.pdf> [Accessed 24/11/20]
67. Scherrenberg M, Wilhelm M, Hansen D, *et al.* 2020. The future is now: a call for action for cardiac telerehabilitation in the COVID-19 pandemic from the secondary prevention and rehabilitation section of the European Association of Preventive Cardiology. *Eur J Prev Cardiol*: 10.1177/2047487320939671
68. Schmidt C, Magalhães S, Barreira A, *et al.* 2020. Cardiac rehabilitation programs for heart failure patients in the time of COVID-19. *Rev Port Cardiol* 39(7): 365-66
69. Andersson C, Gerds T, Fosbøl E, *et al.* 2020. Incidence of New-Onset and Worsening Heart Failure Before and After the COVID-19 Epidemic Lockdown in Denmark. *Circ Heart Fail* 13(6): e007274
70. British Heart Foundation. 2020. Coronavirus and heart and circulatory diseases factsheet. Available from: <https://www.bhf.org.uk/what-we-do/our-research/heart-statistics> [Accessed 2/11/20]
71. Colivicchi F, Di Fusco SA, Magnanti M, *et al.* 2020. The Impact of the Coronavirus Disease-2019 Pandemic and Italian Lockdown Measures on Clinical Presentation and Management of Acute Heart Failure. *J Card Fail* 26(6): 464-65
72. Mafham MM, Spata E, Goldacre R, *et al.* 2020. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. *The Lancet* 396(10248): 381-89
73. Shah N, Ahmed I, Nazir T. 2020. Heart failure-related hospitalisation and management during the COVID-19 pandemic: a reflection. *Eur J Heart Fail*: 10.1002/ejhf.1931
74. European Society of Cardiology. 2020. The collateral damage of COVID-19: cardiovascular disease, the next pandemic wave. [Updated 3/06/20]. Available from: <https://www.escardio.org/The-ESC/Advocacy/Shaping-policy-and-regulation/ESC-positions/the-collateral-damage-of-covid-19-cardiovascular-disease-the-next-pandemic-wav> [Accessed 28/10/20]
75. Bollmann A, Hohenstein S, Meier-Hellmann A, *et al.* 2020. Emergency hospital admissions and interventional treatments for heart failure and cardiac arrhythmias in Germany during the Covid-19 outbreak: insights from the German-wide Helios hospital network. *Eur Heart J Qual Care Clin Outcomes* 6(3): 221-22
76. Cleland JGF, Clark RA, Pellicori P, *et al.* 2020. Caring for people with heart failure and many other medical problems through and beyond the COVID-19 pandemic: the advantages of universal access to home telemonitoring. *Eur J Heart Fail* 22(6): 995-98
77. Bromage DI, Cannatà A, Rind IA, *et al.* 2020. The impact of COVID-19 on heart failure hospitalization and management: report from a Heart Failure Unit in London during the peak of the pandemic. *Eur J Heart Fail* 22(6): 978-84
78. UK Cabinet Office. 2020. Guidance: Staying at home and away from others (social distancing). [Updated 1/05/20]. Available from: <https://www.gov.uk/government/publications/full-guidance-on-staying-at-home-and-away-from-others/full-guidance-on-staying-at-home-and-away-from-others> [Accessed 15/10/20]
79. UK Government. 2020. Guidance on shielding and protecting people who are clinically extremely vulnerable from COVID-19. [Updated 2/12/20]. Available from: <https://www.gov.uk/government/publications/guidance-on-shielding-and-protecting-extremely-vulnerable-persons-from-covid-19/guidance-on-shielding-and-protecting-extremely-vulnerable-persons-from-covid-19#Clinically> [Accessed 28/10/20]
80. Jones L. 2020. BHF calls for clearer guidance on shielding and for clinically vulnerable people. [Updated 1/06/20]. Available from: <https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2020/june/bhf-calls-for-clearer-guidance-on-shielding-and-for-clinically-vulnerable-people> [Accessed 15/10/20]
81. NHS England. 2020. Aftercare needs of inpatients recovering from COVID-19. [Updated 5/06/20]. Available from: <https://www.pcrs-uk.org/sites/pcrs-uk.org/files/nhs-aftercarecovid.pdf> [Accessed 24/11/20]
82. Allan J, Powell D, Ferguson K, *et al.* 2020. Breaks at breaking point—doctors need to take time out in a pandemic [blog]. *BMJ* 2 Oct. Available from: <https://blogs.bmj.com/bmj/2020/10/02/breaks-at-breaking-point-doctors-need-to-take-time-out-in-a-pandemic/> [Accessed 28/10/20]
83. Bielicki JA, Duval X, Gobat N, *et al.* 2020. Monitoring approaches for health-care workers during the COVID-19 pandemic. *Lancet Infect Dis* 20(10): e261-e67



84. Nguyen LH, Drew DA, Graham MS, et al. 2020. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. *Lancet Publ Health* 5(9): e475-e83
85. Wang D, Hu B, Hu C, et al. 2020. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA* 323(11): 1061-69
86. Samsky MD, DeVore AD, McIlvennan CK, et al. 2020. Heart Failure Clinical Trial Operations During the COVID-19 Pandemic. *Circ Heart Fail* 13(9): e007456
87. Ozkan J. 2020. Trying times for heart failure trials during the COVID-19 pandemic. *Eur Heart J* 41(18): 1715
88. European Centre for Disease Prevention and Control. 2020. *Infection prevention and control and preparedness for COVID-19 in healthcare settings, 4th version, 3 July 2020*. Stockholm: ECDC
89. NHS England. 2020. Clinical guide for the management of cardiology patients during the coronavirus pandemic. [Updated 20/03/20]. Available from: <https://www.bcis.org.uk/wp-content/uploads/2020/03/specialty-guide-cardiology-coronavirus-v1-20-march.pdf> [Accessed 28/10/20]
90. British Heart Foundation. 2020. Influencing Government and health services in response to Covid-19. Available from: <https://www.bhf.org.uk/what-we-do/policy-and-public-affairs/policy-response-to-covid-19> [Accessed 2/11/20]
91. Iyengar-Kapuganti RL, Patel N, Anastasius M, et al. 2020. Point-of-Care Ultrasound Findings and Clinical Outcomes in Patients with COVID-19. *J Am Soc Echocardiogr* 33(11): 1416-17
92. Jiménez-Rodríguez D, Santillán García A, Montoro Robles J, et al. 2020. Increase in Video Consultations During the COVID-19 Pandemic: Healthcare Professionals' Perceptions about Their Implementation and Adequate Management. *Int J Environ Res Public Health* 17(14): 5112
93. Jin K, Khonsari S, Gallagher R, et al. 2019. Telehealth interventions for the secondary prevention of coronary heart disease: A systematic review and meta-analysis. *Eur J Cardiovasc Nurs* 18(4): 260-71
94. Thomas E, Gallagher R, Grace SL. 2020. Future-proofing cardiac rehabilitation: Transitioning services to telehealth during COVID-19. *Eur J Prev Cardiol*: 10.1177/2047487320922926
95. Lang CC, Smith K, Wingham J, et al. 2018. A randomised controlled trial of a facilitated home-based rehabilitation intervention in patients with heart failure with preserved ejection fraction and their caregivers: the REACH-HFpEF Pilot Study. *BMJ Open* 8(4): e019649
96. Royal Cornwall Hospitals NHS Trust. 2020. Rehabilitation Enablement in Chronic Heart Failure (REACH-HF). Available from: <https://www.royalcornwall.nhs.uk/services/research-development-innovation/rehabilitation-enablement-chronic-heart-failure-reach-hf/> [Accessed 28/10/20]
97. De Filippo O, D'Ascenzo F, De Ferrari GM. 2020. Heart failure-related hospitalisation and management during the COVID-19 pandemic: a reflection. Reply. *Eur J Heart Fail*: 10.1002/ejhf.1939

To find out more about the Heart Failure Policy Network and this work, go to [www.hfpolicynetwork.org](http://www.hfpolicynetwork.org)

If you have any comments or questions, please get in touch with the authors at [info@hfpolicynetwork.org](mailto:info@hfpolicynetwork.org)

© 2020 The Health Policy Partnership Ltd. This report may be used for personal, research or educational use only, and may not be used for commercial purposes. Any adaptation or modification of the content of this report is prohibited, unless permission has been granted by The Health Policy Partnership.