**DELIVERING HEALTHCARE REMOTELY TO CARDIOVASCULAR PATIENTS DURING COVID-19.**

**A RAPID REVIEW OF THE EVIDENCE.**

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**Abstract**

Background: Although attention is focused on addressing the acute situation created by the COVID-19 illness, it is imperative to continue our efforts to prevent cardiovascular morbidity and mortality, particularly during a period of prolonged social isolation which may limit physical activity, adversely affect mental health and reduce access to usual care. One option may be to deliver health care interventions remotely through digital health care solutions. Therefore, the aim of this paper is to bring together the evidence for remote healthcare during a quarantine situation period to support people living with cardiovascular disease during COVID-19 isolation.

Methods: The PubMed, CINAHL, and Google Scholar were searched using telehealth OR digital health OR mHealth OR eHealth OR mobile apps AND COVID-19 OR quarantine search terms. We also searched for literature relating to cardiovascular disease AND quarantine.

Results: The literature search identified 45 potentially relevant publications, out of which 9 articles were included. Three overarching themes emerged from this review: (1) Preparing the workforce and ensuring reimbursement for remote healthcare, (2) Supporting mental and physical health and (3) Supporting usual care

Conclusion: To support people living with cardiovascular disease during COVID-19 isolation and to mitigate the effects of quarantine and adverse effect on mental and physical well-being, we should offer remote healthcare and provide access to their usual care.

**Keywords**

Cardiovascular disease, COVID 19, remote healthcare, digital health, telehealth, quarantine, isolation

**Background**

Cardiovascular disease (CVD) is estimated to be responsible for almost 18 million deaths per year globally.1 Although attention is focused on addressing the acute situation created by the COVID-19 illness, it is imperative to continue our efforts to prevent cardiovascular morbidity and mortality, particularly during a period of prolonged social isolation which may limit physical activity and adversely affect mental health. The virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), first emerged in December 2019. By early April 2020 there were over a million confirmed cases of COVID-19 reported worldwide, with 46 891 deaths.2 Worryingly, complications and deaths appear to be higher in those with known CVD.3 While preparations for management of acute cases and field hospitals being established dominate our news, another alarming trend is appearing: people with chest pain or other cardiac symptoms that need acute care are delaying presentation at hospital, potentially with catastrophic effects.4-6 It is suggested that the causes of delays for chest pain presentation are likely multifactorial, but may include a fear of attending hospital due to perceived risk of contracting an infection, or because of limited emergency medical services due to staff who are ill, or self-isolating, or systemic overload.6 Furthermore, patients observe how overstretched the healthcare system is, and fear creating an additional burden, so minimise symptoms.6

In addition to delaying presentation, people with CVD are facing the largest quarantine that the world has ever known. Approximately one-third of the world is now in some form of quarantine.7 The word quarantine originates from the Italian word for forty ‘quaranta’, since people with illness that were feared to be contagious were isolated from others for forty days.8 During this current crisis people may face much longer in quarantine. For example, in the UK during COVID-19, several groups of people, who are considered to be at very high risk, have been advised to remain in isolation for 12-weeks.9 This form of isolation is being described as ‘shielding’ and includes staying at home, avoiding situations where you come into contact with other people, such as in a supermarket queue or on public transport, asking others if they can shop for basic essentials, collecting prescriptions, or do anything that can help you to avoid going out. Even in the moderate risk group, which the majority of people living with CVD will be in, the request is to practice ‘stringent social distancing’.9

Consequently, it is unsurprising that global physical activity levels are falling. A study in the US has shown that physical activity, measured objectively by Fitbit trackers, has fallen by 39% in the month of March since social distancing measures were implemented.10 This is of great concern, as physical activity has well-established benefits for primary11 and secondary prevention of CVD. In patients with CVD12 13 physical activity can lead to a reduction in cardiovascular mortality and the risk of hospital admissions and improvement of quality of life.14 Indeed, 1 in 4 adults in the world and approximately half of CVD patients were already insufficiently active,15 and this will be adversely affected by any form of prolonged isolation.

As well as adversely affecting physical health, it is clear that psychosocial health will be impacted by social isolation and quarantine. A rapid review of the psychological impact of quarantine highlighted that frustration and boredom are common, and that many people experience anxiety and depression.16 Low mood and irritability are particularly noted, and the authors comment on the importance of minimising the duration of quarantine, and of effective and rapid communication.16 One study showed that after the Severe Acute Respiratory Syndrome (SARS) quarantine, some people experienced depressive symptoms for at least three years following quarantine.17 Because anxiety and depression are well known predictors of poor outcome in CVD,18 it is essential that people with CVD are supported and have clear channels of communication that are relevant to their health during the current COVID-19 pandemic.

Although the importance of clear communication with people who can offer appropriate support would appear to be vital, many providers of health advice for people with CVD, such as cardiac rehabilitation staff, are being redeployed into acute care. One option may be to deliver health care interventions remotely through digital health care solutions. Therefore, the aim of this paper is to bring together the evidence for remote healthcare during a quarantine situation period to support people living with CVD during COVID-19 isolation.

**Methods**

A rapid review methodology was used to bring together the evidence.19 Searches were conducted between 27th March- 1st April 2020. We searched PubMed, CINAHL, and Google Scholar. Search terms included telehealth OR digital health OR mHealth OR eHealth OR mobile apps AND COVID-19 OR quarantine. We also searched for literature relating to cardiovascular disease AND quarantine. We included papers published in English that focused on use of technology to support people with cardiovascular disease to manage their health during times of quarantine. We excluded papers that used technology to identify clusters of COVID-19 or to track or predict outbreaks of the virus. Our search was limited to the years 2000-2020 to ensure we captured information about quarantine in the digital age. A subsample of 20% of abstracts were reviewed by a second reviewer. Risk of bias was not assessed due to the limited literature available and the lack of trials in this area.

**Results**

We reviewed over 16,000 titles (Figure 1). Fifty-eight abstracts were reviewed, 45 full text papers were considered, and nine papers fit the inclusion criteria for this review. All included papers came from high income countries. All were ‘expert opinion’ papers, only one paper came from prior to 2020 and this was a book chapter. Quality of the evidence was therefore not assessed, as there were no trials included. Three overarching themes emerged from this review:

1. **Preparing the workforce and ensuring reimbursement for remote healthcare**

Overall, all papers commented on the importance of telehealth to improve access to services during any form of quarantine. Over ten years ago, it was recognised that having a digitally connected home could mitigate the effects of quarantine.20 Despite that, it is clear that substantial work needs to be undertaken to prepare the health systems for delivering health care remotely. Firstly, mechanisms need to be made available to reimburse health care providers for work done remotely.21-23 Secondly, staff may need upskilling and resources may need to be made available to provide suitable equipment and technology to ensure rapid deployment of remote health solutions.22 24 Staff who already have skills in remote delivery could not only be leveraged to provide support to people with CVD, but could also provide training and support to those who are new to it.24

1. **Supporting mental and physical health**

The adverse effects on mental and physical well-being in patients were noted.25 It is recommended that providers transition to providing remote resources to support people living with CVD.26 In particular, it was highlighted that patients are usually offered cardiac rehabilitation following on from a cardiac event, but this may have ceased as providers are called back to acute care roles to support immediate management of COVID-19.26 Therefore, given the well-known benefits of cardiac rehabilitation on cardiovascular risk factors, quality of life, and reduction of morbidity and mortality, transitioning existing cardiac rehabilitation programmes online seems to be critical in maintaining the health of people with CVD.26

1. **Supporting usual care**

For people with CVD, it is vital that they have access to their usual care. They need to be able to access their medications, and online pharmacies could provide a solution to enabling vulnerable people to obtain medications.20 27 Furthermore, access to healthy food and other essential supplies can be obtained remotely.20 It was noted that anxiety during the recent months has led to panic buying,28 and this is something that may make obtaining essential supplies remotely more challenging for those who have previously had limited access to technology and are having to rapidly upskill in use of digital technology.

The findings of this review are synthesised into our ‘top ten recommendations for remote delivery of healthcare to CVD patients’ (Box 1). These overarching themes, together with what our own experience of looking after patients with CVD in the community led us to develop a conceptual model for a CVD patient (Figure 2) which highlights the key findings of this review, with the addition of one essential point. People with CVD need to know that it is still vitally important that they seek appropriate health care if they experience sudden changes in their symptoms. For example, if a patient has chest pain, they should still call for an ambulance. Although the ‘stay at home’ message is vitally important, CVD emergencies will still occur, and if people with CVD don’t seek help in a timely fashion the consequences could be grave.

**Discussion**

This review indicates a large body of literature has been generated in a small amount of time, but there is very little work conducted to understand the effects of prolonged quarantine on cardiovascular health, or outcomes of remote delivery of advice and support to people living with CVD during quarantine. Consequently, recommendations to use telehealth during COVID-19 are written by experts in the field who have experience of remote delivery of health care solutions. The 2007 paper by Kun suggests that we could have been better prepared for a quarantine scenario, and emphasises the need to proactively develop protocols and systems for rapid change to healthcare delivery.20 While our review highlighted the importance of reimbursement mechanisms, we contend that telehealth has now moved beyond an optional extra, to become and essential service that must be funded.

Despite increased requirements for the patient to initiate and maintain self-care and self-management in the COVID-19 social distancing context, discussion on these points was very limited in the literature reviewed. As self-care tends to decline over time29 and support from health professionals is independently predictive of long-term adherence to cardiac treatment,30 strategies that promote independent self-care are urgently needed. Strategies that promote increased perceived control may be beneficial given the association with self-care in Lilijeroos et al (2020).29 In most non-invasive remote health care patients and/or family caregivers need to take an active role and be motivated to gather data to signs and symptoms (self-care monitoring) and to respond to able to changes if needed (self-care management). Some patients might experience challenges for remote health care since they suffer from sensory, cognitive and physical decline and this needs to be taken into account when offering telehealth.31

It is probable that people with CVD will experience lasting effects of social isolation and reduced physical activity beyond COVID-19. Overall, this review suggests that proactive use of telehealth could mitigate some of these effects. People living with CVD are frightened and have many questions about COVID-19 and what they should or should not do. A recent paper from the European Society of Cardiology patient forum highlights the many questions that patients are asking about their health during COVID-19 and offers answers to these,32 although it is likely that people will have many more concerns that could be effectively supported through remote services. Although the papers in our review did not highlight the importance of routine follow-up appointments, including with GPs, cardiologists, and specialist nursing or allied professional services, it is our contention that continued support and care that will reduce some of the potential adverse effects people with CVD may experience following quarantine.

In addition, other sources of support are available, including patient forums. Cardiac patients are interested in other patient's experiences33 and social media provides a useful tool for patients to meet and provide mutual support.34 There are many examples of patient forums, for example, PatientsLikeMe (<https://www.patientslikeme.com/>) or the Arrhythmia Alliance (<https://www.heartrhythmalliance.org>), but the benefits of such forums is poorly investigated. Referring patients to an appropriate website may be necessary to support at distance, but when doing so, healthcare professionals need to ensure that the content of the site is appropriate and user-friendly.35 The Heart Failure Matters website is an example of a user-friendly website with reliable information 36 which offers updates on the consequences of the COVID-19 pandemic for heart failure patients in 10 languages and also gives opportunity to discuss experiences via a dedicated Facebook forum (<https://www.heartfailurematters.org>).

Although online resources are not listed in standard academic databases, there is a range of available tools that are being made available at this time, and we have highlighted a few that are available in Table 2. This list is not intended to be exhaustive, and should only be used as a guide. One exemplar from this list is TeleCheckAF- a programme that started in March 2020, and now has 13 sites enrolled across Europe. Scalability of services depends on cooperation, and pockets of excellence will only benefit a minority of people. Therefore, it is critical that we share best practice and ensure we collaborate to support people with CVD.

Of course, with any new service, there must be caveats: we do not know what the outcomes of deploying remote healthcare during quarantine will actually be. Although studies have shown favourable outcomes for people with CVD who access healthcare through remote technology, they have also noted that these are complex interventions, and the ‘active ingredient’ is always hard to determine.37 Indeed, no single intervention has been delivered without some form of face-to-face component, even if it is only to recruit participants into the study. Furthermore, the quality of communication delivered via remote technology is likely to be significant in ensuring appropriate healthcare access. In a recent study looking at the effects of telecare on presentation with myocardial infarction, skilled probing to elicit an accurate history was critical in timely use of emergency services.38 Similarly, the paper by Greenhalgh et al emphasised the need for training to conduct remote healthcare delivery effectively.24 This is echoed by study conducted to deploy telemedicine for stroke patients, which nurses had a vital role to play in ensuring uptake, but that they may also feel less prepared or willing to adopt telemedicine than non-nursing colleagues.39 One of the challenges we may face is preparing staff to provide remote care, when training must also be conducted remotely.

One key obstacle that has not been addressed in this review is global access to digital technology. There is a potential that making services available through digital technology may exclude those who cannot afford access to digital devices, and it is likely those who are most vulnerable who will suffer most. All of the included literature came from high income countries, where access to the Internet is as high as 95%.40 Although rapid deployment of technology is possible, it needs to be matched by an effort to ensure that everyone who needs support can access it.

Finally, this review was conducted in a very short timeframe, and the literature has been evolving daily. Despite that, there are few papers that contain original research. Our findings from this review suggest that what is urgently needed is long-term monitoring of the effects of quarantine on cardiovascular health and evaluation of remote healthcare on the quality of life and health care outcomes for people with CVD. We strongly encourage our colleagues who are delivering care to CVD patients remotely to audit their programmes and to report these findings to inform future developments. It is likely that patients will suffer if all resources are diverted to acute care, so we call on health care policy makers and payers to ensure that routine care is not overlooked, and to support people with CVD during and beyond COVID-19.

**Limitations**

Due to the rapidly evolving literature on this topic, it is likely that more has been published even since the initial search was conducted. It is also possible that the search terms were not exhaustive, since we did not specifically look at the terms ‘social isolation’ or ‘social distancing’. The papers are predominantly calls to action to improve health care management with digital interventions and it is unclear to what extent these interventions have on CVD. A large number of resources may not have been identified, as they are being deployed. Longer term outcomes of quarantine and CVD are not known.

**Conclusions**

There is very little literature on the effects of quarantine on people living with CVD, but experts agree that telehealth is likely to provide an opportunity to ensure people living with CVD are supported during COVID-19. Urgent research is required during this crisis, and systems must be developed and supported that enable staff to upskill and allow long-term follow up of people with CVD who have experienced quarantine, social isolation, or social distancing.

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