

BCS Editorial

## COVID-19: a practical guide to cardiac assessment and treatment

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### Introduction

The global COVID-19 pandemic has emerged as the greatest public health emergency in recent history. Although predominantly a disease of the respiratory system, there is emerging evidence that COVID-19 has a number of cardiac manifestations. Early data from China suggests that patients with cardiac comorbidities, especially systemic hypertension, appear to be particularly susceptible to COVID-19 infection and these individuals are more likely to have a severe course of the disease.<sup>1-4</sup> In addition, cardiovascular complications including myocardial injury, myocarditis and arrhythmia are common and are associated with a poor prognosis.<sup>1,5</sup> Thus, it is likely that cardiologists will be asked to see large numbers of suspected or confirmed cases of COVID-19 as the pandemic develops. This editorial aims to provide a practical guide to the cardiac assessment and treatment of patients with COVID-19.

### Take Home Messages

- A significant minority of patients with COVID-19 develop cardiac complications.
- A modified approach to clinical assessment of patients is needed to minimise risk of infection to patients and staff.
- Routine testing of troponin or NT-proBNP is not recommended in COVID-19 patients with no cardiac symptoms.
- Where possible we should try to maintain current guideline recommended therapy for cardiac conditions.
- The disruption of normal cardiac services due to the pandemic cannot be under-estimated.

### COVID or non-COVID?

All patients should have a clinical assessment of the likelihood of COVID-19 infection. If COVID-19 infection is suspected, patients should have nasal and pharyngeal swab testing for RT-PCR detection of the SARS-CoV-2 viral RNA. Multiple swabs may be needed as the sensitivity of swab testing has been reported as low as 60%. If there are multiple negative swabs but the clinical suspicion of COVID disease remains high, then CT thorax is a useful investigation typically showing ground-glass changes or consolidation, with up to 88% sensitivity for diagnosis of the condition.<sup>6</sup> Typical and atypical CT thorax features can be found in an accompanying BCS editorial.<sup>7</sup> It is important to assess whether the patient's clinical condition will allow for certain tests to be deferred until COVID status is confirmed.

### About the author

Dr Ashwin Radhakrishnan graduated with a BMedSc and BM (Hons) from the University of Southampton in 2012. He is a Cardiology Registrar in the West Midlands Deanery and is currently undertaking an MD at the University of Birmingham, studying the role of coronary microvascular dysfunction in chronic kidney disease.



## PPE

It is extremely important that appropriate PPE is worn to protect healthcare workers from the risk of COVID infection. **Figure 1** summarises current Public Health England and British Cardiac Intervention Society (BCIS) guidelines on PPE for cardiology.<sup>8,9</sup> Type 2 PPE use, including a fit tested FFP3 respirator (see **Figure 2**), is recommended in the cardiac catheter laboratory (cath lab) for the 1<sup>st</sup> and 2<sup>nd</sup> operators. This is particularly important in

the context of primary percutaneous intervention (PPCI) when cardiac arrest and the subsequent need for cardiopulmonary resuscitation ± intubation is a relatively high possibility. FIT testing should be performed within your local department by a trained individual. Transoesophageal echocardiography is also considered high risk of aerosolisation and type 2 PPE should be worn.

**Figure 1.** Guidance for use of PPE in Cardiology settings

	Gloves	Apron	Gown	Eye protection	Surgical mask	FFP3 respirator
Assessing patients on ward	Green	Green	Red	Yellow	Green	Red
Assessing patients in COVID ED	Green	Red	Green	Green	Red	Green
TTE	Green	Red	Green	Green	Green	Red
TOE	Green	Red	Green	Green	Red	Green
Cath lab	Green	Red	Green	Green	Red	Green

Green is recommended, orange is optional, red is not required. Adapted from <sup>8</sup>. ED emergency department, PPE personal protective equipment, TTE transthoracic echocardiography, TOE transoesophageal echocardiography.



**Figure 2.** FFP2 (left) and FFP3 (right) respirators

FFP3 respirator is a protective mask with a mechanical filter that prevents inhalation of viral particles. Characterised by blue (FFP2) or red (FFP3) elasticated bands respectively. FFP3 has higher aerosol filtration and lower rate of internal leak. Healthcare workers can be FIT tested in their local hospital by trained individuals to ensure there is no leak.

## Clinical assessment

The infectious nature of the pathogen and the real risk for healthcare workers from repeated exposure to infected patients means that an altered approach to clinical assessment is necessary:

- Collate all available information before approaching the patient. This is preferably done remotely if possible. Review all previous documentation, bloods, ECG and imaging. This will allow you to focus your history and examination.
- Protect yourself! Ensure that you wear appropriate personal protection equipment (PPE) – see above. Ensure that the patient wears a mask and turns their head away from you during clinical examination.
- Take a focussed history, concentrating on the presence of cardiac symptoms that warrant further investigation. Maintain a distance (2m) from the patient when taking a history.
- Ask yourself which aspects of the clinical examination is necessary and will add to the diagnosis. Make use of clinical observations and any cardiac monitoring that is available.
- Avoid unnecessary duplication – if the patient has already been examined by a colleague then a repeat clinical examination may not be necessary.
- Make use of clinical investigations– e.g. an echocardiogram if available will identify valve disease, a chest radiograph showing pulmonary oedema helps in the diagnosis of left ventricular failure.
- Limit trips to the patient – try to do all necessary tasks in one trip, to avoid repeated donning and doffing of PPE. This is more efficient and will reduce unnecessary waste of scarce equipment.

## The role of troponin testing

Acute cardiac injury (defined as high sensitivity troponin >99th percentile)<sup>10</sup> appears prevalent among patients with COVID-19. Chinese data shows that acute cardiac injury is present in 7-44% of patients with COVID-19 and is more common in older patients, patients with comorbidities and patients requiring intensive care.<sup>1,4,5</sup> Thus an elevated troponin is a very non-specific finding and troponin elevation alone is insufficient to make a

diagnosis of ACS. A recent statement from the American College of Cardiology recommends that:

**“clinicians are advised to only measure troponin if the diagnosis of acute myocardial infarction is being considered on clinical grounds”.**<sup>11</sup>

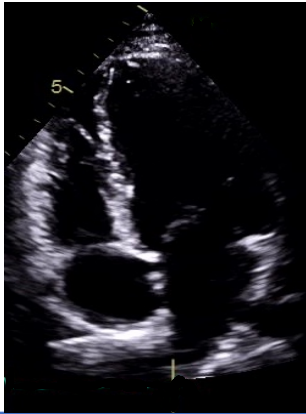
It is important that this concept is disseminated to ED and medical teams who are involved in the treatment of patients with COVID-19, to avoid unnecessary troponin measurement and potential clinical harm from unnecessary antiplatelet therapy administration.

## Echocardiography

Transthoracic echocardiography can be a very useful investigation in the assessment of cardiac complications in COVID-19 disease. However, this needs to be balanced against the risk of infection to echocardiographers from prolonged close exposure to infected patients. If possible, TTE should be deferred until COVID-19 status confirmed.

The British Society of Echocardiography (BSE) recommend that for patients with confirmed or suspected COVID-19 disease, only a focused level 1 scan should be performed.<sup>12</sup> This allows assessment of right and left ventricular function as well as detection of any major structural valve disease.<sup>13</sup> However, more complex pathologies may not be detected and a formal departmental scan at a later date would be recommended. The following recommendations should be followed to minimise risk (see **Figure 3**). For patients with elevated troponin, TTE should only be performed if it is expected to meaningfully affect the patient's outcome.<sup>11</sup>

TOE is felt to be higher risk of aerosolisation of viral particles and thus the BSE currently recommends that all routine TOE is cancelled. TOE should only be performed when it will immediately change management and should be a consultant cardiologist decision. TOE should be conducted with level 2 PPE.<sup>14</sup>

**Figure 3.** BSE recommendations for TTE in COVID-19

1. Is the scan necessary or can it be deferred
2. Use dedicated machine for COVID-19 patients
3. Wear appropriate PPE
4. Scan at bedside
5. Avoid ECG – use time loops
6. Focussed Level 1 scan <sup>a</sup>
7. Do measurements offline
8. Ensure appropriate cleaning of machine

<sup>a</sup> Level 1 scan refers to the BSE dataset for emergency echocardiography, comprising of 17 images.<sup>13</sup> Adapted from <sup>12</sup>. ECG electrocardiogram, PPE personal protective equipment, TTE transthoracic echocardiography.

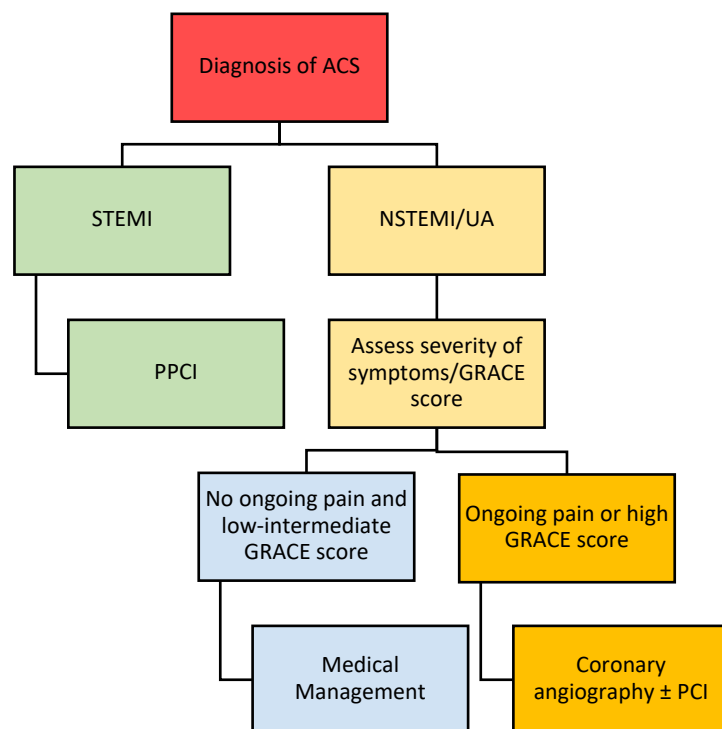
### Acute coronary syndromes

Chinese protocols at the height of the pandemic recommended thrombolysis as the initial reperfusion strategy in STEMI patients with suspected or confirmed COVID-19, with percutaneous coronary intervention (PCI) reserved for patients who were low risk or confirmed negative COVID-19.<sup>15</sup> However BCIS are clear that the current UK advice is that primary PCI should be the default treatment strategy for patients with STEMI, due to significantly higher rates of reperfusion, better left ventricular function, fewer complications and a shorter hospital stay.<sup>16</sup> For patients with NSTEMI, particularly in patients with a low or intermediate GRACE score ( $\leq 140$ ), medical treatment and early discharge from hospital may be a pragmatic treatment choice in the current climate. However coronary angiography and PCI should still be considered for patients with ongoing symptoms despite medical treatment, or signs of haemodynamic instability. A suggested treatment algorithm is shown in **Figure 4**.

Certain modifications to normal practice are in place at my institution and may be appropriate if local resources allow:

- All patients should have clinical assessment of COVID status prior to a procedure. If possible, the procedure should be deferred until COVID status is confirmed.
- Where possible, PCI centres should ideally operate a “COVID cath lab” and a “non COVID cath lab” to minimise cross contamination of patients and staff.

- Patients with ACS should have an echocardiogram prior to discharge if possible as it is not clear when routine outpatient services will resume.
- A strategy of complete revascularisation of all significant lesions during the index procedure or prior to discharge should be considered as timely staged outpatient treatment of residual coronary artery disease may not be feasible in the next few months. This strategy has evidence of some benefit as demonstrated in the COMPLETE trial<sup>17</sup> and has been discussed in a previous BCS editorial.<sup>18</sup>

**Figure 4.** Suggested treatment algorithm for acute coronary syndrome during COVID-19 pandemic

## Arrhythmias

A direct arrhythmogenic effect of the SARS-CoV-2 virus has not been demonstrated. However, patients with COVID-19 infection are at higher risk of arrhythmia due to both cardiomyopathy and myocarditis as well as the QT interval prolonging effect of potential therapies such as hydroxychloroquine.<sup>19</sup> Bradyarrhythmia has also been reported.<sup>20</sup> Telemetry should be undertaken in patients with arrhythmia or high risk of arrhythmia due to concurrent medication and can be used in lieu of repeated ECGs to monitor QT<sub>c</sub> interval in high risk patients. Treatment of arrhythmias is as per conventional management. If temporary or permanent pacing is required, level 2 PPE should be worn.

## Heart failure

Patients with suspected heart failure requiring admission should also be screened for COVID-19 given the overlap of symptoms. Similar to troponin, N Terminal pro brain natriuretic peptide (NT-proBNP) is also often elevated in COVID-19 infection. An elevated NT-proBNP should not automatically trigger investigation for heart failure, if there are no symptoms to suggest this.<sup>11</sup> Level 1 echo is sufficient to diagnose impaired ventricular systolic function and to guide management of heart failure. After a period of inpatient stabilisation, early discharge and telephone follow up should be carried out to allow continued titration of medication in the community. Patients should be advised to monitor weight at home. Heart failure services should put in place mechanisms to allow bloods to be done in the community to monitor renal function and electrolytes, either through GP surgeries or satellite clinics.

## Conclusion

Although predominantly a respiratory illness, it is clear that the cardiovascular complications of COVID-19 are common and serious. Nearly 1 in 4 patients diagnosed with COVID-19 have heart failure,<sup>21</sup> and over 3% of deaths in COVID-19 patients were attributed to myocarditis.<sup>1</sup> Cardiologists will have a key role in managing these complications. A modified approach to assessment and treatment is required to minimise risk to

patients and staff. The long-term effects and prognosis of COVID-19 patients with cardiac complications is unknown and may represent a significant future burden on cardiology services.

## Disclosures

None.

## Abbreviations

ACS acute coronary syndrome, BCIS British Cardiovascular Intervention Society, BCS British Cardiovascular Society, BSE British Society of Echocardiography, COVID-19 Coronavirus disease 2019, CT computed tomography, ECG electrocardiogram, GRACE global registry of acute cardiac events, NSTEMI non ST-segment elevation myocardial infarction, NT-proBNP N terminal-pro brain natriuretic peptide, RNA ribose nucleic acid, PCI percutaneous coronary intervention, PPE personal protective equipment, RT-PCR reverse transcriptase-polymerase chain reaction, QT<sub>c</sub> heart rate corrected QT interval, SARS-Co2 severe acute respiratory syndrome Coronavirus 2, TOE transoesophageal echocardiography, TTE transthoracic echocardiography, UK United Kingdom.

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