



## Editorial

# Myocardial Revascularization in COVID-19 Era

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## ARTICLE INFO

### Keywords:

Myocardial Revascularization;  
COVID-19 era

## ABSTRACT

Coronavirus disease 2019 (COVID-19) is a highly contagious disease caused by the coronavirus 2 that causes severe acute respiratory syndrome (SARS-CoV-2). More discussion is required to achieve the balance between clinical benefit and risk in the treatment of acute coronary syndrome (ACS) patients with COVID-19. The current COVID-19 pandemic prompts the need to evaluate criteria for indication and efficacy of the general safety protocols and particular cardiac catheterization laboratory (CCL) procedures to safeguard the patient and healthcare professionals.

## 1. Introduction

The coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome (SARS-CoV-2) virus has been at pandemic levels since March 2020. The Covid-19 pandemic had a significant impact on healthcare, involving the management of acute coronary syndrome (ACS). ACS encompasses a wide range of clinical manifestations, from ST-segment elevation myocardial infarction (STEMI) to Non-ST-segment elevation Acute Coronary Syndrome (NSTEMI-ACS), which includes NSTEMI and unstable angina pectoris (UAP). Regarding the COVID-19 era, resources from regular hospital services, such as Cardiac Catheterization Laboratory (CCL) facilities, have been redirected to focus on the care of COVID-19-infected patients. There is still a concern that the public would delay seeking emergency help due to the worry of contracting COVID-19 in health facilities.<sup>1,2</sup> It might cause serious consequences, particularly in conditions including acute coronary syndrome (ACS), where prompt treatment and coronary revascularization have been shown to reduce mortality and morbidity. Isolated reports were disclosed by local and regional authorities that the current pandemic is linked to a reduction in both presentations with acute myocardial infarction and revascularization procedures during the pandemic.

The risk of nosocomial viral transmission must be weighed against the benefits of revascularization in managing ACS in patients with confirmed or suspected COVID-19. In the event of a highly contagious pandemic, healthcare workers must remain vigilant and adhere to all safety precautions when within CCL.<sup>3,4</sup>

## 2. Revascularization

The necessary reorganization of healthcare facilities to combat the COVID-19 pandemic has highlighted numerous major challenges regarding the prioritization of invasive cardiac procedures. A systematic approach was needed to distinguish between people in a condition that allows invasive cardiac procedures to be postponed and those who need to be treated immediately. Maintaining the current level of care and providing timely revascularization to patients with ACS remain a challenge. All patients should be screened for SARS-CoV-2 as soon as possible after initial medical contact, regardless of the revascularization method used. Both coronary artery bypass graft (CABG) and percutaneous coronary intervention (PCI) procedures may be postponed in the majority of chronic coronary syndrome (CCS) cases.<sup>4,5</sup>

The timely reperfusion of STEMI patients should not be compromised even during the current pandemic. STEMI patients with a negative result in the rapid screening test for COVID-19 underwent standard STEMI management according to the 2017 ESC guideline for STEMI (Figure.1). Primary PCI is still the treatment of choice for reperfusion. Primary PCI routes may be postponed during the pandemic (according to various experiences - up to 60 minutes) due to the delay in administering therapy and the deployment of protective measures. If the target revascularization time was not able to be achieved and fibrinolysis was not a contraindication, fibrinolysis should be used as the first line of treatment. Furthermore, if severe pneumonia symptoms develop, the patient should receive conservative treatment

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<https://doi.org/10.21776/ub.hsj.2021.002.03.1>

Received 12 May 2021; Received in revised form 12 June 2021; Accepted 28 March 2021

Available online 1 July 2021

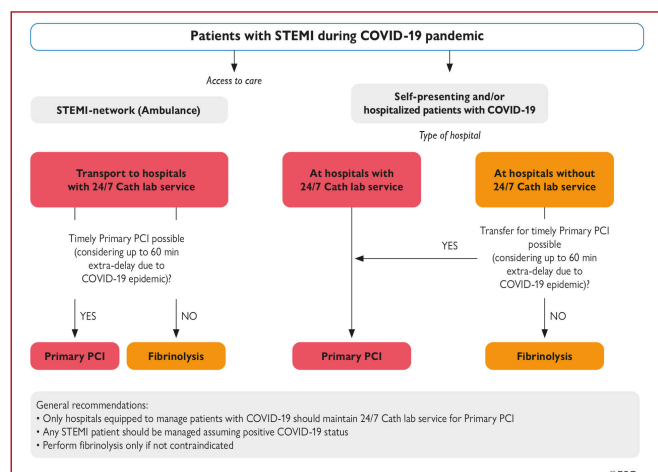
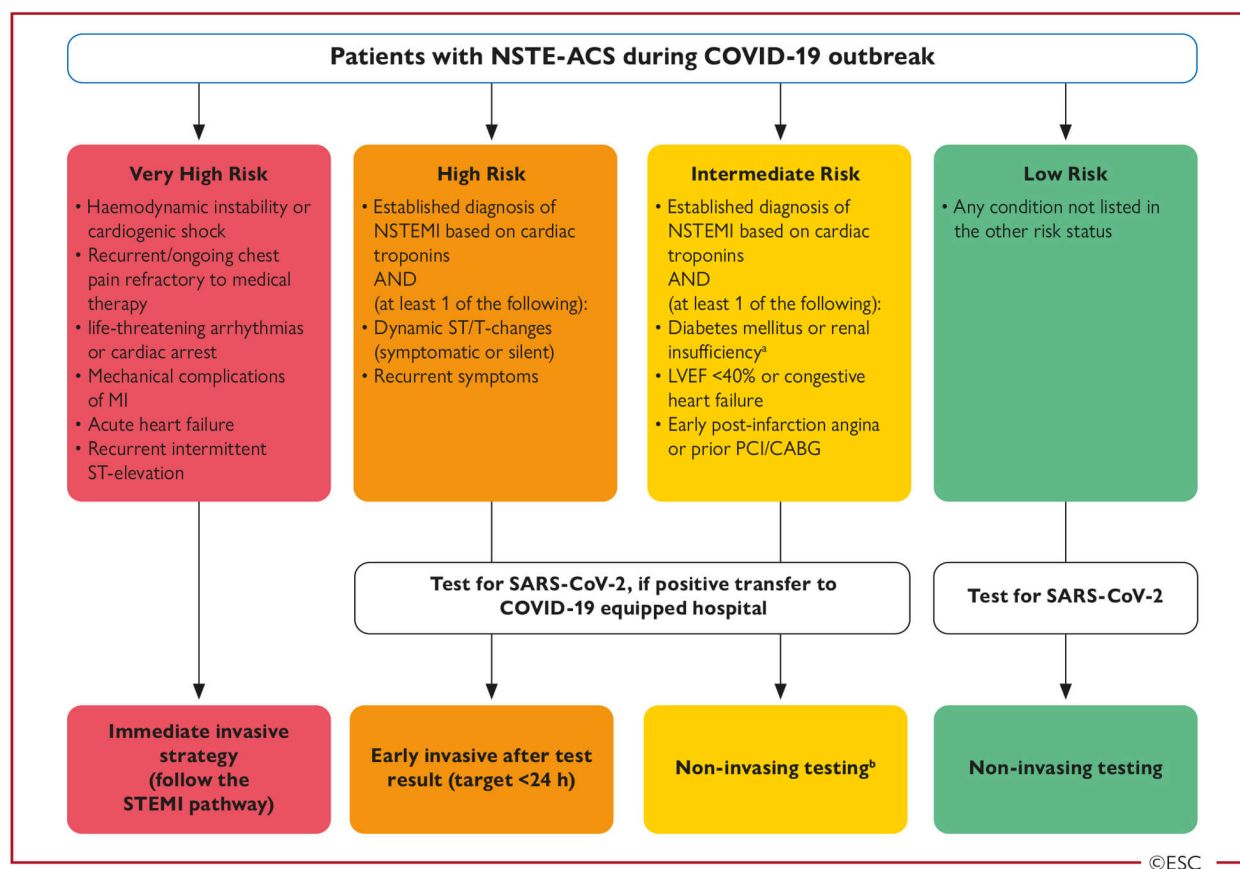


Figure 1. Management of STEMI during COVID-19 Pandemic

in an isolation inpatient facility. However, in case an unstable hemodynamic sign evolves without the signs and symptoms of severe pneumonia, primary PCI is recommended in isolated CCL if the benefits of PCI outweigh the risks.<sup>5,6</sup>

On the other hand, revascularization strategy for NSTEMI-ACS should be directed by risk stratification. Patients have to be classified into four risk groups (low risk, intermediate-risk, high risk, and very high risk) and treated appropriately. NSTEMI-ACS patient with a negative result in the rapid screening test for COVID-19 undergoes NSTEMI-ACS standard treatment according to the 2020 ESC guideline for NSTEMI-ACS. After initial medicinal therapy, revascularization of NSTEMI-ACS patients with confirmed or suspected COVID-19 but no symptoms may be delayed until negative SARS-CoV-2 test results are verified. Non-invasive testing could accelerate risk assessment, prevent unnecessary invasive procedures, and allow for early patient discharge. Patients with a positive SARS-CoV-2 test result should be transported to a facility that is prepared to treat COVID-19-positive patients for revascularization treatment. Similar to STEMI patients with a confirmed or suspected case of COVID-19, NSTEMI-ACS patients presenting with unstable hemodynamic signs without the signs and symptoms of severe pneumonia, invasive strategy is recommended in isolated CCL if the benefits of revascularization outweigh the risks. Nonetheless, in the COVID-19 age, when the health system is overburdened and CCL or operators are not readily available, non-invasive conservative treatment with early hospital discharge and scheduled clinical follow-up may be recommended.<sup>5,7</sup>



LVEF = left ventricular ejection fraction; MI = myocardial infarction; NSTEMI = non-ST-segment-elevation MI.

<sup>a</sup>estimated glomerular filtration rate <60 mL/min/1.73 m<sup>2</sup>.

<sup>b</sup>Coronary computed tomography angiography (CCTA) should be favored, if equipment and expertise are available. In low risk patients other non-invasive testing might be favored in order to shorten hospital stay. It is suggested to perform left ventriculography during catheterization if echocardiography not performed before cathlab admission.

Figure 2. Recommendation of Management of NSTEMI-ACS during COVID-19 Pandemic

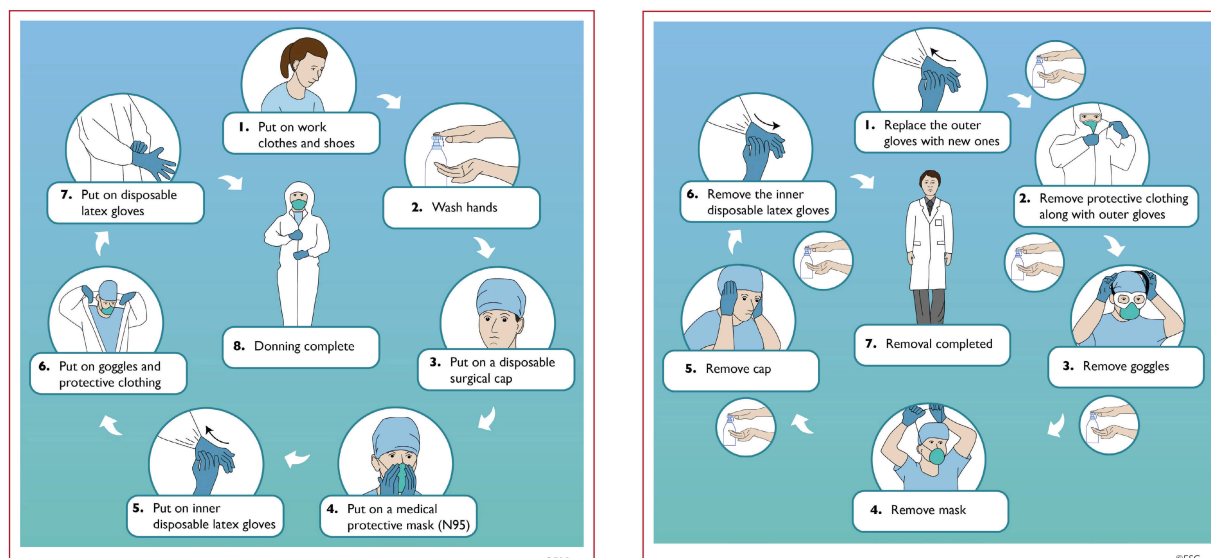


Figure 3. Guidance for (A) Donning and (B) Removing Personal Protective Equipment (PPE) in COVID-19 Era

### 3. Cath Lab Operation

During the COVID-19 era, case decisions in the CCL should be individualized, taking into account carefully weighting the balance of staff exposure and patient benefit. Thorough infection management with adequate personal protective equipment (PPE) should be a priority. Additionally, repeated wipe downs of frequently handled objects in control rooms (e.g., keyboards, doorknobs, etc) should be done regularly. Furthermore, when it's feasible, all items that cannot be adequately sanitized after each case should be discarded to prevent the risk of cross-contamination. Regular meetings and conferences should be conducted through the internet or over-the-phone connections.<sup>9,10</sup>

During the procedure, all CCL employees should wear N95 masks, protective glasses, disposable hats, full face shields, surgical gloves, disposable gowns, and shoe coverings. Full-face masks are recommended since they offer additional facial protection. Lead aprons should be worn beneath the PPE to avoid contamination. The lead coats and the room should be sanitized according to the recommendation from the infection control team after the procedure. UV light and 500 ppm diluted bleach, or other disinfectants, can be used to disinfect the area. Hand hygiene is particularly important before and after PCI to keep medical professionals and patients safe. It is not recommended to use non-invasive ventilation or a high-flow nasal cannula during PCI to prevent aerosol dissemination. While performing PCI, these protective measures aim to protect clinicians from infectious sources such as airborne, droplet, and direct contact.<sup>3,4,9,10</sup>

### 4. Conclusion

The COVID-19 pandemic has made a substantial impact on the health-care system and medical personnel's clinical behavior. Fibrinolysis may be used first for STEMI patients with confirmed or suspected COVID-19. PCI could be reserved for people who have failed fibrinolysis in STEMI if CCL for COVID-19 patients is available. Revascularization of NSTEMI-ACS patients with confirmed or suspected COVID-19 but free from symptoms following medical treatment may be postponed until negative SARS-CoV-2 test results are validated. The data on safeguarding measures regarding the current pandemic in the catheterization

laboratory is limited. Personnel safety plays an essential role in preventing in-hospital virus transmission and contamination.

### 5. Conflict of Interest

There is no conflict of interest

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