Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial commentary: The need for a streamlined approach to STEMI management during the COVID-19 pandemic ☆

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As the rates of infections with coronavirus disease 2019 (COVID-19) continue to rise exponentially globally, the management of acute cardiac conditions presents a challenge to clinicians. The review of the management of patients with ST-elevation myocardial infarction (STEMI) during the COVID-19 pandemic in this issue of *Trends in Cardiovascular Medicine* is timely and an important reminder of recommended measures and treatment algorithms for patients with cardiac emergencies during the pandemic [1]. Myocarditis, stress-induced and other non-ischemic cardiomyopathy, coronary spasm and non-specific myocardial injury in patients with COVID-19 infection can mimic STEMI presentations, leading to a complex decision tree for the management of these patients [2,3].

The key for optimal management of STEMI has been an early recognition of symptoms, utilizing systems of care that minimize delays in patient presentation to emergency departments (ED), and the rapid triage to cardiac catheterization laboratories (CCL) from the ED for primary PCI (PPCI) for a door-to-balloon time of less than 90 min or a transfer to hospitals with PPCI capacity if a first medical contact to balloon time of less than 120 min is achievable [4]. One of the major obstacles to optimal care during this pandemic has been a fear of the public for seeking medical care, which has led to a significant overall decrease in the rates of STEMI presentations and an increase in rates of at home cardiac arrests [5,6]. Furthermore, delays to care due to infection precautions that are appropriate and necessary to protect the healthcare workers present another cause for delays in door-to-balloon times and in the optimal revascularization of these patients. As Dr. Jain and colleagues correctly point out, STEMI cardiology and emergency medicine guidelines recommend to treat all patients presenting with coronary emergencies (STEMI and high-risk non-ST elevation myocardial infarction) as persons under investigation (PUI), and to use protective PPE with all CCL procedures during the pandemic [7]. The status of their COVID polymerase chain reaction (PCR) test performed in the ED is helpful for triaging purposes, as most hospitals have dedicated COVID units. The risk of infection from COVID can be significantly reduced if recommendations of donning and doffing personal protective equipment in the CCL are followed [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/infection-prevention-and-control].

The rates of thrombosis in the coronary arteries with microemboli in multiple organs suggest a systemic coagulopathy associated with COVID-19 infection. This process is associated with significantly elevated inflammatory (erythrocyte sedimentation test, high-sensitivity C-reactive protein, procalcitonin, ferritin, TNF-alpha, IL-6) and prothrombotic markers (d-dimer and prolonged prothrombin time) with multi-system organ dysfunction in advanced stages of the disease [8]. SARS-CoV-2 infects host cells using the angiotensin converting enzyme 2 (ACE-2) receptor, which is expressed in the heart, lungs, kidneys and gastrointestinal tract [9]. Pathology samples and autopsy series have demonstrated infection of the endothelial cells by the virus, with an increase in inflammatory cells leading to a vascular endothelialitis. This is in part due to a greater number of ACE-2 positive endothelial cells with associated destruction of endothelial morphology in multiple organs [10,11]. COVID-19 patients can present with pulmonary embolism [12], deep-vein thrombosis, cerebral venous sinus thrombosis, cerebrovascular accidents [13] and STEMIs. One of the main challenges that the authors touch upon in the review is the degree of thrombus burden in these patients, which is likely rooted in a combination of the activation of the coagulation cascade, endothelial dysfunction and increase in systemic inflammatory pathways [14]. With presentation for STEMI, this correlates with a significant increase in cardiac enzymes, and an increase in the need for the use glycoprotein (GP) IIb-IIIa or a novel parenteral $P2Y_{12}$ inhibitor agent (cangrelor), as well as the potential benefit for aspiration thrombectomy at the time of PPCI [15].

A key question that arises is whether fibrinolysis could play a role as a primary tool for managing STEMI patients given the increased thrombus burden [16].The need to perform PPCI as the frontline strategy, as discussed by the authors of this review, remains essential as there are clear advantages of PPCI over fibrinolysis [4]. Given that a higher than usual percentage of patients who have STEMI present without evidence of obstructive disease [17], the risk:benefit equation favors a routine invasive approach. In some select cases during our experience at the height of the first wave of COVID in New York City, we have used intracoronary thrombolytics in a judicious manner with some success in patients with significant thrombus burden who had not achieved Thrombolysis in Myocardial Infarction (TIMI)-3 flow after aspiration thrombectomy and use of GP IIb/IIIa (or cangrelor) infusion.

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As discussed in this comprehensive review, multiple lessons have been learned including routine use of non-invasive imaging to assess wall motion abnormality in the ED during the early triage phase of these patients. Some of the remaining challenges include [1] increasing community awareness of acute coronary syndromes at baseline and especially during this pandemic given the significant thrombotic risk of COVID-19 and the underlying apprehension to seek medical care; and [2] creating regional systems of STEMI care when intensive care unit and coronary care unit beds become scarce.

This is a time for a coordinated team approach and we are greatly reassured by the cardiology community's response to this clinical challenge around STEMI presentation and management. We will come out of the pandemic with new tools to raise awareness of STEMI and have taken measures to optimize our approach.

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