

## EDITORIAL COMMENT

# ST-Segment Elevation Myocardial Infarction Care During COVID-19



## Losing Sight of the Forest for the Trees\*

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By the end of December 2019, a new coronavirus, severe acute respiratory syndrome-coronavirus-2, was identified as the cause of a disease outbreak that originated in the city of Wuhan, China. The disease it causes was named coronavirus disease-2019 (COVID-19). The infection spread rapidly, and the World Health Organization, on March 11, characterized COVID-19 as a pandemic. On April 11, 2020, more than 1.6 million cases had been diagnosed in 179 countries on 5 continents, with nearly 100,000 confirmed deaths (1). Since the start of the outbreak, as the weeks have passed, unexpected side effects that directly affect medical attention to other pathologies have been witnessed.

In this issue of *JACC: Case Reports*, Moroni et al. (2) report 3 cases of ST-segment elevation myocardial infarction (STEMI) that were attended in the midst of the COVID-19 pandemic in the Lombardy region of Italy, which at that time had the highest incidence of cases worldwide. In all 3 cases, despite presenting clear symptoms and having a hospital nearby, patients decided not to go to the emergency room because of fear of acquiring the virus in the hospital, which was overwhelmed with COVID-19 patients.

After a few days, they ended up going to the hospital after suffering serious complications related to STEMI, which caused serious sequelae or even death. Risk perception is irrational, and fear of infection opens a new scenario in which patients with serious pathologies avoid going to hospitals, despite the fact that the risk of untreated STEMI exceeds by far the risk of COVID-19 itself.

Preliminary analyses have shown an important and disturbing decrease in the number of STEMI patients attending hospitals in Europe and in North America during the COVID-19 outbreak. A nationwide analysis in 73 Spanish centers involved in STEMI care networks revealed a 40% decrease in patients treated for STEMI when comparing activity before and during the current outbreak (3). In the same direction, an American study revealed an estimated 38% reduction in catheterization laboratory STEMI activations in 9 high-volume centers during the early phase of the COVID-19 pandemic (4). In both cases, STEMI care networks were working normally, so potential etiologies for this decrease should be a combination of avoidance of medical care due to social distancing, concerns of contracting COVID-19 in the hospital, STEMI misdiagnosis, or increased use of pharmacological reperfusion (Table 1).

Regarding reperfusion therapy, primary angioplasty has consistently proven to reduce mortality, reinfarction, stroke, and mechanical complications and avoid bleeding events when compared with thrombolysis as reperfusion treatment in STEMI patients, if delay to treatment between both options is similar (5), and should probably be kept as the first treatment option. Different scientific societies have developed protocols with recommendations on choice of reperfusion treatment during the COVID-19 outbreak, with advice that may be opposed, depending on the conditions in each country. For

\*Editorials published in the *JACC: Case Reports* reflect the views of the authors and do not necessarily represent the views of *JACC: Case Reports* or the American College of Cardiology.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Case Reports* [author instructions page](#).

<b>TABLE 1 Main Concerns Regarding STEMI Care During the COVID-19 Outbreak</b>	
<b>STEMI Treatment</b>	<b>COVID-19 Management</b>
<ol style="list-style-type: none"> <li>1. Decrease in number of patients attending emergency systems</li> <li>2. Increase in out-of-hospital sudden cardiac arrest</li> <li>3. Increase in delays from symptoms onset to reperfusion</li> <li>4. Increased use of thrombolysis as reperfusion therapy</li> <li>5. Increased short- and long-term complications</li> <li>6. Increased short- and long-term mortality</li> </ol>	<ol style="list-style-type: none"> <li>1. Revascularization strategies in STEMI patients with COVID-19</li> <li>2. Infection prevention in patients admitted for STEMI</li> <li>3. Infection prevention in health care personnel</li> </ol>
COVID-19 = coronavirus disease-2019; STEMI = ST-segment elevation myocardial infarction.	

example, in China, Peking Union Medical College Hospital recommended thrombolysis as first-choice treatment, and only recommended coronary intervention after ruling out COVID-19, even in case of thrombolytic contraindication (6). Conversely, in Spain, the Interventional Cardiology Association recommended primary angioplasty as first-choice treatment, considering thrombolysis only in the case that the patient was in a center without primary angioplasty capability and required a transfer that would delay treatment for more than 120 min, or in patients who have tested positive for COVID-19 with poor clinical state that makes transfer difficult, or in patients who have tested positive for COVID-19 with low hemorrhagic risk and symptoms of <3 h duration (7). Primary angioplasty also allows early discharge without further invasive examinations in a significant percentage of patients, which simplifies the management of these patients, limits patients' exposition to the hospital environment, and reduces hospital occupation.

In addition to the decrease in the number of patients who consult in hospitals, those who consult will do so with a longer delay. A recent study by Tam et al. (8) during the actual COVID-19 outbreak in Hong Kong, China, showed an almost 4-fold increase in median time from symptoms onset to first medical contact (from 82.5 to 318 min), and a more than 2-fold increase in median time from door to device (from 84.5 to 110 min). Ischemic time duration is the major determinant of infarct size and is directly related to short- and long-term survival (9). The increase in ischemic time may be due to patient's delay in consulting, or due to delay in diagnosis, because of the work overload of the emergency services or due to the difficulty of organizing and performing the procedure with appropriate personal protective equipment (10).

In the current situation, in which patients avoid going to the emergency services (or if they go, they do it with long delays), a disturbing increase in out-of-hospital sudden cardiac arrest (OHSCA) mortality should also be expected. Although it is difficult to know the real incidence of OHSCA in the setting of

STEMI, it is estimated that up to 75% of mortality occurs before contact with the health system (11), and the main way to prevent OHSCA is to seek hospital treatment as soon as symptoms of STEMI occur (12). Furthermore, very controversially, it has been suggested not to start chest compressions or ventilation in patients who are in cardiac arrest if they have suspected or diagnosed COVID-19, unless they are in the emergency department and staff are wearing full personal protective equipment (13).

As described by Moroni et al. (2), lack of or delayed access to reperfusion treatment will lead to an increase in short-term STEMI complications, such as left ventricular systolic dysfunction, cardiogenic shock, intraventricular thrombus formation, and peripheral embolism or mechanical complications (14). Short-term complications, in addition to increasing mortality, require prolonged admission in critical care units, which could be a serious problem in these times of scarce resources.

In the long term, suboptimal revascularization and larger infarct size will lead to an increase in complications related to worse ventricular remodeling, such as chronic heart failure or ventricular arrhythmias (15).

Last, but not least, the current moment requires special care by health care organizations to prevent nosocomial infection in patients with cardiovascular disease, who are especially vulnerable if affected by COVID-19 (16). Health care personnel caring for patients must be equipped with appropriate personal protective equipment. It is absolutely inadmissible that the lack of these equipment causes situations such as those experienced these days in Spain, the United States, or Italy, where up to 20% of responding health care workers have been infected, and some have died (17).

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**KEY WORDS** COVID-19, STEMI