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Critical Organizational Issues for Cardiologists in the COVID-19 Outbreak: A Frontline Experience From Milan, Italy

Running Title: *Stefanini et al.; Cardiologists and COVID-19: Organizational Issues*

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Lombardy, in northern Italy, is one of the regions most affected by coronavirus disease 2019 (COVID-19) secondary to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.[1,2] Since the first case diagnosed on February 20, 2020 in Codogno Hospital (Lodi, Lombardy, Italy), the infection has rapidly spread throughout Lombardy, reaching 28,761 confirmed cases, with 3,776 deaths as of March 23, 2020.

As cardiologists working in this situation, we are facing a number of critical issues regarding organizational aspects of management and treatment of cardiovascular disease due to the reorganization of the Regional Health Service in response to this epidemic.[3]

Prioritization of unstable patients with cardiovascular disorders

The Italian tax-funded National Health Service, established in 1978, is administered through regional authorities (i.e., the Regional Health Service). In late February, one of the first measures adopted by the Lombardy Regional Health Service was to reduce the number of elective hospitalizations by approximately 80%, with the aim of increasing capacity for COVID-19 patients. Under normal conditions, our waiting list allows patients with chronic coronary syndromes and clinical indications to undergo coronary angiography within approximately 3 weeks. After the decision to reduce the number of elective hospitalizations was implemented, maintaining the same waiting times was no longer possible. Already during the first week of restrictive measures (i.e., 24-29 February), we had to postpone 80% of planned procedures. Therefore, we needed a strategy to select patients in whom clinical status would not allow postponement of their planned cardiac procedure. Prioritization was based on risk stratification, taking into account patient symptoms, evidence of a large area of ischemia, and the presence of known critical disease of the left main stem or of the proximal left anterior descending coronary artery at prior coronary angiogram or at coronary computed tomography angiography. In

addition, we prioritized patients with decompensated, symptomatic, severe aortic stenosis scheduled for transcatheter aortic valve replacement. This has led to the postponement of a large number of elective hospitalizations. The impact on patient prognosis of this inevitable decision is unknown.

Reorganization of clinical activities for cardiologists

Due to the reorganization of the Regional Health Service, available resources for Cardiology (e.g. ward beds, intensive care unit beds, outpatient clinics) have been drastically reduced. In our setting, outpatient clinics have been closed and beds available for Cardiology (both in wards and intensive care units) are limited to those required to manage patients with cardiovascular emergencies.

However, it is noteworthy that COVID-19 patients tend to be elderly and suffer from several comorbidities.[4,5] Among these comorbidities, a history of ischemic heart disease and other cardiovascular risk factors is prevalent and is associated with worse outcomes. Along the same lines, myocardial involvement has been described in COVID-19 patients; those with the most severe clinical presentation have elevated cardiac biomarkers coupled with impairment of left ventricular ejection fraction.[4,5]

In this context, cardiologists' clinical activities have been reorganized into two teams; those taking care of cardiovascular emergencies and those focusing on the management of cardiovascular comorbidities and myocardial involvement in critical COVID-19 patients. The latter activity requires close and constant collaboration between cardiologists and infectious disease experts, pulmonologists, and intensive care specialists managing these patients.

Providing safe and timely access to care for acute myocardial infarction

Another critical issue for cardiologists working in our current situation is to provide timely

access to care for patients with acute myocardial infarction (AMI). The major goal is not to compromise the standard-of-care for the management of AMI patients. In order to continue to treat AMI patients in line with current guidelines while preventing their exposure to SARS-CoV-2, the Lombardy Regional Health Service restructured the AMI network. Under normal conditions, Lombardy has 129 accredited hospitals, 55 of which are equipped with cardiac catheterization laboratories offering 24/7 service for AMI to approximately 10 million inhabitants. On March 8, 2020, the regional government passed a deliberation to reduce to 13 the hospitals with catheterization laboratories now acting as *Hubs*, with the remaining hospitals acting as *Spokes.* Patients are now referred to a *Hub* on the basis of geographic proximity. The same model has been applied to other cardiovascular emergencies (e.g., stroke). The result of this measure has been to concentrate a large majority of AMI patients in a limited number of hospitals. Whether this will have an impact on timely reperfusion strategies is currently unknown.

Safety of healthcare professionals

Last but not least, a key issue is how to manage COVID-19 patients with cardiovascular emergencies. In recent weeks, a small number of COVID-19 patients have required coronary angiography due to suspected acute coronary syndromes. In addition, some patients underwent urgent coronary angiography, only to test positive for COVID-19 afterwards. This exposed healthcare professionals to risk of infection as a result of their involvement in the provision of acute care for these patient. The safety of healthcare professionals in this setting is a major challenge and requires detailed and dedicated training on the appropriate use of personal protective equipment. Moreover, to mitigate the risk of infection among healthcare professionals in the setting of acute AMI, we implemented a protocol to manage all patients undergoing urgent

coronary angiography as potentially COVID-19-positive in the absence of an available negative test.

Final considerations

Italy is facing its most dramatic emergency of its National Health Service. This crisis has many implications for the organization of clinical activities related to cardiology. All resources and efforts implemented to limit the diffusion of SARS-CoV-2 infection and to treat COVID-19 should not compromise contemporary standard-of-care for the treatment of cardiovascular diseases.

Thus, key actions for cardiologists should include efforts to:

1) Foster a close collaboration with other specialists involved in the management of COVID-19 patients;
2) Define pathways to appropriately manage cardiovascular diseases in both COVID-19-positive and uninfected patients, while guaranteeing safety of healthcare professionals;
3) Enhance cooperation between hospitals to centralize services to treat cardiovascular diseases.

Disclosures

The authors have no conflicts of interest to disclose.

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