

# CACI recommendations on interventional treatment during the COVID-19 pandemic

## Recomendaciones del CACI sobre el tratamiento intervencionista durante la pandemia COVID-19

Ruben Kevorkian, Gaspar Caponi, Gabriel Dionisio, José Luis Lazarte, Arturo Fernández Murga, Matías Szejfman, Carla Agatiello, Juan Manuel Ponce, Oscar Carlevaro, Alejandro Cherro, Raúl Solerno, Fernando Cura, Carlos Fernández Pereira, Humberto Bassani Molinas, Diego Grinfeld

*Revista Argentina de Cardioangiología Intervencionista* 2020;11(2):65-69. <https://doi.org/10.30567/RACI/202002/0065-0069>

Back in December 2019, China identified the very first cases of SARS-CoV-2. Shortly after that, the WHO declared an international emergency and in February 2020 over 800 000 cases had already been confirmed<sup>1</sup>. This is a highly contagious viral infection with a high mortality rate in populations at risk<sup>2,3</sup>. This disease is characterized by a severe acute respiratory distress syndrome that can cause myocardial damage through different mechanisms. It has been reported that high ultra-sensitive troponin levels associated with comorbidities lead to high in-hospital mortality rates<sup>4</sup>.

This pandemic has put tremendous pressure on the health-care systems across the world. Hospitals from China, Italy, Spain, and the United States, among other, experienced a sudden increase of critically ill patients with COVID-19 that has resulted in insufficient hospital resources and higher lethality and contagion rates for healthcare workers due to lack of personal protective equipment (PPE).

Although, in our country, cardiovascular disease is the first cause of death (33.3% back in 2018<sup>5</sup>) in order to prepare for a potential exponential growth of contagions, the Argentinian Ministry of Health ordered that all scheduled procedures should be postponed following the line of action of other countries<sup>6</sup>. International studies show that consultations due to AMI have gone down or even been delayed<sup>7</sup>. In Spain the use of percutaneous coronary interventions (PCI) and the occurrence of structural heart disease dropped by 40%<sup>8</sup>. The use of PCIs also dropped in New York City with the corresponding increase of home sudden deaths<sup>9,10</sup>.

The objective of this study was to design recommendations to perform procedures effectively by protecting patients and healthcare workers from contagion.

### THE INTERVENTIONAL CARDIOLOGY EXPERIENCE ACROSS THE WORLD

**The Chinese experience:** This country adopted a very restrictive policy by suspending all scheduled procedures and

surgeries and urgent care with invasive methods in very selected cases. For the management of the ST-segment elevation myocardial infarction (STEMI) fibrinolytic therapy was prioritized without the proper scientific back up<sup>11,12</sup>.

**The European experience:** The recently published clinical practice guidelines<sup>13</sup> include in-hospital strategies for the protection of health professionals through triage, the proper use of PPE, and telemedicine. In patients with STEMI and high viral loads, level III PPE (the highest) while performing PCIs is advisable. In patients with non-ST-segment elevation acute coronary syndrome (NSTEMI/ACS), COVID-19 infection should be ruled out before performing any procedures. When performing PCIs on COVID-19-positive patients, the same cath lab should be spared for them using high-efficiency filters and total air exchange at a ratio of 15 times every hour.

**The U.S. experience:** Here consensus for the management of AMI<sup>14</sup> suggests adopting cautious measures due to the scarce scientific medical evidence available. PCI is recommended for the management of STEMI within a 3-group classification: defined, possible, and futile. Within the “possible” group, in suspected cases, it is advisable to perform bedside echocardiograms to rule out non-coronary presentations like myocarditis. Within the “possible” group, a coronary computed tomography angiography and ultra-rapid testing should be performed to detect coronavirus. Within the “futile” group with COVID-19 related severe systemic compromise, compassionate medical treatment should be considered. Patients with multiple-vessel lesions should be treated in one single session to shorten the hospital stay. In PCI-capable hospitals, fibrinolytic therapy should be considered based on the patient, possible delays, etc.

**The New Zealand and Australian experience:** The scientific societies of these two countries recommend considering fibrinolysis even in PCI-capable centers. They suggest performing PCIs only in patients with low chances of infection or high-risk AMI. They arrange and organize health-care through referral networks. Also, they suggest dividing experienced health professionals into working groups with “clean” staff outside the cath lab<sup>15</sup>.

1. Colegio Argentino de Cardioangiología Intervencionistas

✉ Correspondencia: Ruben Kevorkian. [rubenkevorkian@gmail.com](mailto:rubenkevorkian@gmail.com)

Los autores declaran no tener conflictos de intereses.

Recibido: 18/05/2020 | Aceptado: 20/05/2020

## CASE DEFINITION

The definition of a confirmed or suspected COVID-19 case is dynamic and depends on the definitions established in our country by the Argentinian Ministry of Health<sup>16</sup>. <https://www.argentina.gob.ar/noticias/ministerio-de-salud-actualizo-la-definicion-de-caso-sospechoso-de-covid-19>

## GENERALITIES ON THERAPEUTIC INTERVENTIONS

In this context every indication should include benefits, resource availability, and the risk of contagion. Indications may vary in time from one region of our country to the next. This means that there are no “one-size-fits-all” circumstances so to speak. For example, several procedures may be delayed until performing PCR tests; this will depend on the urgency, availability of the test, and the effective regulations.

Centers with several cath labs are compelled to use clean areas and COVID-specific areas. If possible, they will need to implement areas for healthcare and waiting, yellow or green depending on the international denomination; they will also have to define routes and protocols for the transfer of the patients. All rooms and areas will need to follow the disinfection protocols implemented. Portable machines like injection pumps, defibrillators, and others are possible sources of infection.

Patients with COVID-19-like symptoms will be told to avoid going to the hospitals. Also, they will be questioned upon admission according to the hospital rules and regulations. Triage will always be done prior to admission to the cath lab. The patient will need to wear a surgical mask even before entering the cath lab that should already be conditioned to host the patient with the staff also wearing their PPE. The cath lab personnel will need to work behind closed doors. The level of protection will always be high and include N95 masks. This recommendation is aimed at protecting health professionals who are difficult to replace; given the asymptomatic nature of patients and the low sensitivity of the tests it is difficult to establish the risks of contagion with lower protection measures. Lastly, the procedures and surgeries that have been brought to a minimum are meant to avoid overloading the resources of the healthcare system. Also, it is advisable to stabilize acute patients. Also, if invasive management of the airway is required, it is advisable to proceed this way rather than transferring the patient to the cath lab.

## MANAGEMENT OF PATIENTS WITH ISCHEMIC HEART DISEASE

**Scheduled care:** The risk of infarction or death with the proper medical therapy in chronic coronary patients is low, which is why interventional cardiology procedures could be postponed; however, if angina symptoms were incapacitating, of high-risk or if stress tests confirmed it, we recommend performing a cine coronary arteriography and eventual treatment<sup>17</sup>. Similarly, coronary patients with significant ventricular dysfunction benefit from a revascularization strategy<sup>18</sup>.

In areas with lower viral circulation, it is advisable to hold the indication to the effective guidelines. In outpatients

with confirmed COVID-19 and moderate cardiovascular risk, it is advisable to wait until the patient is cleared of his infection<sup>19,20</sup>.

**Urgent care:** Infection due to COVID-19 triggers mediators that predispose to the occurrence of acute coronary syndrome. The increase of cardiovascular events has already been confirmed in the context of other pandemics like H1N1 influenza A and MERS<sup>21</sup>.

**Patients with STEMI:** When a patient with symptoms suggestive of AMI is admitted to the ER, the first thing to do is triage. These brief delays are necessary to establish a safe working routine. The current clinical practice guidelines recommend reperfusion for all patients with symptoms of myocardial ischemia of less than 12-hour duration and persistent ST-segment elevation<sup>22-24</sup>. The percutaneous coronary intervention (PCI) has proven to be the treatment of choice in multiple studies<sup>25-28</sup>, yet the quality standards previously described should be observed at all time. In referred patients the timing of the care provided stays the same. In its consensus document for the management of STEMI, the Argentinian Society of Cardiology<sup>29</sup> recommends that, in non-PCI centers, low or medium-risk infarctions not reperfused < 90 minutes can be treated with rtPA or TNK with a low risk of bleeding (IB). The PCI related mortality benefit is lost with longer delays than advised. This means that early reperfusion is more important than treatment *per se*<sup>30</sup>. If times during the transfer of the patient cannot be met, thrombolysis should be performed<sup>30-33</sup>. COVID-19-positive patients with severe myocardial ischemia should be assessed to avoid therapeutic futility<sup>34</sup>. Once the PCI has successfully been performed in the culprit vessel, other accessible lesions can be treated<sup>35,36</sup>. Because of the multiple factors involved, we recommend leaving this decision to the discretion of the medical team.

**Patients with NSTEMACS:** In patients who have tested COVID-19-negative, the corresponding clinical practice guidelines should be followed<sup>37-39</sup>.

Although the cine coronary arteriography is an imaging modality indicated for the management of NSTEMACS, in patients with COVID-19, the cardiovascular signs can be mistaken for a myocardial infarction<sup>40</sup>. Additional imaging modalities like echocardiography and coronary computed tomography angiography may contribute to the patient's diagnosis and prognosis.

In patients with confirmed or suspected COVID-19, the early invasive strategy is advisable in very high-risk clinical scenarios only:

- Refractory pain compromising a significant myocardial territory.
- Ischemia related heart failure or hemodynamic instability.
- Ischemia related severe arrhythmias.
- Significant ST-segment elevation.
- Patients of high ischemic risk (Grace score > 140)

Patients with severe pneumonia and on mechanical ventilation have a poor prognosis, which is why conservative treatment should be used. In patients without COVID-19 case criteria, the indication for a cine coronary arteriogra-

phy should follow the current indications for treatment<sup>41-43</sup>. Transfers are ill-advised during the management of COVID-19 related low-risk unstable anginas or severe anginas. Here, the ultimate decision should always be based on the patient's clinical status, the treating medical team, and the complexity of each particular center.

## MANAGEMENT OF STRUCTURAL HEART DISEASE

### Transcatheter aortic valve implantation (TAVI)

Because of their old age and comorbidities, several patients with severe symptomatic aortic stenosis (AS) have a high-risk of complications and death due to COVID-19. However, a higher mortality rate has also been confirmed in patients in whom treatment is delayed<sup>44-45</sup>. These are often challenging patients who need general anesthesia, transesophageal echocardiogram, pacemaker implantation, and whose indications should be reviewed.

In patients admitted due to severe, symptomatic AS, reduced LVEF, presence of congestive heart failure or syncope, TAVI is recommended during admission to minimize the progression of the disease. In symptomatic outpatients with severe-to-critical stenosis and NYHA functional class class III-IV dyspnea or syncope, TAVI is recommended without further delay. In patients with NYHA FC I-II symptoms and quantitative measures of the severity of the valve indicative of a critically stenosed valve, it may be reasonable to consider TAVI or close monitoring. In patients with asymptomatic severe-to-critical aortic stenosis it is reasonable to postpone TAVI based on the patient's clinical progression and capabilities of the treating center.

Close outpatient monitoring through telemedicine should be kept in all patients since symptoms are expected to become complicated in some of them; no algorithm can identify the patients whose procedures can be postponed safely. All patients should undergo a COVID-19 diagnostic test to rule out positivity until the COVID-19 disease has been cleared.

Most TAVIs can be performed using a minimalistic approach with conscious sedation<sup>46</sup>. If necessary, the PCI should be performed the same day before the TAVI. The procedure should be limited to critical lesions for TAVI to be successful. Otherwise, the procedure can be postponed<sup>47,48</sup>. Aortic valvuloplasty as a bridging therapy to TAVI should be spared for hospitalized patients who do not respond to medical therapy<sup>49</sup>.

Preprocedural imaging studies should be simplified to reduce the risk of contagion. Echocardiograms of the last 6 months should be enough. The diagnostic cine coronary arteriography can be performed prior to TAVI. The only mandatory imaging modality is coronary computed tomography angiography because of the information it provides.

## REFERENCES

1. Wu, Guan, Z. Ni, Yu Hu, et al. *Clinical Characteristics of Coronavirus Disease 2019 in China. The China Medical Treatment Expert Group for Covid-19. N Engl J Med* 2020 Apr 30;382(18):1708-1720. DOI: 10.1056/NEJMoa2002032.
2. [www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk](https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk).
3. Wu Z, McGoogan JM. *Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) port of 72 314 Cases From the Chi-*

## MANAGEMENT OF VASCULOPATHIES

Here we will be giving recommendations for the management of aneurysms, aortic dissections, and other urgent vasculopathies. In all cases the current recommendations will be always followed while taking into considerations aspects already described for healthcare provision under the current pandemic. COVID-19 disease will be ruled out whenever possible. In suspicious or emergent cases, the risk of contagion and the expected benefits will be analyzed carefully.

During the pandemic: in the management of aneurysms of the abdominal aorta the urgent management of symptomatic aneurysms is always advised. Compared to surgery, this procedure can avoid the death of the patient and shorten the hospital stay. The remaining aneurysms of the abdominal aorta should always be postponed if asymptomatic. Treatment is recommended for the management of symptomatic peripheral aneurysms. In patients with peripheral pseudoaneurysms, the percutaneous treatment is recommended during the current pandemic when other less invasive treatments have failed. Percutaneous treatment should be used for the management of complicated type B aortic dissections. Percutaneous treatment is recommended for the management of splanchnic symptomatic aneurysms. It is advisable to treat symptomatic carotid stenosis too. Percutaneous treatment is recommended for the management of patients on dialysis with dysfunctional fistulae. Percutaneous treatment is recommended for the management of lower extremity vasculopathies. Percutaneous treatment is also recommended for the management of life-threatening treatment-refractory low GI bleeding during the current pandemic. Also, during the current pandemic, percutaneous treatment is recommended for the management of other non-medical bleedings in unstable, uncontrollable patients with general measures and on medical therapy<sup>1,2</sup>.

Patients with COVID-19 will be assessed to see whether they can be treated or not. The risk that, in these cases, a procedure can be futile is very high and compromises personnel and resources that may be necessary for other patients who may be recoverable. Each case should be defined by the treating physician. However, it seems logical to consider conservative treatment until the infection of a patient with COVID-19 is gone.

## CONCLUSION

The current COVID-19 pandemic is a challenge from the healthcare perspective. In disease-free patients, the indications to be followed should be those established by the clinical practice guidelines. Also, procedures should be postponed in patients with COVID-19 when possible. ST-Segment elevation myocardial infarction in a Buenos Aires center during the current COVID-19 pandemic

- nese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-1242. doi:10.1001/jama.2020.2648.
4. Tao Guo, Yongzhen Fan, Ming Chen, et al. Cardiovascular Implications of Fatal Outcomes of Patients With Coronavirus Disease 2019 (COVID-19). *JAMA Cardiol* 2020 Mar 27. Epub ahead of print. doi:10.1001/jamacardio.2020.1017. <https://www.who.int/health-topics/cardiovascular-diseases>.
  5. [www.cms.gov/files/document/31820-cms-adult-elective-surgery-and-procedures-recommendations.pdf](https://www.cms.gov/files/document/31820-cms-adult-elective-surgery-and-procedures-recommendations.pdf)
  6. Katz JN, Sinha SS, Alviar CL. Disruptive Modifications to Cardiac Critical Care Delivery During the Covid-19 Pandemic: An International Perspective. *J Am Coll Cardiol* 2020 Apr 14. pii: S0735-1097(20)35002-6. DOI: 10.1016/j.jacc.2020.04.029.
  7. Rodríguez-Leora O, Cid-Álvarez B, Ojeda S. Impacto de la pandemia de COVID-19 sobre la actividad asistencial en cardiología intervencionista en España. *REC Interv Cardiol* 2020. Epub ahead of print.
  8. De Filippo O, D'Ascenzo F, Angelini F. Reduced Rate of Hospital Admissions for ACS during Covid-19 Outbreak in Northern Italy. *N Engl J Med* 2020 Apr 28. Epub ahead of print. DOI: 10.1056/NEJMc2009166.
  9. Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-Segment Elevation Cardiac Catheterization Laboratory Activations in the United States during COVID-19 Pandemic. *J Am Coll Cardiol*. 2020 Apr 9. Epub ahead of print. doi: 10.1016/j.jacc.2020.04.011.
  10. Jing ZC, Zhu HD, Yan XW, et al. Recommendations from the Peking Union Medical College Hospital for the Management of acute myocardial infarction during the COVID-19 outbreak. *Eur Heart J* 2020 May 14;41(19):1791-1794. doi: 10.1093/eurheartj/ehaa258.
  11. Chen Jiyan, Cheng Xiang, Han Yaling, et al. Consensus on Managing CVD during CO-VID-19 Epidemic. *Chinese Journal of Cardiovascular Diseases* 2020,48 (03): 189-94. DOI: 10.3760/cma.j.cn112148-20200210-00066.
  12. Andreini D, Arbelo E, Barbato E, et al. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic Last updated on 21 April 2020. <https://www.escardio.org/Education/COVID-19-and-Cardiology/ESC-COVID-19-Guidance>.
  13. Szerlip M, Anwaruddin S, G. Cohen M. Considerations for Cardiac Catheterization Laboratory Procedures During the COVID-19 Pandemic. Perspectives from the Society for Cardiovascular Angiography and Interventions Emerging Leader Mentorship (SCAI ELM) Members and Graduates. <https://doi.org/10.1002/ccd.28887>.
  14. Lo STH, Yong AS, Sinhal A, et al. Consensus Guidelines for Interventional Cardiology Services delivery during COVID-19 Pandemic in Australia and New Zealand. *Heart Lung Circ* 2020 May 6. Epub ahead of print. doi: 10.1016/j.hlc.2020.04.002.
  15. <https://www.argentina.gov.ar/noticias/ministerio-de-salud-actualiza-la-definicion-de-caso-sospechoso-de-covid-19>.
  16. Antman EM, Braunwald E. Managing Stable Ischemic Heart Disease. *Engl J Med* 2020 Apr 9;382(15):1468-1470. doi: 10.1056/NEJMe2000239.
  17. Knuuti J, Wijns W, Saraste A, et al. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes: The Task Force for the diagnosis and management of chronic coronary syndromes of the European Society of Cardiology (ESC). *Eur Heart J*, Volume 41, Issue 3, 14 January 2020, Pages 407–477. <https://doi.org/10.1093/eurheartj/ehz425>.
  18. Borrás Pérez FX. Diagnóstico y estratificación de la angina estable. *Rev Esp Cardiol Supl* 2012;12(D):9-14.
  19. Macin SM, Bono J, Ramos H, et al. Guías de manejo de cardiopatía isquémica crónica: angina crónica estable. *Rev Fed Arg Cardiol* 2009;38 (Suppl 1): S1-S23.
  20. Ying-Ying Zheng, Yi-Tong Ma, Jin-Ying Zhang, et al. COVID-19 and the cardiovascular system. *Nat Rev Cardiol* 2020 May;17(5):259-260. doi: 10.1038/s41569-020-0360-5.
  21. Levine GN, O'Gara PT, Bates ER, et al. 2015 ACC/AHA/SCAI Focused Update on primary percutaneous coronary intervention for patients with ST-elevation myocardial infarction: an update of the 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention and the 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *Circulation*. 2016 Mar 15;133(11):1135-47. doi: 10.1161/CIR.0000000000000336.
  22. Ibanez B, James S, Agewall S, et al. Group ESCSD. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39(2):119-177. <https://doi.org/10.1093/eurheartj/ehx393>.
  23. Tajer C, Charask A, de Abreu M, et al. Actualización del Consenso de Síndromes Coronarios Agudos con Elevación del Segmento ST – 2019. <https://www.sac.org.ar/wp-content/uploads/2019/11/consenso-scacest-2019>.
  24. Grines CL, Browne KF, Marco J, et al. A comparison of immediate angioplasty with thrombolytic therapy for acute myocardial infarction. The Primary Angioplasty in Myocardial Infarction Study Group. *N Engl J Med* 1993;328:673-9.
  25. Zijlstra F, de Boer MJ, Hoorntje JC, et al. A comparison of immediate coronary angioplasty with intravenous streptokinase in acute myocardial infarction. *N Engl J Med* 1993;328:680-4.
  26. Keeley EC, Boura JA, Grines CL, et al. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. *Lancet* 2003;361:13-20.
  27. Thrane PG, Kristensen SD, Olesen KKW, et al. 16-year follow-up of the Danish Acute Myocardial Infarction 2 (DANAMI-2) trial: primary percutaneous coronary intervention vs. fibrinolysis in ST-segment elevation myocardial infarction. *Eur Heart J* 2020 Feb 14;41(7):847-854. doi: 10.1093/eurheartj/ehz595.
  28. Tajer C, Charask A, de Abreu M, et al. Actualización del Consenso de Síndromes Coronarios Agudos con Elevación del Segmento ST – 2019. <https://www.sac.org.ar/wp-content/uploads/2019/11/consenso-scacest-2019>.
  29. Daniels MJ; Mauricio G. Cohen; Anthony A. Bavy et al. Reperfusion of STEMI in the COVID-19 Era. *Business as Usual?* *Circulation*. 2020 Apr 13. Epub ahead of print. doi: 10.1161/CIRCULATIONAHA.120.047122.
  30. Levine GN, O'Gara PT, Bates ER, et al. 2015 ACC/AHA/SCAI Focused Update on primary percutaneous coronary intervention for patients with ST-elevation myocardial infarction: an update of the 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention and the 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *Circulation*. 2016 Mar 15;133(11):1135-47. doi: 10.1161/CIR.0000000000000336.
  31. Ibanez B, James S, Agewall S, et al. Group ESCSD. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39(2):119-177. <https://doi.org/10.1093/eurheartj/ehx393>.
  32. Tajer C, Charask A, de Abreu M. Actualización del Consenso de Síndromes Coronarios Agudos con Elevación del Segmento ST – 2019. <https://www.sac.org.ar/wp-content/uploads/2019/11/consenso-scacest-2019>.
  33. Szerlip M, Anwaruddin S, Aronow HD, Cohen MG. Considerations for Cardiac Catheterization Laboratory Procedures During the COVID-19 Pandemic. Perspectives from the Society for Cardiovascular Angiography and Interventions Emerging Leader Mentorship (SCAI ELM) Members and Graduates. <https://doi.org/10.1002/ccd.28887>.
  34. Szerlip M, Anwaruddin S, Cohen MG, et al. Considerations for Cardiac Catheterization Laboratory Procedures During the COVID-19 Pandemic. Perspectives from the Society for Cardiovascular Angiography and Interventions Emerging Leader Mentorship (SCAI ELM) Members and Graduates. <https://doi.org/10.1002/ccd.28887>.
  35. Andreini D, Arbelo E, Barbato E, et al. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic Last updated on 21 April 2020. <https://www.escardio.org/Education/COVID-19-and-Cardiology/ESC-COVID-19-Guidance>.
  36. Levine GN, O'Gara PT, Bates ER, et al. 2015 ACC/AHA/SCAI Focused Update on primary percutaneous coronary intervention for patients with ST-elevation myocardial infarction: an update of the 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention and the 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *Circulation* 2016 Mar 15;133(11):1135-47. doi: 10.1161/CIR.0000000000000336.

38. Ibanez B, James S, Agewall S, et al. Group ESCSD. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39(2):119-77. <https://doi.org/10.1093/eurheartj/ehx393>.
39. Tajer C, Charask A, de Abreu M. Actualización del Consenso de Síndromes Coronarios Agudos con Elevación del Segmento ST – 2019. <https://www.sac.org.ar/wp-content/uploads/2019/11/consenso-scacest-2019>.
40. Guan W, Ni Z, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *The China Medical Treatment Expert Group for Covid-19. N Engl J Med* 2020 Apr 30;382(18):1708-20. DOI: 10.1056/NEJMoa2002032.
41. Levine GN, O’Gara PT, Bates ER, et al. 2015 ACC/AHA/SCAI Focused Update on primary percutaneous coronary intervention for patients with ST-elevation myocardial infarction: an update of the 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention and the 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *Circulation* 2016 Mar 15;133(11):1135-47. doi: 10.1161/CIR.000006.
42. Ibanez B, James S, Agewall S, et al. Group ESCSD. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2018;39(2):119-77. <https://doi.org/10.1093/eurheartj/ehx393>.
43. Tajer C, Charask A, de Abreu M, et al. Actualización del Consenso de Síndromes Coronarios Agudos con Elevación del Segmento ST – 2019. <https://www.sac.org.ar/wp-content/uploads/2019/11/consenso-scacest-2019>.
44. Elbaz-Greener G, Maish S, Fang J, et al. Temporal trends and clinical consequences of wait times for transcatheter aortic valve replacement: a population study. *Circulation* 2018 Jul 31;138(5):483-493. doi: 10.1161/CIRCULATIONAHA.117.033432.
45. Elbaz-Greener G, Yarranton B, Qiu F, et al. Association between wait time for transcatheter aortic valve replacement and early postprocedural outcomes. *J Am Heart Assoc* 2019 Jan 8;8(1):e010407. doi: 10.1161/JAHA.118.010407.
46. Hyman MC, Vemulapalli S, Szeto WY, et al. Conscious sedation versus general anesthesia for transcatheter aortic valve replacement: insights from the national ACC/STS TVT registry. *Circulation* 2017 Nov 28;136(22):2132-40. doi: 10.1161/CIRCULATIONAHA.116.026656.
47. Van Mieghem NM, van der Boon RM, Faqiri E, et al. Complete revascularization is not a prerequisite for success in current transcatheter aortic valve implantation practice. *JACC Cardiovasc Interv* 2013 Aug;6(8):867-75. doi: 10.1016/j.jcin.2013.04.015.
48. Kotronias RA, Kwok CS, George S, et al. Transcatheter aortic valve implantation with or without percutaneous coronary artery revascularization strategy: a systematic review and metaanalysis. *J Am Heart Assoc* 2017 Jun 27;6(6). pii: e005960. doi: 10.1161/JAHA.117.005960.
49. Andreini D, Arbelo E, Barbato E, et al. ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic Last updated on 21 April 2020. <https://www.escardio.org/Education/COVID-19-and-Cardiology/ESC-COVID-19-Guidance>.
50. Benson RA, The Vascular and Endovascular Research Network (VERN) Collaborators, The COVID-19 Vascular sERvice (COVER) Study: An International Vascular and Endovascular Research Network (VERN) Collaborative Study Assessing the Provision, Practice, and Outcomes of Vascular Surgery During the COVID-19 Pandemic. *Eur J Vasc Endovasc Surg*. <https://doi.org/10.1016/j.ejvs.2020.04.039>.
51. Björck M, Boyle JR, Dick F, et al. The Need of Research Initiatives Amidst and After the Covid-19 Pandemic: A Message from the Editors of the EJVES. *Eur J Vasc Endovasc Surg* Vol. 59, Issue 5, p695–696. DOI:<https://doi.org/10.1016/j.ejvs.2020.04.002>.