

¹ Instituto de Cardiologia de Santa Catarina,
São José, SC, Brazil.

General measures in cath lab management during SARS-CoV-2 pandemics

Medidas gerais no manejo do laboratório de hemodinâmica durante a pandemia do SARS-CoV2

Rodrigo de Moura Joaquim^{1iD}, Roberto Léo da Silva^{1iD}

DOI: 10.31160/JOTCI202028A202003

ABSTRACT – With rapid dissemination throughout the world, the pandemics caused by the novel coronavirus SARS-CoV-2, known by the acronym COVID-19, has already been declared as of community transmission in all Brazilian states. Considering the reports of electrocardiographic and echocardiographic changes, myocardial injury and type 2 myocardial infarction observed in infected patients, the practical activities and management of cath lab, as well as care of individuals with cardiovascular diseases must be addressed. The purpose of this document is to summarize measures that can be taken, to optimize the flow and care of patients during the current pandemics situation.

Keywords: SARS virus; Coronavirus; Coronavirus infections; Hemodynamic; Hemodynamic monitoring; Security measures; Risk-taking

RESUMO – Com rápida disseminação em escala global, a pandemia provocada pelo novo coronavírus tipo 2, conhecido pela sigla COVID-19, já exibe transmissão local declarada em todas as Unidades Federativas do país. Mediante os relatos de alterações eletrocardiográficas e ecocardiográficas, injúria miocárdica e infarto agudo do miocárdio tipo 2 observados em pacientes infectados, surgem implicações para a prática e o gerenciamento do laboratório de hemodinâmica, bem como no atendimento das doenças cardiovasculares nesses pacientes. Esse documento tem como objetivo sumarizar medidas que podem ser aplicadas, a fim de otimizar o fluxo e o atendimento de pacientes durante a situação de pandemia instalada.

Descritores: Vírus da SARS; Coronavírus; Infecções por coronavírus; Hemodinâmica; Monitorização hemodinâmica; Medidas de segurança; Assunção de risco

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is caused by coronavirus type 2, and its most severe manifestation is severe acute respiratory syndrome (SARS-CoV2). It had a rapid spread on a global scale, and was declared a pandemic by the World Health Organization (WHO), on March 11, 2020.¹ Despite being a dynamic condition, in Brazil, the virus outbreak already has the characteristics of a pandemic, and local transmission has been declared in all states.

Cardiovascular diseases (CVD) have a reported prevalence of approximately 15% in infected patients, and may reach 25% in those who require intensive care.^{2,3} In addition, electrocardiographic and echocardiographic changes, myocardial injury and type 2 acute myocardial infarction (MI), due to supply-demand imbalance, have already been reported.² This situation has implications for the daily management practice in the cath lab and CVD treatment in these patients.

This document aims to summarize applicable measures to optimize the flow and care of patients during a full-blown pandemic.

How to cite this article:

Joaquim RM, da Silva RL. General measures in cath lab management during SARS-CoV-2 pandemic. J Transcat Interv. 2020;28:eA202003. <https://doi.org/10.31160/JOTCI202028A202003>

Corresponding author:

Rodrigo de Moura Joaquim
Instituto de Cardiologia de Santa Catarina
Rua Adolfo Donato da Silva, s/n –
Praia Comprida
Zip code: 88103-901 – São José, SC, Brazil
E-mail: rodrigojoaquim@gmail.com

Submitted on:

Mar 22, 2020

Accepted on:

Mar 24, 2020



This content is licensed under a Creative Commons Attribution 4.0 International License.

GENERAL MEASURES

The initial objective is to reduce the circulation of people in the cath lab and the length of stay of individuals in the room. The main measures to achieve this goal are, initially, reducing the number of procedures, adjourning elective cases, and a thorough review of acute coronary syndrome (ACS) cases. The rotation of the cath lab staff members is to be carried out in shifts, anticipating a possible staff reduction, depending on the evolution of the pandemic.⁴

During procedures in which the patient is a suspected or confirmed case of COVID-19, a minimum number of people in the room is recommended. Reducing the number of people in the room not only reduces viral spread, but spares supplies and equipment to be used during the pandemic. The discussion of cases should preferably occur outside the cath lab and, whenever possible, via telephone or video call, further reducing the circulation of people.

Another important consideration is the cleaning of the cath lab after the procedures. The time required for appropriate cleaning procedures after treating a patient with suspected or confirmed COVID-19 can restrict the use of the cath lab for other patients. Each organization will have to adapt its services to the resources available.²

Cleaning and disinfection of floors and walls must follow a protocol that includes:

- Visible dirt, which must be removed before disinfection:
 - Apply chlorine-based disinfectant (concentration of 1,000mg/L), spraying or applying directly.
 - The process should take at least 30 minutes.
 - Complete the entire process after each procedure performed on a suspected patient and at the end of the day.
- Pay special attention to the presence of blood or secretions. Cover the secretions with compresses soaked with chlorine-based disinfectant solution (concentration of 5,000mg/L), ideally for 30 minutes, and then remove them carefully. After that, the surfaces should be cleaned twice with a less concentrated solution (1,000mg/L).
- Dispose of all materials used for cleaning as infectious material, which must be placed in two sealed plastic bags. If reprocessing is chosen, keep it completely immersed in a high concentration (5,000mg/L) chlorine-based disinfectant solution, for a minimum period of 30 minutes, after following the usual local protocol.
- Perform room air disinfection, using plasma sterilizers (continuously turned on) or ultraviolet lamp (turned on for 1 hour, three times a day, or after each procedure performed on a COVID-19 patient).^{5,6}

PROTECTION MEASURES FOR STAFF AND ROOM

The protection measures for the staff are fundamental for maintaining a minimum number of professionals, in face of possible sick leaves and mandatory quarantine

of infected workers. There is no need for additional use of protective equipment during daily routine, except when managing suspected or confirmed cases of COVID-19.

When suspected or confirmed cases are treated, the patient must always wear a surgical mask. The entire staff in the room must be equipped with Personal Protective Equipment (PPE) for aerosol-generating procedures, including gloves (two pairs, the first one is put on before wearing the protective clothing, and the second one as the last step), fluid-resistant apron, N95 or PFF2 mask, head covering and face shield (in the absence of a face shield, wear goggles). Training is essential for putting on and removing PPE correctly, especially the latter, when the risk of contamination is greater for the healthcare worker.^{4,6}

MANAGEMENT OF ACCIDENTAL EXPOSURE

Each exposed person should be removed and quarantined for 14 days.⁵

Skin

Remove the contaminating secretion with clean gauze, after applying an alcoholic solution of 0.5% chlorhexidine digluconate or 70% alcohol, keeping the solution on the skin for at least 3 minutes, then wash under running water.

Mucous membranes (including eyes)

Abundant washing with saline 0.05% iodine solution can be used.

Puncture wounds

Apply compression from proximal to distal to increase bleeding. Afterwards, wash under running water and disinfect the wound using 0.5% chlorhexidine digluconate or 70% alcohol.

Respiratory exposure

Gargle with plenty of normal saline or 0.05% iodine solution. Dip a swab in 70% alcohol and clean the nasal cavity in a circular motion.

ELECTIVE PROCEDURES

Several states and health care services in Brazil have already adjourned elective procedures as a measure to spare hospital beds, and reduce the circulation of people around healthcare settings, decreasing environmental exposure to SARS-CoV2. This is the preferred measure in the case of the pandemic we are experiencing. However, an individual assessment of the need for each procedure can be performed, so that other patients are not completely neglected. Procedures that require admission to an intensive care unit, procedures in patients with multiple comorbidities for which the expected hospital stay exceeds 48 hours, and

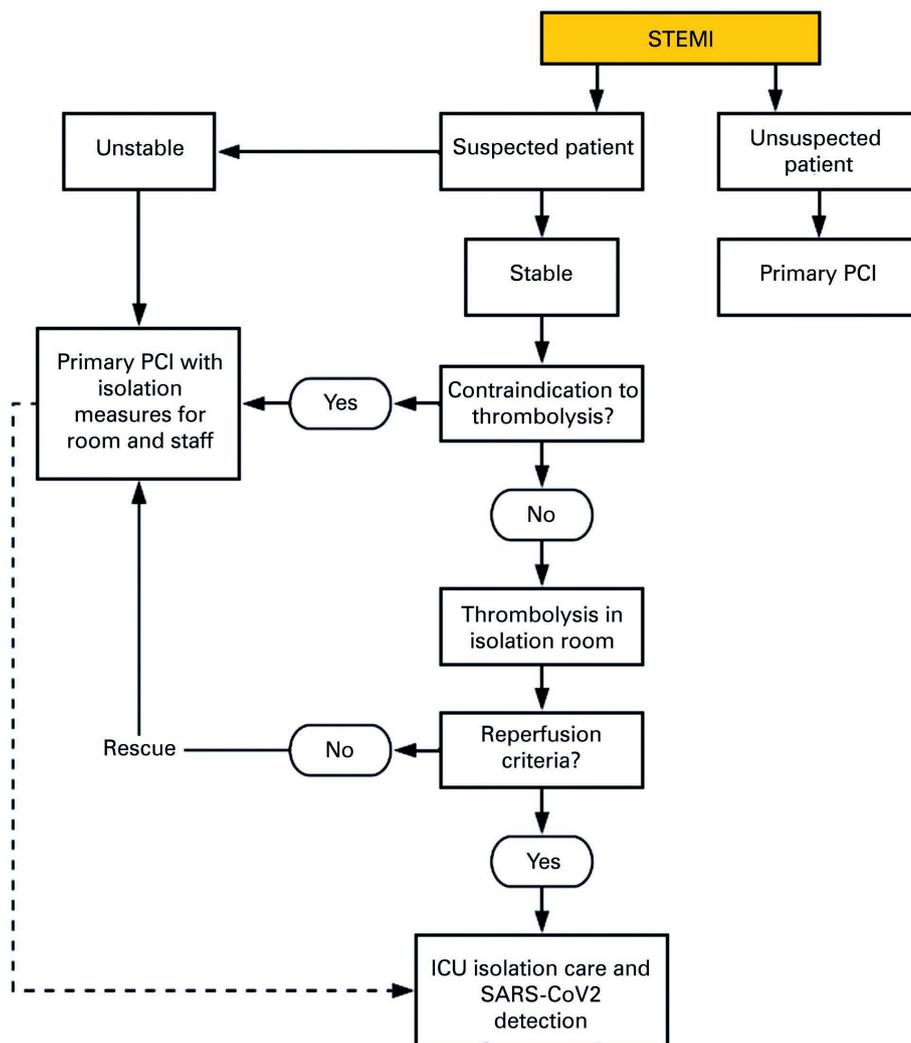
procedures that are really elective, such as revascularization in stable coronary artery disease, for example, should be avoided.²

ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION

An article portraying the experience in a Chinese province reports the management of patients with ST-segment elevation MI, based on rapid testing for SARS-CoV2 and the use of thrombolytics.⁶ Due to the lack of rapid testing in most locations, this measure may not be viable, and the cases should be treated as suspected or unsuspected. In the extreme case of a pandemic, the balance between the risk of exposure of the cath lab staff and the therapeutic benefit to the patient must be assessed, in order to determine the best treatment.

Thrombolytic therapy can be used as a reperfusion method of choice for stable patients without contraindications who are suspected cases of COVID-19. Unstable cases, with contraindication to thrombolysis or which do not meet the reperfusion criteria, should undergo primary percutaneous coronary intervention (PCI), with all the isolation and PPE measures for the staff, in addition to terminal cleaning of the room after the procedure.^{2,6}

After reperfusion, a clinical evaluation and ancillary exams should be performed, aiming at an early discharge (24 to 48 hours) for stable and uncomplicated patients, for outpatient follow-up, preferably without face-to-face consultations during the pandemic period. Figure 1 shows a suggested algorithm for the management of these patients during a pandemic.



After reperfusion, assess clinical conditions, electrocardiogram and echocardiogram in 24 to 48 hours. Consider early discharge

STEMI: ST-segment elevation myocardial infarction; PCI: percutaneous coronary intervention; ICU: intensive care unit.

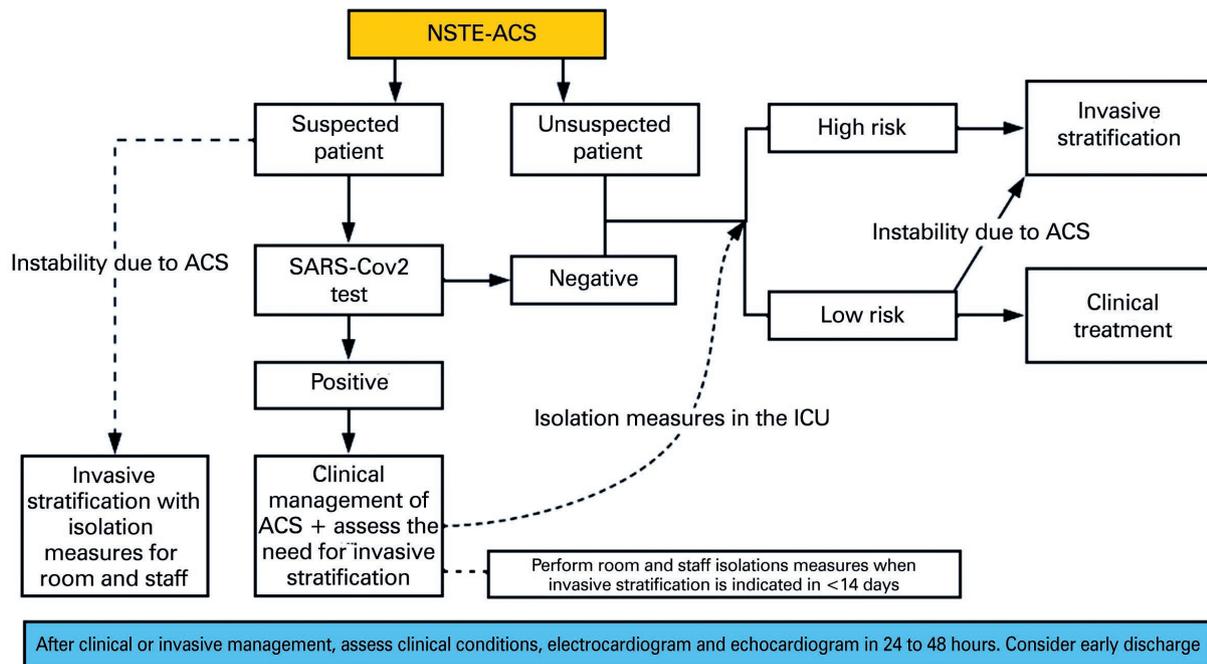
Figure 1. Flowchart of care for patients with ST-elevation acute myocardial infarction during a pandemic.

NON-ST-SEGMENT ELEVATION ACUTE CORONARY SYNDROME

In most cases of non-ST-segment elevation ACS (NSTE-ACS) involving patients with unstable angina or non-ST-segment elevation MI, the time interval until invasive stratification is performed allows for the ruling out or confirming SARS-CoV2 infection by virus detection in suspected cases.² In the context of a pandemic, any diagnosis of NSTE-ACS must be evaluated with caution. Reports indicate that 7% to 17% of patients with COVID-19 have myocardial injury, including patients with myocarditis and type 2 MI,² and up to 22% of patients in intensive care present an increase in troponin levels ($p < 0.001$, when compared to mild cases).³ These patients are likely to benefit from a conservative strategy.

In addition, stable patients and patients at low risk for ischemic events should be evaluated for the possibility of maintaining a conservative clinical treatment, aiming at a lower circulation of patients at hospital facilities, and a lower risk of transmission to the cath lab staff. Early discharge after PCI for these patients is essential in order to release hospital beds and prevent greater viral exposure to these patients.²

When necessary, these procedures should preferably be carried out at the end of the routine day, due to the need for terminal cleaning of the room and isolation procedures for the staff.² Figure 2 shows the proposed algorithm for the management of patients with NSTE-ACS during a pandemic.



NSTE-ACS: non-ST-segment elevation acute coronary syndrome; ACS: acute coronary syndrome; ICU: intensive care unit. **Figure 2.** Flowchart of care for patients with non-ST-segment elevation acute coronary syndrome during a pandemic.

RESPIRATORY CARE

Patients who develop respiratory failure should be evaluated before being transported to the cath lab and, when there is a high risk, orotracheal intubation should be performed, and the patient should be kept connected to the respirator in a closed system.² This helps prevent spreading the virus, particularly by droplets during transport and inside the facilities and the cath lab, and contaminating the equipment, creating a more suitable environment for carrying out the proposed procedure.

LESS COMPLEX PROCEDURES

It is important to minimize the circulation of possibly infected personnel and patients in the cath lab. Therefore, all less complex procedures, such as the implantation of temporary pacemaker, central venous catheter, hemodialysis catheter, Swan-Ganz catheter, placement of an intra-aortic balloon, or a pericardiocentesis, should preferably be performed at the bedside by the assisting team, in a respiratory isolation environment.²

SOURCE OF FINANCING

None.

DECLARATION OF CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: RMJ and RLS; data collection: RMJ and RLS; data interpretation: RMJ and RLS; writing of the text: RMJ and RLS; approval of the final version to be published: RMJ and RLS.

REFERENCES

1. World Health Organization (WHO). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet]. Geneva: WHO; 2020 [cited 2020 Mar 23]. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
2. Driggin E, Madhavan MV, Bikdeli B, Chuich T, Laracy J, Bondi-Zoccai G, et al. Cardiovascular considerations for patients, health care workers, and health systems during the coronavirus disease 2019 (COVID-19) pandemic. *JACC*. 2020. <https://doi.org/10.1016/j.jacc.2020.03.031>
3. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020; 323(11):1061-9. <https://doi.org/10.1001/jama.2020.1585>.
4. Welt FG, Shah PB, Aronow HD, Bortnick AE, Henry TD, Sherwood MW, Young MN, Davidson LJ, Kadavath S, Mahmud E, Kirtane AJ, from the American College of Cardiology's (ACC); Interventional Council and the Society of Cardiovascular Angiography and Intervention (SCAI). Catheterization laboratory considerations during the coronavirus (COVID-19) pandemic: from ACC's Interventional Council and SCAI. *JACC*. 2020. <https://doi.org/10.1016/j.jacc.2020.03.021>.
5. Liang T, editor. Handbook of COVID-19 prevention and treatment. Zhejiang: The Jack Ma Fondation; 2020.
6. Tsui KL, Li SK, Li MC, Chan KK, Leung TC, Tse TS, et al. Preparedness of the cardiac catheterization laboratory for severe acute respiratory syndrome (SARS) and others epidemics. *J Invasive Cardiol*. 2005;17(3):149-52. PMID: 15867442.
7. Zeng J, Huang J, Pan L. How to balance acute myocardial infarction and COVID-19: the protocols from Sichuan Provincial People's Hospital. *Intensive Care Med*. 2020. <https://doi.org/10.1007/s00134-020-05993-9>.