



Recommendations for cardiac interventions during COVID-19 pandemic in Switzerland 2020

A statement of the Swiss Working Group for Interventional Cardiology, in collaboration with the Swiss Society of Cardiology (SSC) and the Swiss Working Groups for Pacemaker and Electrophysiology and Grown Up Congenital Heart Disease (WATCH)

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According to the experience in China, Italy and other countries, the COVID-19 will impose a high burden on health-care systems in Switzerland. As it already has spread widely all over the globe, all of us will experience specific implications in cardiac units and in catheterization and EP laboratories. We should thus be prepared to modify and adapt practice for standard cardiac patients, those who are suspected COVID-19 patients and those patients with confirmed COVID-19 who have either unrelated cardiac conditions or cardiac manifestations of the disease. The situation is very dynamic and recent developments have demonstrated a south-to-north gradient in the spread of the disease and the strain on healthcare resources in our country. Meanwhile, questions and uncertainties prevail on how to provide optimal care for patients with cardiac disease (particularly acute or unstable conditions) in this changing environment of COVID-19 pandemic. This paper aims to help decision making in hospitals with catheterization and EP labs dealing with potential or confirmed COVID patients.

The selection process of patients for diagnostic invasive or interventional procedures should be discussed and adapted on a daily basis in the hospitals. Some recommendations by foreign national or international cardiology societies have been published already but official regulatory directives vary among countries (1). In Switzerland, as of 16 March 2020, the Federal Council has declared the “extraordinary situation” based on the growing COVID-19 pandemic. Thus, regional regulatory authorities in the majority of cantons in Switzerland have issued statements and directives restricting hospital activities to only urgent or emergent cases while placing a moratorium on elective treatments in order to make medical resources available for the increasing number of COVID-19 patients and to protect high-risk patients from in hospital transmission. The following Swiss recommendation provides guidance for cardiologists all over the country on how to deal with this extraordinary situation and how to provide optimal patient care for patients with cardiac conditions while respecting current regulations and minimizing risks for patients and personnel. Importantly, ethical conduct in accordance with the most important principles in medical ethics (do good, do not harm, respect autonomy, social justice) must remain our foremost priority despite troubled times. The statement focuses on patient selection, treatment aspects and personal protection measures confronting patients with suspected or confirmed COVID-19.

1. Catheterization laboratory organization

As mentioned above a downsizing of the case volumes is required and mandatory (e.g. deferral of elective cases). Consider and anticipate staff shortages (infected staff,

quarantine, childcare at home). Specific consideration to subspecialty care teams may be required: separation of individuals with overlapping skillsets. Given the infectious risk of transporting patients from wards to the catheterization lab, some procedures routinely done in the catheterization laboratory should be considered for bedside performance, such as implantation of temporary pacemakers, pericardiocentesis or removal of assist devices. However, the decision to perform procedures outside of the usual environment depends on a risk-benefit-decision of the respective operator.

Recommendation for catheterization labs:

- For all known or suspected COVID-19 positive patients' a dedicated Cath lab is recommended
- Determine rooms/spaces for specific procedures: e.g. pulmonary artery catheter placement, pericardiocentesis and insertion of assist devices (depending on availability)
- catheterization labs require a terminal cleaning following the procedure leading to delays for subsequent procedures

2. Personal protective equipment (PPE)

Every institution has local recommendations of the department for infectious diseases. You should rigorously follow these recommendations.

Given the close contacts between operators, staff and patients in the Cath Lab, priority for state-of-the-art protective gear should be given to the Cath Lab personnel, in order to perform these procedures safely. This is particularly important given the fact that patients can become hemodynamically unstable in the Cath Lab, with potential spreading of the viruses (forceful coughing, vomiting etc.).

The teams of the Cath Labs, operating rooms, ICUs and emergency departments need instructions for the correct use of masks, gloves and goggles. All catheterization lab directors and managers should work closely with their institutional infection control group in order to ensure availability and training in the use of this equipment. The Personal protective equipment (PPE) should include gown, gloves, goggles (or shields) and a mask. The hospitals are responsible to ensure availability of all elements for PPE.

Recommendation for PPE:

- In all the contexts with risk of aerosol production (critical and unstable patients, patients vomiting, respiratory distress, intubation): always FFP2
- Stable patient without risk of aerosol production (stable patients, no need for any respiratory assistance): surgical mask (droplets protection)
- Any critical/unstable/resuscitated patient (including patients with unreliable anamnesis) should be considered as suspected for COVID and treated/managed consequently until the result of the test is known
- Adhere to the hospital's recommendations for hygienic measures
- Ensure availability of the PPE (Cave: mask shortage)
- Mask according to the risk of dissemination/spreading
- Avoid shortage of masks, gowns, gloves and regular surgical masks by deferring of elective cases and reducing the number of people who scrub into procedures.

3. Selection and treatment of patients:

Elective patients: As recommended by authorities, institutions in Switzerland have placed a moratorium on elective procedures in stable patients that can be delayed for 2-3 months without harming the patients. The aim is to preserve resources and avoid exposure of high-risk patients to the hospital environment where COVID-19 may become more prevalent within the next weeks. Non-urgent procedures requiring a stay in the intensive care unit should be postponed, especially those who will need a post procedural stay in the ICU. The definition of “truly elective” requires a reasonable clinical judgement, because deferral of patients may have independent deleterious effects. Case decisions should be individualized, taking into account the risk of COVID-19 exposure versus the risk of delay in diagnosis or therapy. Exceptions from the general recommendations below may occur in the case of intractable symptoms or if deferral by ≥ 3 months may have an adverse impact on the prognosis of the patient. In uncertain cases, an interdisciplinary discussion in the Cardiac Heart Team should be sought and decisions based on broad consensus of their members.

General recommendation for procedures to defer:

- PCI for stable ischemic heart disease
- Endovascular intervention for peripheral vascular disease
- Structural heart disease evaluation and treatment for stable patients without heart failure
- Stable congenital heart disease (CHD) patients
- Cardiac surgery for stable patients
- Elective EP procedures

STEMI patients: In Switzerland, primary PCI (pPCI) is the routine treatment for STEMI in most patients. A recent report from China outlines a protocol that relies on rapid nucleic acid testing and reliance on fibrinolytic therapy (2). In Switzerland, pPCI is widely accepted as the best reperfusion strategy due to short delays and rapid emergency medical systems. However, in patients with known COVID-19 and STEMI, the balance of staff exposure and patient benefit should be weighted carefully (2). In patients with active COVID-19 in whom primary PCI needs to be performed, appropriate personal protective equipment is mandatory.

Recommendation for STEMI patients:

- pPCI should remain the first option for STEMI patients
- Suspected (any symptoms!) or confirmed COVID-19 patients need to be performed in a protected environment: personal protective equipment (PPE) and general hospital measures, defined Cath Lab
- Thrombolysis is generally not recommended and should only be considered for highly selected patients/setting
 - symptom onset < 6 h timely pPCI cannot be performed (< 120 min)
 - patient has no contraindication for fibrinolysis
 - Appropriate PPE is not available, or risk for personnel (operator/staff) is considered excessive
- Consider conservative measures in older multimorbid patients

- Consider conservative measures in patients referred under resuscitation (eCPR) or in severe cardiogenic shock. We recommend the reading of the ethical statement of the SAMW “triage in intensive care medicine” during the Covid-19 pandemic (4).

NSTEMI patients: Patients with very high-risk features should be considered as STEMI patients (2015 NSTEMI GIs). Patients with NSTEMI without very high-risk criteria presenting with signs and symptoms of COVID-19 should be deferred from invasive treatment until their COVID-19 status is known. In appropriately selected cases of hemodynamically stable patients with known COVID-19 and NSTEMI (e.g. type 2 MI), conservative therapy may be considered based on the patient’s risk. CCTA may be performed if imaging quality is assured (e.g. HF <70/min, nitrate administration possible).

Recent reports suggest that acute cardiac injury is present in about 7% of patients with COVID-19 and may represent either type 2 MI or myocarditis (4). There are also reports of micro thrombotic disease (MI without stenosis). All of these factors need to be taken into account when weighing risks and benefits. Efforts should be made to try to differentiate between type 2 vs. type 1 MI.

Recommendation for NSTEMI patients:

- For NSTEMI patients with very high-risk criteria consider pPCI with personal protective equipment (PPE) and general measures of the hospital
- Deferred invasive strategy for NSTEMI patients presenting with signs and symptoms of COVID-19 and without very high-risk criteria and patients with type 2 MI. We recommend performing CRP, chest imaging (X-rays or CT) and testing for COVID-19 in NSTEMI patients and at least in patients with atypical/questionable chest pain to rule out COVID-19
- Send stabilized patients home as soon as possible

Patients requiring intubation, suctioning or CPR: Intubation, suction and active CPR likely result in aerosolization of respiratory secretions. STEMI patients might present different clinical scenarios that don’t give time to the operator/nurses to change the mask such as sudden cardiac arrest, nausea leading to vomiting, extreme bradycardia episodes during which patients are asked to cough.

Therefore, protection of the personnel in the catheterization laboratories is mandatory as the likelihood of exposure to the virus increases (appropriate gowns, strict hand disinfection, appropriate face masks). Endotracheal intubation of patients with COVID-19 or suspicion of COVID-19 should be performed by experienced healthcare workers according to the current guidelines on the Management of Critically Ill Adults with Coronavirus Disease (5). Patients who are already intubated pose less of a transmission risk to staff given that their ventilation is managed through a closed circuit.

General recommendation (Swiss consensus): in all the patients referred for an invasive procedure (urgent/emergent/accelerated) the COVID test should be considered, regardless of patient’s symptom

Recommendation for intubated patients and patients in need for CPR:

- Patients in which a proper medical history cannot be obtained (heavily sedated, intubated, after prolonged CPR, in shock) should be considered as suspected COVID-19

cases and treated accordingly (see specific recommendation for STEMI and NSTEMI patients)

- Patients with COVID-19 or suspected COVID-19 requiring intubation should be intubated outside the Cath Lab prior to arrival to the catheterization laboratory
- The threshold to consider intubation in a patient with borderline respiratory status may need to be lowered in order to avoid emergent intubation in the catheterization laboratory (non-invasive ventilation if needed)
- Close coordination with the critical care team and anesthesia teams for airway management and resuscitation
- Strict use of personal protective equipment (PPE) during CPR
- Use of Powered Air Purifying Respirator (PAPR) systems may be reasonable, especially for patients who may be vomiting (Morphine, inferior STEMI)

Patients with structural heart disease, including congenital heart disease: Patients with structural heart disease should continue to be discussed in an interdisciplinary heart team consisting of interventional cardiologists, cardiac surgeons, non-invasive cardiologists and cardiac anesthesiologists. In patients with urgent need for a structural interventional (e.g. critical aortic stenosis, unstable clinical condition) the optimal treatment (structural interventions versus surgery) needs to be discussed on an individual based on anatomical suitability, expertise and hospital resources. In centers offering both, experienced structural interventional and surgical programs, transcatheter therapies may be favored over surgical treatments due to less strain on ICU and ventilatory resources in selected patients. Stable patients without critical disease should be referred after the pandemic in order to preserve bed availability both on the wards and on ICUs.

Recommendation for patients requiring structural percutaneous procedures:

- Discuss patients with structural and/or congenital heart disease in the heart team. Individual decisions based on patient condition, hospital resources, expertise and anatomical suitability
- Defer stable patients (without critical disease and/or unstable clinical condition)

Patients requiring urgent diagnostic invasive procedures (i.e. right heart catheterization for pulmonary arterial hypertension): In case of urgent initiation of specific medical therapies in treatment naïve pulmonary hypertension patients, diagnostic invasive exams should not be deferred. However, decisions for escalating pulmonary vasoactive therapies should be based on non-invasive risk stratification. Elective right catheterization for assessing treatment response in stable pulmonary hypertension patients should be postponed.

Recommendations for pulmonary hypertension patients:

- Defer stable patients
- Discuss unstable patients with needs for initiating or escalating pulmonary vasoactive therapies with the pulmonary hypertension team.

Patients with heart rhythm issues (10)

All procedures and implantations that are not urgent should be postponed. Treatment of arrhythmias with imminent risk for tachycardiomyopathy, or associated with syncope,

hemodynamic compromise, etc. that cannot be managed with antiarrhythmics should not be deferred. For patients with CRMD consider remote monitoring.

Recommendations for CRMD

- Urgent pacemaker implants for symptomatic AV block should continue
- Urgent ICD or CRT-D implants for secondary prevention following cardiac arrest or syncope VT should continue
- ICD or CRT-D implants for primary prevention should be risk assessed on a case-by-case basis but may be deferred, accepting that there is a finite risk associated with delay.
- CRT for patients with unstable heart failure should be considered on a case-by-case basis.
- Urgent replacements, e.g. for EoL with no underlying rhythm, should continue.

Recommendations for ablation procedures

- Ablation for rapidly conducted pre-excited AF in WPW patients, patients with heart failure secondary to tachycardia, and VT ablation for patients who are not controllable with medication can be considered.

4. Experience increasing: Need for ongoing information and exchange of experience

The COVID-19 is a novel disease and experience is therefore small. Report and publications are increasing day by day. Exchange between opinion leaders and centers already treating a huge number of COVID patients will be crucial for the future. There are some published data and experience from the SARS epidemic (6). Consensus and recommendation papers can help to guide the approach to COVID patients in this unique and critical situation (7).

Recommended information source of the ACC (8, 9).

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