

Management of patients with indications for cardiac catheterization in congenital heart disease during Coronavirus (COVID-19) pandemic

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On December 29th, 2019, a hospital in Wuhan (Hubei-China) reported an outbreak of severe unexplained viral pneumonia¹ by Coronavirus-19 (COVID-19). On February 21st, 2020, the first two clusters of COVID infection in Europe were reported in Codogno (Lombardy-Italy) and Vò Euganeo (Veneto-Italy). Other Italian regions were rapidly contaminated, and the disease spread over the rest of the world a few weeks later. As a consequence, national authorities proclaimed progressive limitations of normal daily life of their citizens. Unfortunately, the number of affected subjects is continuing to increase, and has involved children and pregnant women also².

This pandemic has radically changed the organization of daily care in the hospitals, due to the number of beds occupied by COVID +ve patients and the number of physicians and nurses involved in the intensive care of these patients. Although the majority of paediatric patients³ have remained free of serious symptoms and complications, children may be contagious and spread the disease, infecting older subjects, whose mortality risk is directly proportional to age.

Hence, it is important to detect COVID-19 infection in hospitalized paediatric patients and managed in order to protect relatives and hospital personnel.

The aim of this document is to propose a protocol that can offer some support for local management of paediatric cardiac patients in need of urgent percutaneous interventional procedures.

Admission planning protocol

In the hospitals operating in epidemic areas, the wards should be divided into COVID +ve wards and COVID-free wards. In order to avoid the contamination of the COVID-free wards, before a planned admission, a nasopharyngeal swab should be taken. If the result is not available on admission, a preventive quarantine should be organized in order to avoid contamination of physicians, nurses, patients and eventually any accompanying persons. Given the relatively low sensitivity of the nasopharyngeal swab (about 65%)⁵, any symptomatic patient or patients who may have been in close contact with COVID +ve patients should be treated as possible COVID +ve patients. Therefore all elective procedures should be postponed until the swab result is available. The number of the caregivers during the hospitalization should be as low as possible, and ideally one per patient.

The procedure

Based on the screening described above, there are six clusters of patients:

- 1) COVID -ve patients: for these patients, the management should follow the standard protocol of the institution for the interventional procedures.
- 2) COVID +ve patients for elective interventional procedure: the procedure should be postponed, and the patients should be treated by a dedicated COVID team and in a dedicated ward or at home until symptoms disappear and the swab becomes negative.
- 3) COVID +ve patients for emergency interventional procedure: follow the indications reported below.
- 4) Suspected (symptoms) or probable (history of close contact with positive or symptomatic patients) COVID +ve patients without evidence from nasopharyngeal swab (patients in quarantine): follow the procedures for COVID +ve patients
- 5) Patients without symptoms and without close contacts with unavailable nasopharyngeal swab for emergency intervention: follow the procedures for COVID +ve patient, if the hospital is in an epidemic area with large prevalence in the population (areas in quarantine)
- 6) Patient with past COVID infection, without symptoms and with at least two negative nasopharyngeal swabs performed 48 hours after the end of isolation period: this patient can be treated like a COVID -ve patient.

Catheter laboratory organization

The following special equipment is needed in the catheter laboratory (the availability of the materials should be verified on a daily base)

- 1) N95 masks, FFP2 masks and FFP3 masks (at least 10 pieces per procedure, depending on the number of staff)
- 2) Disposable overshoes (at least 10 pairs per procedure)
- 3) Facial masks or face shield (at least 5 pieces, depending on the number of staff)
- 4) Dedicated laryngoscopes
- 5) Clamp for endotracheal tube for disconnection/connection manoeuvres

Preparation before arrival of the patient

The materials for the procedure (anaesthetic equipment, catheter equipment such as introducer sheaths, catheters, devices, syringes, needles, guidewires, etc.) should be prepared before arrival of the patient.

For the most commonly used materials, a designated shelf should be available for COVID +ve procedures.

The passage during the patient transfer to the catheter laboratory should be free of obstructions and persons.

On arrival of the patient in the catheter laboratory, nurses and anaesthetists should be prepared as below. The team may include one anaesthetist and assistant, 2 nurses, 1 radiology technician, one cardiac physiologist, and one or two interventional cardiologists. The team numbers should be as small as possible.

Dressing of operators

A coordinator familiar with the correct dressing sequence should guide the dressing of the operators.

- 1) Remove any personal objects
- 2) Put on a disposable scrub
- 3) Put on the disposable overshoes
- 4) Put on the leaded gown
- 5) Put on disposable gown
- 6) Put on the mask FFP2-FFP3 with modeling the nasal iron strip in order to achieve the best fit on the face
- 7) Put on the headset
- 8) Put on the facial mask/face shield
- 9) Scrub and disinfect the hands
- 10) Put on the first pair of gloves
- 11) Put on the sterile coat or an impermeable coat (anaesthetists, nurses and radiology technician)
- 12) Put on the second pair of gloves (figure 1)

Once the patient is placed on the catheter laboratory table, the preparation should continue as usual. All the doors to the catheter laboratory should be closed and should remain closed, with the operators remaining inside until the patient leaves the room.

If catheters, devices or other equipment are needed and these are outside the catheter laboratory or in non-dedicated shelves, the nurse should change the gloves before leaving the room to collect the material.

After the procedure has finished, the team should place the patient in the appropriate cradle or insulated bed. Once the patient is outside the catheter laboratory, the undressing procedure can begin for all the operators:

Undressing procedure for operators

- a) Clean the outer gloves with disinfectant
- b) Remove the sterile or impermeable coat and the gloves (glove in glove method or beak method) and place in a special waste disposal bin without pushing in order to avoid the nebulization phenomenon
- c) Clean the inner gloves with the disinfectant

- d) Remove the facial mask or the facial shield and put in a receiver filled with disinfectant (similar to the ones used for trans-esophageal probes)
- e) Clean the inner gloves again with disinfectant
- f) Remove the headset, the leggings and the inner gloves
- g) Clean the hands with disinfectant
- h) Leave the operating room and close the door.
- i) Use a pair of disposable gloves
- j) Remove the FFP2/FFP3 mask and put in the special waste disposal bin
- k) Remove the disposable gown
- l) Wash hands thoroughly
- m) A team member should clean the leaded gown with a disinfecting solution (whilst still on the operator)
- n) Remove the leaded gown
- o) Wash hands again

Once the patient is back in the ward or Intensive Care Unit, the management will continue as recommended in similar documents.

For dressing and undressing maneuvers, a tutorial is available on

<https://www.dctv.unipd.it/tutorialcovid>

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Figure 1: dressing for COVID +ve treatment

