



How cardiologists respond to COVID-19: the experience of West China Hospital, China

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Dear Editors,

A recent outbreak of the coronavirus disease 2019 (COVID-19) was first identified in the central Chinese city of Wuhan [1–4], Hubei Province, China. The World Health Organization has declared the COVID-19 outbreak as the sixth public health emergency of international concern (PHEIC). The outbreak of COVID-19 is in the season of high incidence of cardiovascular diseases, and it is the third coronavirus to emerge in human populations in the past two decades (Table 1) and has put Chinese health authorities and global public health institutions on alert. While preventing COVID-19 and controlling its transmission, the diagnosis and treatment of patients with acute coronary syndrome (ACS) cannot be ignored. ACS is characterized by acute onset and rapid progression, which may have life-threatening consequences. During the epidemic prevention and control period, thrombolytic drug followed by perfusion therapy should be the first choice of treatment for patients with acute myocardial infarction (AMI), according to the principle of “treatment in the nearest place, safe protection, thrombolysis as a top priority, designated transfer, and tele-consultation.” Based on the characteristics of cardiovascular diseases, the novel coronavirus protection strategy for cardiologists in our unit is developed based on the background of novel

coronavirus infection control, providing a reference. Meanwhile, the strategy will be updated at any time in accordance with the changes of the relevant national, provincial, municipal, and hospital regulations. However, percutaneous coronary intervention (PCI) should be considered when the benefits of emergency PCI outweigh the risks based on comprehensive evaluations in the emergency department. The aim of the plan is to enable us to provide the maximum level of care to protect the safety of both medical staff and patients and the experience of West China Hospital, China.

West China Hospital is the referral medical center in Sichuan Province and the largest hospital in southwest China. It is our responsibility to provide pre-care for the admission of additional critically ill patients from all over the country [5]. To prevent the epidemic of COVID-19 according to the present law, prevent the spread of the virus, and protect the safety of both physicians and patients, relevant treatment approaches are proposed in admitting patients with emergency intervention needs into the cardiac catheterization room. In the emergency department or chest pain center, if patients require urgent interventions, such as PCI, temporary pacemaker implantation, and extracorporeal membrane oxygenation, for the treatment of diseases, including ACS, bradyarrhythmia, and fulminant myocarditis, the following procedures should be applied in admission and treatment (Fig. 1).

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Step one: Communication over the phone

The on-duty physician in the catheterization room should first communicate with the staff in the emergency department or chest pain center by phone to determine the patient’s epidemiological history, clinical manifestations, nucleic acid test result, and chest computed tomography finding. Patients should be classified into two categories based on the initial evaluations: (1) high-risk suspected patients with nonviral infection (I) and (2) high-risk suspected patients with viral

Table 1 Epidemiological characteristics of mainly known to infect humans coronaviruses in the past two decades

Virus	Onset time	Cov	Reservoirs	Intermediate host	Fatality rate (%)	Incubation period (days)	More Susceptible group	Confirmed cases/deaths cases, spread to countries	Reproduction number R0	PHEIC	Symptoms	Receptor	First identified location
SARS-CoV	11/2002	β -CoV	Bat	Civet	9.5–10	5–6	Elderly males	8098 (confirmed) 774 (death) 37 countries from Nov 2002 to Jul 2003	2–5	NO	SARS	Angiotensin-converting enzyme 2 (ACE2)	Guangdong China
MERS-CoV	04/2012	β -CoV	Bat	Camel	34.4–35.5	4.5–5.2	Elderly males	2494 (confirmed) 858 (death) 27 countries from Sep 2012 to Sep 2019	<1	NO	SARS, prominent gastrointestinal symptoms and often AKF	Dipeptidyl peptidase 4 (DPP4); also known as CD26	Jeddah Saudi Arabia
SARS-CoV2	12/2019	β -CoV	Bat?	Unknown	Unknown	1–14?	Elderly males?	Unknown	1.5–3.5?	YES	Asymptomatic, mild, moderate to SARS	Angiotensin-converting enzyme 2 (ACE2)	Wuhan China

SARS-CoV, severe acute respiratory syndrome-related coronavirus; MERSr-CoV, Middle East respiratory syndrome-related coronavirus; β -CoV, betacoronavirus; PHEIC, public health emergency of international concern; ACE2, angiotensin-converting enzyme 2; DPP4, dipeptidyl peptidase 4; SARS, severe acute respiratory syndrome; AKF, acute kidney failure; ?, according to the present available updated information evidence shows it needs further investigation to be thoroughly elucidated

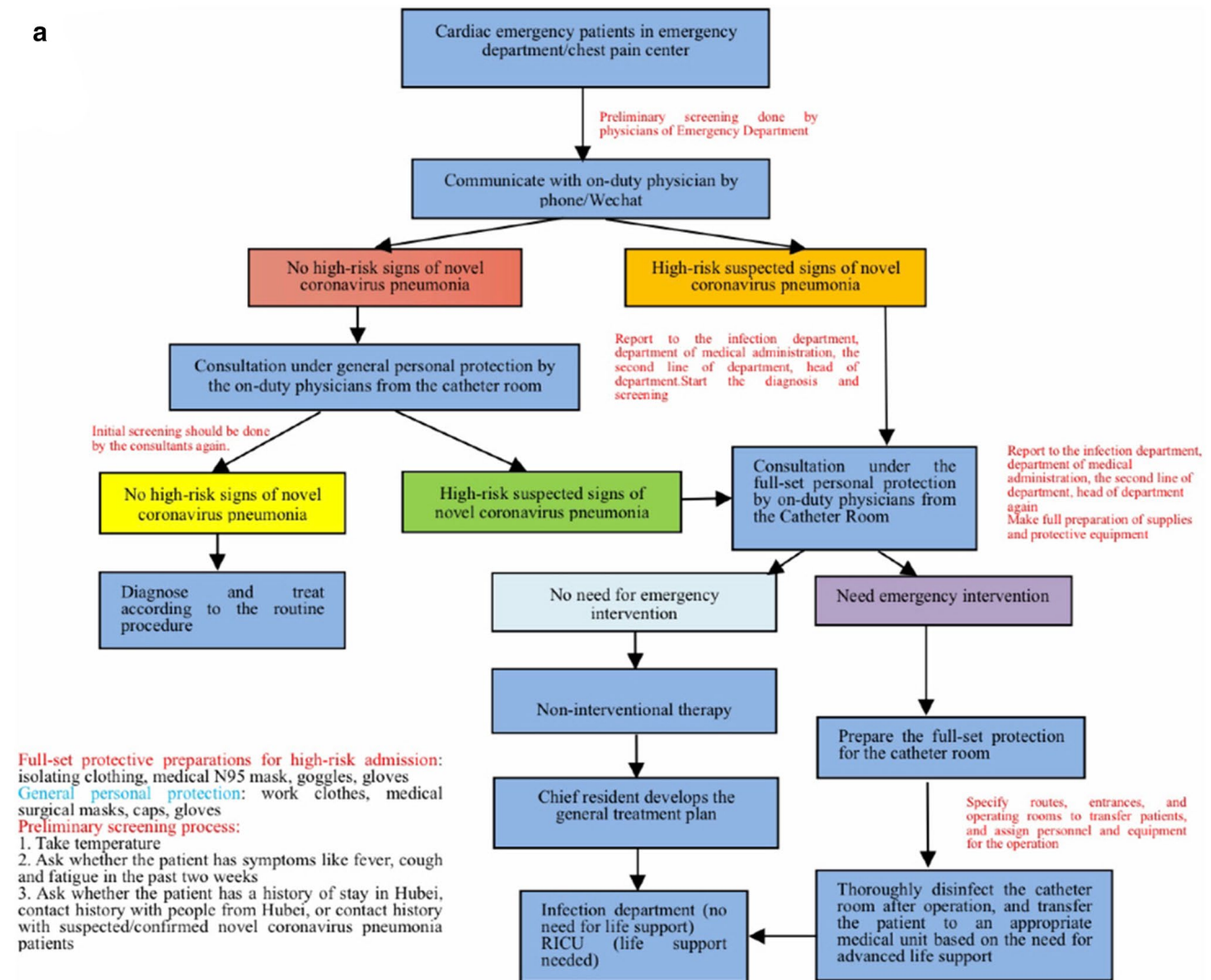


Fig. 1 a Flow Chart. **b** Personal protection level and requirements. Shaded upward triangle, respirators are not necessary and can be used if conditions permit

infection (II). The catheterization room will be closed for the two abovementioned categories through the emergency admission, except for special reasons, and the cardiologists should guide and triage the patients in the chest pain center to complete corresponding procedures.

Step two: Consultation

(I) High-risk suspected patients with nonviral infection should undergo consultation by the on-duty physician in the catheterization room.

(1) Personal protection requirements for the consultants: Work clothes, medical surgical mask, cap, and gloves will be required, and everyone should follow the unified route planned by the hospital to enter and exit the emergency

department. (2) Consultation task and triage treatment: Detailed inquiry, screening, and temperature measurement of the patient should be conducted again. The intervention procedure for suspected patients with low risk in the emergency should be followed as usual.

(II) High-risk suspected patients with viral infection should undergo a consultation by the on-duty physician in the catheterization room. (1) Personal protection requirements for the consultants: Consultants will be informed after the consultation request of such patient is sent by the emergency department, and everyone should follow the unified route planned by the hospital to enter and exit the emergency department. The consultation should not be performed until the consultant wears the personal protective equipment (isolation clothing, medical N95 respirator, goggles, caps, and gloves) at the emergency

b Items	Level 1 of Protection Against COVID-19	Level 2 of Protection Against COVID-19	Level 3 of Protection Against COVID-19
Disposable medical surgical mask	△		
Caps		△	△
Protective clothing		△	△
Isolation clothing	△		
Medical protective mask		△	△
Gloves	△	△	△
Goggles/protective face mask		△(Alternative)	△(Both)
Boots/protective shoe covers		△	△
Respirator			▲
Medical observation on close contacts	△		
Patient transfer		△	
Disinfection		△	
Samples shipment	△		
Outpatient and emergency treatment of fever for general respiratory infections	△		
Medical treatment, cleaning, and disinfection in observing room and isolation ward		△	
Disposal of the patients' blood, secretion, and excrement		△(Plus mask)	△

Fig. 1 (continued)

department. (2) Consultation task and triage treatment: (1) If the emergency intervention surgery is unnecessary, the corresponding diagnosis and treatment should be planned. Simultaneously, the consultant should ask the emergency department for the onset of diagnosis and screening according to the requirements of infection management and admit the patient to the department of infectious diseases or intensive care unit (ICU). (2) The patient with AMI who requires emergency medical thrombolysis

should be treated with thrombolytic therapy in the emergency department (negative-pressure isolation ward) under the guidance of the chief resident of the department of cardiology. After the thrombolytic therapy is completed, the patient should be admitted to the department of infectious diseases or ICU, depending on the severity of the disease. (3) If the benefits of emergency PCI outweigh the risks according to comprehensive evaluations, PCI in the emergency department should be considered, and it is

necessary to report to both the department supervisor and department of infection control or department of medical administration.

Step three: Transfer and surgery

1. Protection requirements

The physician from the cardiac catheterization room should participate in the transfer, and the emergency surgeons shall wear a full set of protective equipment, including isolation clothing, N95 respirator, goggles/mask, and sterile gloves before the transfer of high-risk suspected patients. Moreover, the patient shall be equipped with relevant protective equipment before the transfer to the cardiac catheterization room.

2. Transfer routes and operating room allocation

After communicating with the physician of the emergency department, the patient is transferred directly to the catheterization room through the special channel and the dedicated elevator and then into the designated and isolated operating room from the patient channel, and the buffer zone is closed. The nurse of the catheterization room is instructed to complete preoperative preparations. All instruments in the operating room are wrapped and covered with disposable instrument covers to prevent potential infection by the blood and/or body fluids of the patient.

3. Postoperative treatment

According to the requirements of the department of infection control, patients who do not need life support are admitted to the department of infectious diseases, and those who need life support are admitted to the ICU. All patients are transferred to the isolation ward through the special elevator and special channel. Simultaneously, this is reported to the department of infection control, and the evaluations are applied on isolation measures that should be taken on the patient's family members and accompanying persons according to the requirements of the Centers for Disease Control (CDC). Finally, a thorough terminal disinfection of the catheterization room should be conducted after the operation.

Therefore, viruses emerge and re-emerge worldwide without consideration for borders. The COVID-19 epidemic

is a threat and requires international efforts and collaboration, not only in China, but also globally. As for all public health emergencies, we need all individuals to fight together. In future cross-disciplinary studies, every effort to cooperate globally is needed to prevent and control the disease, and the time to act is now.

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Compliance with ethical standards

Conflict of interest The authors declare that they do not have any conflict of interest.

Statements on human and animal rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study, formal consent is not required.

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