

Expert Consensus on prevention and control in Ultrasound Department for Novel Coronavirus Outbreak

Corresponding Author:

Yuxin Jiang, Peking Union Medical College Hospital jiangyuxinxh@163.com

Jianchu Li, Peking Union Medical College Hospital jianchu.li@163.com

Writing Team:

Hongyan Wang, Peking Union Medical College Hospital

Qing Zhou, People's Hospital of Wuhan University

Youbin Deng, Wuhan Tongji Hospital, Tongji Medical College of Huazhong University of Science and Technology

Mingxing Xie, Wuhan Union Hospital, Tongji Medical College of Huazhong University of Science and Technology

Expert Group:

Experts in Chinese National Ultrasound Medical Quality Control Center and the Chinese Society of Ultrasound in Medicine

Secretary Group:

Luying Gao, Peking Union Medical College Hospital

Ruojiao Wang, Peking Union Medical College Hospital

Xixi Tao, Peking Union Medical College Hospital

Rui Zhang, Peking Union Medical College Hospital

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Introduction

The novel coronavirus currently was officially named as COVID-19 by the World Health Organization (WHO) and termed it as the causative agent [1-8]. Preventing nosocomial cross-infection has become one of the current priorities for prevention and control. The ultrasound department is an important platform and key hub department in the hospital. It deals with patients in multiple departments such as internal medicine, surgery, obstetrics and gynecology, emergency department, intensive care unit (ICU), fever clinic, isolation ward, etc., and it is highly mobile. Prevention plays a critical role in mitigating the risk of sonographer personnel exposure in the care of patients with COVID-19. By the characteristics of ultrasound medical diagnosis and treatment, Chinese National Ultrasound Medical Quality Control Center and the Chinese Society of Ultrasound in Medicine have formulated the expert consensus on prevention and control (PC) in ultrasound department for novel coronavirus outbreak, to guide the PC of COVID-19 infection in ultrasound department of medical institutions.

Purpose

1. Standardize the ultrasound diagnosis and treatment in medical institutions for the PC of COVID-19 infection
2. Ensure the quality and safety of ultrasound medicine
3. Instruct staff in ultrasound department to take effective protective measures and reduce the risk of exposure
4. Control nosocomial infections and contain the spread of the virus

Application

This guideline applies to prevent and control of novel coronavirus outbreak in the ultrasound departments of medical institutions.

Epidemic prevention and management of novel coronavirus infection in the department of ultrasound

1. Team leader: Chief of the department, who is responsible for building the department's PC system and coordinating arrangements for the prevention.
2. Deputy Leader: Responsible for the following four parts:
 - 2.1 Patient management: measure the temperature of patients, supervise the wearing of masks, and ask about medical history.
 - 2.2 Environmental disinfection and personnel protection: supervise the disinfection of equipment and environment, and the distribution the personnel protective equipment (PPE).
 - 2.3 Supplies and staffing: manage department supplies and arrange medical staff work
 - 2.4 Staff training and psychological support: organize the staff to learn about the COVID-19 and establish a psychological support system

Divisional and graded prevention and control in ultrasound department

(I) Divisional setting

Divided the department into three sections: clean area, buffer area, and clinic area. Medical staff enter and exit from the clean area, patients and others enter and exit from the clinic area, and a buffer zone is set in the middle. Medical staff goes through the clean area → buffer area → clinic area, the opposite is the end of work, it is clinic area → buffer area → clean area, and finally, leave the department from the clean area. The cleaning order is clean area → buffer area → clinic area [Figure 1].

(II) Different risk graded clinics

According to the different levels of exposure to the novel coronavirus and the different locations of the ultrasound examination, environmental management, instrument disinfection, and personnel protection standards are implemented for each graded area.

1. Outpatient and Ward

1.1 Environmental Management

Ventilate the room twice a day, 30 minutes each time. After the daily work, air disinfection is performed in the consulting room with ultraviolet light for one hour. The surfaces of objects (desktops, door handles, telephone bases, panel switches, etc.) that are frequently touched are disinfected with 75% alcohol every 6 hours, at least twice a day. After 3 minutes, wipe with a dry cloth. The ground, floor mat, washbasin is disinfected with 1000mg/L chlorine-containing disinfectant every 6 hours, at least twice a day. After 30 minutes, wipe with water. Sheets and pillowcases are replaced every half a day and replace them immediately if they are damaged or contaminated. Dispose of medical waste (such as disposable sheets, pillowcases, paper towels, gloves, etc.). The trash can is disinfected with 500mg / L chlorine disinfectant, twice a day [Figure 2] [9,10].

1.2 Instrument disinfection

- 1) Wear gloves, goggles, and caps for the disinfection of instruments. Turn off the power before disinfecting the main unit, and avoid directly using the spray type to prevent the disinfectant from entering the panel gap or probe jack.
- 2) Disinfection of ultrasound equipment: Previous conventional disinfectant (ethanol alcohol disinfectant) is not recommended for the disinfection of host monitors, touch screens, cables, probe cables and probe sound-sensitive parts. There is still controversy about choosing the appropriate disinfectant. Previous studies have shown that the novel coronavirus is sensitive to alcohol. Since the rapid volatilization of alcohol, it is advisable to sterilize the ultrasonic instrument with 75% alcohol. It is recommended to use disinfection paper towels to wipe the sensitive parts of the probe after disinfection. This protocol is used during the novel coronavirus outbreak [Figure 3] [10,11].

1.3 Personnel protection

Requires primary protection, wear disposable work caps, medical-surgical masks, and work clothes, and disposable latex gloves if necessary. The patient's temperature needs to be measured. Fever patients are transferred to the fever clinic, and patients should wear masks before entering the clinic to prevent cross-infection [Figure 4] [12,13].

2. Emergency department

2.1 Environmental management

1) Ventilate the room twice a day, 30 minutes each time. When necessary, irradiated the room with ultraviolet light for one hour or 500mg / L chlorine-containing disinfectant spray for 30-60 minutes. The surfaces of objects (desktops, door handles, telephone bases, panel switches, etc.) that are frequently touched are disinfected with 75% alcohol every 6 hours, at least three times a day. After 3 minutes, wipe with a dry cloth. The ground, floor mat, washbasin is disinfected with 1000mg/L chlorine-containing disinfectant every 6 hours, at least twice a day. After 30 minutes, wipe with water.

2) The treatment of medical supplies is the same as the low exposure risk area. Medical institutions with conditions are advised to use disposable sheets and pillowcases.

3) With a suspected or confirmed case, the surface of the object would be wiped with 75% alcohol and the floor is sprayed and wiped with 1000mg / L chlorine-containing disinfectant after the patient is transferred. With an unmanned condition, the consultant room is disinfected with 500mg /L chlorine-containing disinfectant for 30-60 minutes, and irradiated with ultraviolet light for one hour. Then, the room is thoroughly ventilated for subsequent inspection [Figure 5] [9,10].

2.2 Instrument disinfection

It is recommended to use a special consultation room or bedside examination in the emergency department, and the equipment is not recommended for other consultation areas to prevent cross-infection. After each bedside examination, the machine needs to be disinfected [Figure 6] [10,11].

2.3 Personnel protection

The emergency department may directly contact the patient's body fluids, mucous membranes or incomplete skin. It requires wearing disposable work caps, goggles or protective face shields, medical protective mask (N95), gown or protective clothing. Wear disposable shoe covers and disposable latex gloves if necessary [Figure 7] [12,13].

3. Fever clinic, isolation ward, designated hospitals (diagnosis and treatment area for patients with suspected or confirmed novel coronavirus infection)

Strictly follow the requirements of World Health Organization 's "Protocol for Assessment of Potential Risk Factors for 2019-novel Coronavirus (2019-nCoV) infection among health care workers in a health care setting", and National Health Committee of China's " Guidelines for the Prevention and Control of Novel Coronavirus Infection in Medical Institutions" [14-16]. The air and environment disinfection of fever clinics, isolated wards, and designated hospitals should comply with the "Specifications for Environmental Cleaning and Disinfection Management of Medical Institutions ws/t 512-2016", "Technical Standard for Disinfection of Medical Institutions ws/t 367-2012", Air purification management standard ws/t 368-2012 ". [10,11,17].

Medical staff who carry out ultrasound diagnosis and treatment must protect according to regulations, and wear and remove PPE correctly. PPE includes disposable caps, goggles / protective goggles, medical protective masks (N95 masks), isolation clothing, protective clothing, disposable latex gloves, disposable shoe covers/boot covers.

COVID-19 critical patients admitted to designated hospitals, ultrasound doctors enter the isolation ward for bedside ultrasound examinations. Ultrasound equipment, especially portable ultrasound, can be moved at any time, and remote ultrasound consultation can be performed with network support [1].

3.1 Indications

For patients with COVID-19, the purposes of the ultrasound examination include 1) to determine whether there are multiple organ damages, such as the heart, kidney, liver, chest, abdominal cavity, and intestines; 2) to determine whether exists secondary diseases, such as lower limb venous thrombosis and pulmonary embolism; 3) Critical and death cases are more common in older patients, and sometimes associated with other medical conditions (such as coronary heart disease, diabetes, chronic renal insufficiency, chronic respiratory diseases, history of surgery, especially history of chest surgery, history of tumors, etc). Ultrasound examination needs to assess the other disease of the patients; 4) Abdominal pain, chest pain or other symptoms occurred during the hospitalization of patients, ultrasound is needed to determine its etiology, such as urinary tract stones, gallbladder stones, aortic dissection, appendicitis, etc .; 5) Cardiac function evaluation, hemodynamic evaluation; 6) Pulmonary ultrasound can be dynamically and effectively performed for monitoring; 7) Ultrasound-guided interventional punctures: such as venipuncture, pleural and abdominal fluid aspiration, thoracic and abdominal fluid drainage, or pericardial effusion drainage, etc.

3.2 Precautions

- (1) After the bedside examination, the instrument is returned to the designated area. The medical staff in the isolation ward is recommended to rotate regularly. After the work in the isolation area, they must be isolated and observed for 14 days.
- (2) Recommend antifogging treatment on the goggles to be worn, which will greatly reduce the interference of fog on the clarity of the visual field and improve the diagnostic quality. Antifogging treatment methods: Pretreatment with iodine volts, dishwashing liquid, anti-fog agents for glasses, alcohol, etc.
- (3) Ultrasound-guided interventional procedures should be strictly sterile and pay attention to patients' blood and body fluids.
- (4) Try to reduce performing bedside ultrasonography immediately after the patient performs operations such as nebulizing inhalation, suctioning, and tracheotomy.

Emergency plan

Ultrasound department is recommended to have a pre-examination triage area for rapid temperature monitoring and epidemiological history inquiry, to screen suspicious patients. For those with epidemiological history, fever ≥ 37.3 °C, and no other cause is confirmed, should be immediately reported to the department and initiate an emergency plan. Epidemiological history includes: (1) travel or residence history of Wuhan or surrounding areas, or other communities with case reports within 14 days before the onset of illness; (2) exposure to the patients with novel coronavirus infection within 14 days before the onset of illness; (3) exposure to the patients with fever or respiratory symptoms from Wuhan and surrounding areas or other communities with case reports within 14 days before the onset of illness; (4) clustered onset.

Isolate the patient immediately, and the patient is guided by a person to enter the isolation area through the standard route. After the patient is transferred, the environment of the clinic is cleaned and disinfected. Wipe alcohol on the surface of objects, spray and wipe 1000mg/L chlorine disinfectant on the ground, spray 500mg/L chlorine disinfectant for air disinfection, and then the room is thoroughly ventilated.

Closely contacted medical staff should follow the occupational exposure process. Take off hats, masks, work clothes, put them in a yellow garbage bag, spray with alcohol, and seal it, and then they are observed. For those with symptoms (such as temperature ≥ 37.3 °C, cough or shortness of breath), should be isolated immediately, follow the clinical diagnosis and treatment process.

Since some patients with novel coronavirus infection have atypical symptoms, the designated hospitals can strictly screen patients according to their actual conditions [1] [Figure 8].

Psychological support of medical staff

During the novel coronavirus outbreak, medical staff is undertaking high-load medical work, and psychological pressure that they are also suffering cannot be ignored. Psychological support helps alleviate the psychological pressure of medical staff, and ensure that the medical work runs smoothly and effectively.

1. Reasonable scheduling: Group scheduling to reduce the risk of cross-infection.
2. Abundant supplies: Abundant protective equipment is required, and a person is responsible for managing protective equipment to ensure that the medical staff has sufficient PPE.
3. Optimize the process: Make coordinated arrangements for the needs of bedside ultrasound. The emergency department is given priority, first visit the non-infectious department, then the infectious department.
4. Psychological care: Active communication, timely discussion, and sharing of feelings and experiences will help reduce stress.

Training

The Department of Ultrasound should formulate a novel coronavirus infection-related training plan, and carry out targeted training to improve the ability of PC of COVID-19.

1. Knowledge and protection training of COVID-19 are generally applicable to all medical staff. Live demonstration and practical operation are for staff in high-exposure areas (such as emergency, fever clinic, and isolation wards). Make sure that they are proficient in the knowledge and skills of PC of novel coronavirus infections.

2. The training content includes prevention, control, diagnosis and treatment knowledge about novel coronavirus infection, how to wear PPE, and iatrogenic infection management.
3. Posters, videos and other forms are used to educate patients and accompanying persons in the reservation hall, waiting area and other places, which includes hand hygiene, respiratory hygiene, cough etiquette, isolation, and the management of medical waste.

Summary Statement

This guidance is intended for healthcare workers in ultrasound department for the prevention and control of COVID-19 infection. The principles of PC strategies are as follows: special personnel are responsible for rational grouping of shifts; ensuring triage for source control; applying divisional and graded prevention and control; using disinfectants (such as alcohol, ultraviolet rays, chlorine-containing disinfectants) for environment management and instrument disinfection; providing medical staff with pre-training, psychological support and adequate supplies of PPE.

Figure 1 Divisional and graded setting for prevention and control of COVID-19 in ultrasound department

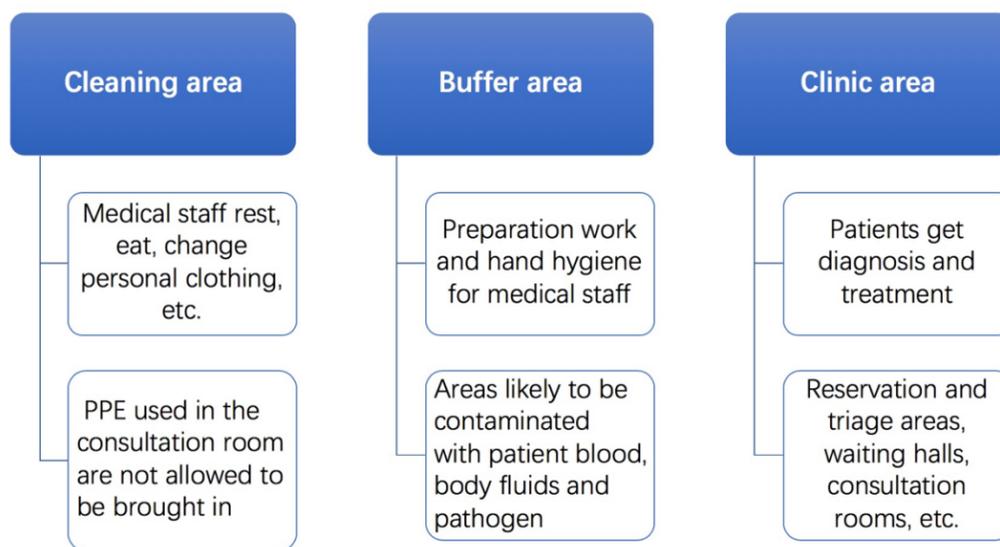


Figure 2 Environmental management in outpatient and ward area for prevention and control of COVID-19

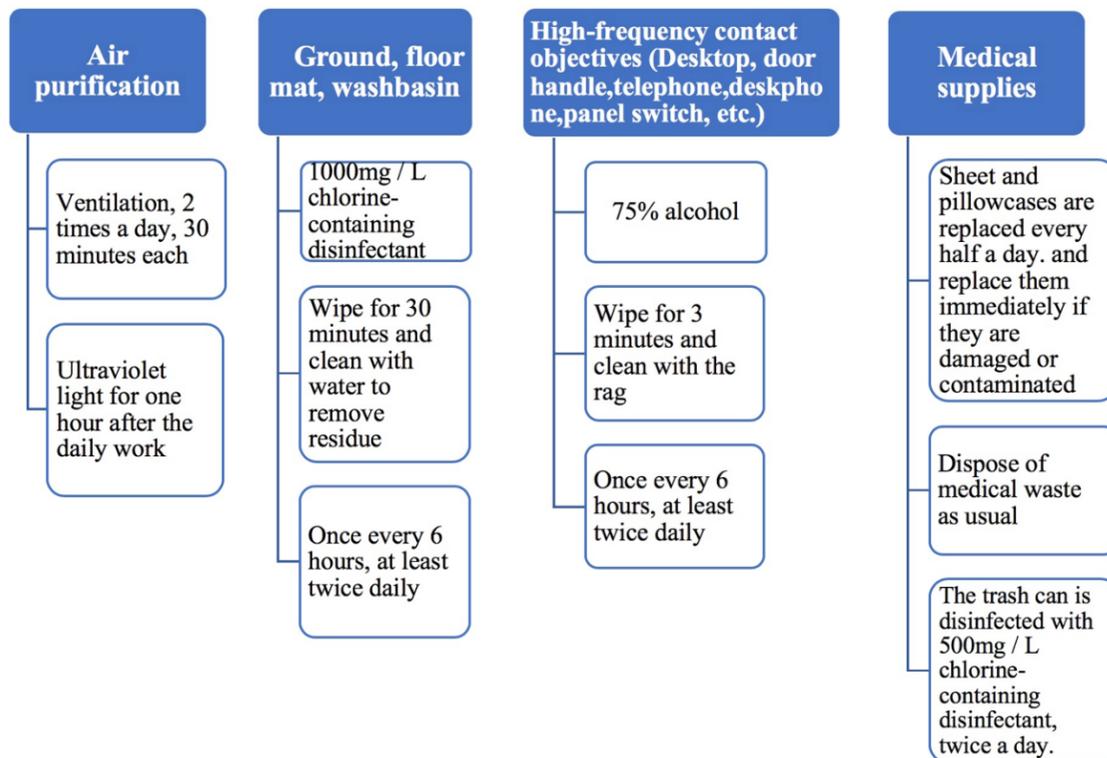


Figure 3 Instrument disinfection in outpatient and ward area for prevention and control of COVID-19

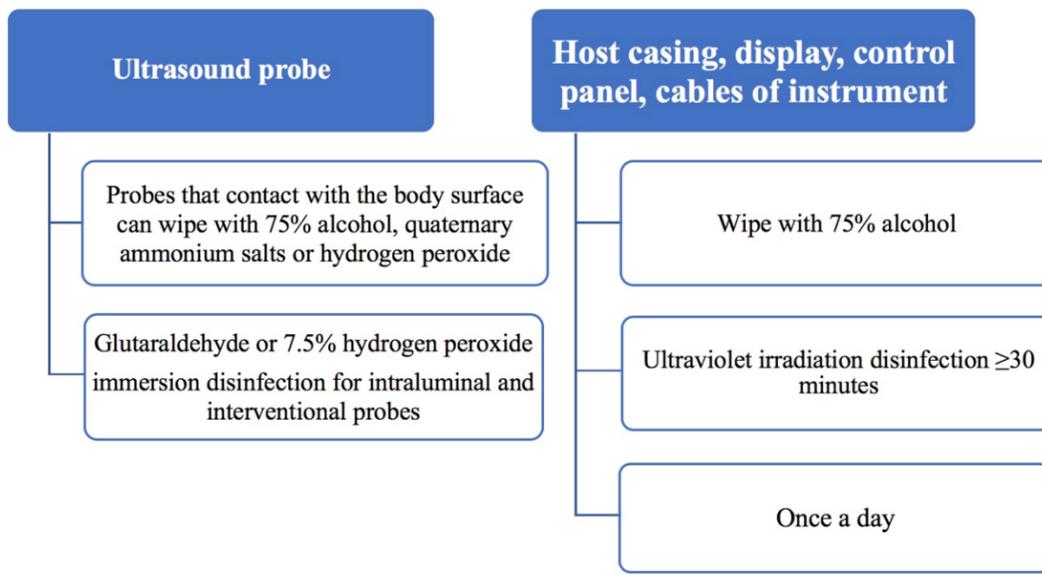


Figure 4 Personnel protection in outpatient and ward area for prevention and control of COVID-19

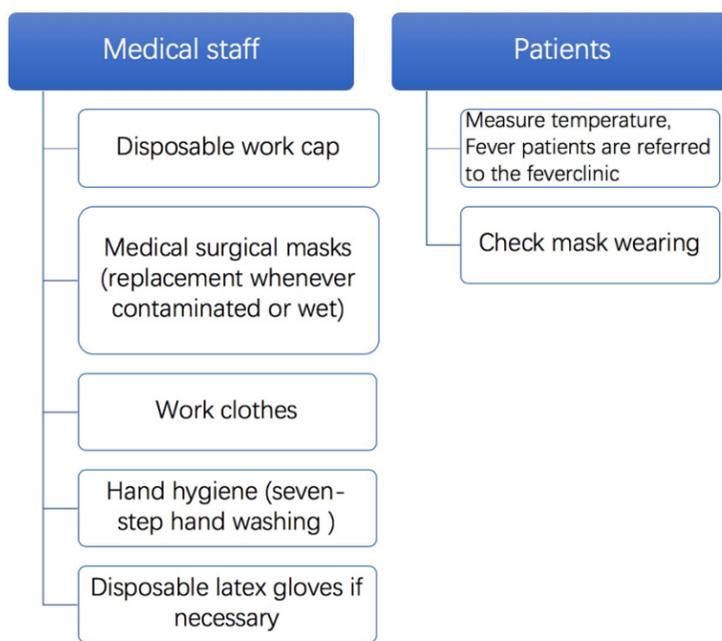


Figure 5 Environmental management in emergency department for prevention and control of COVID-19

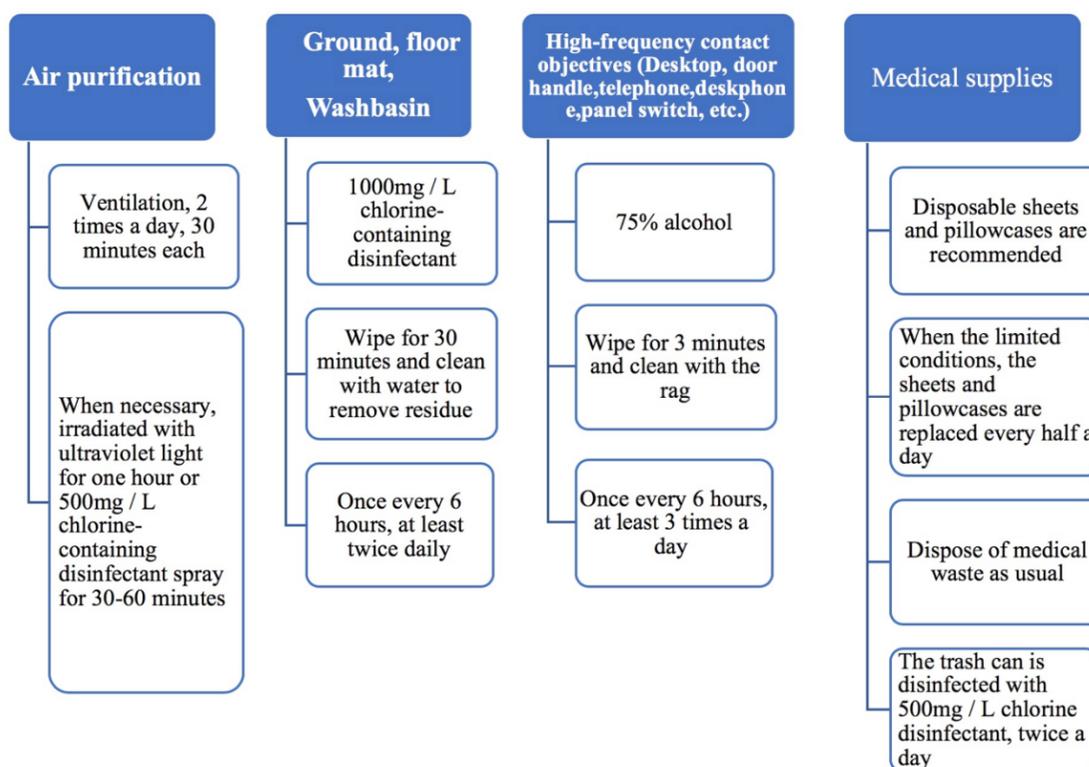


Figure 6 Instrument disinfection in emergency department for prevention and control of COVID-19

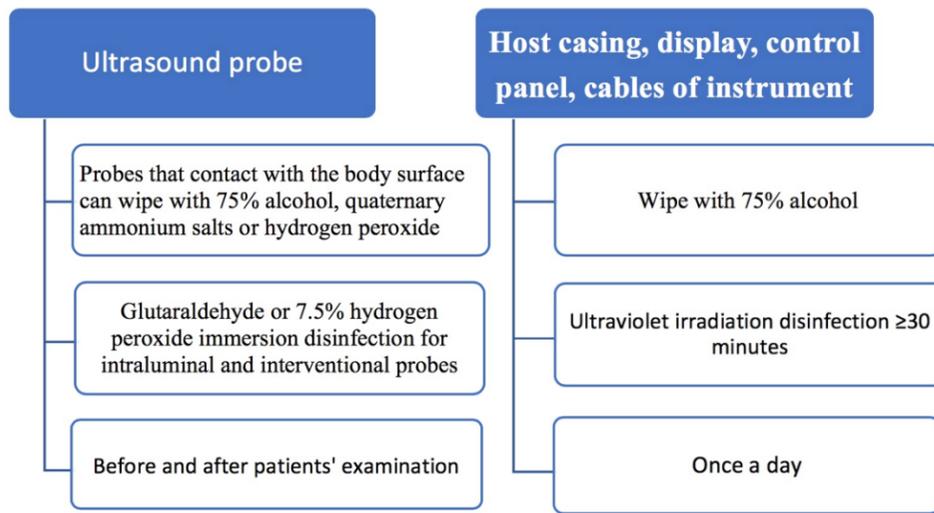


Figure 7 Personnel protection in emergency department for prevention and control of COVID-19

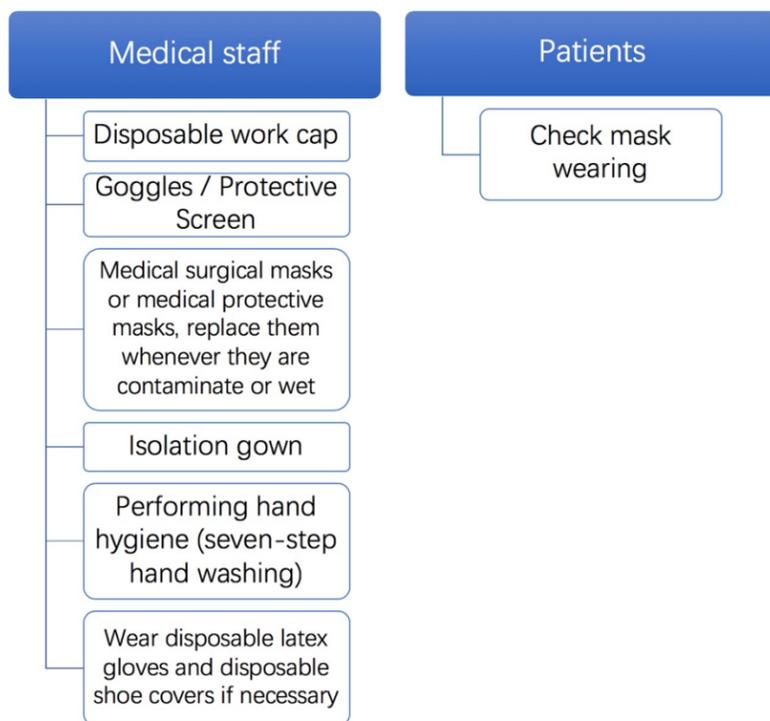
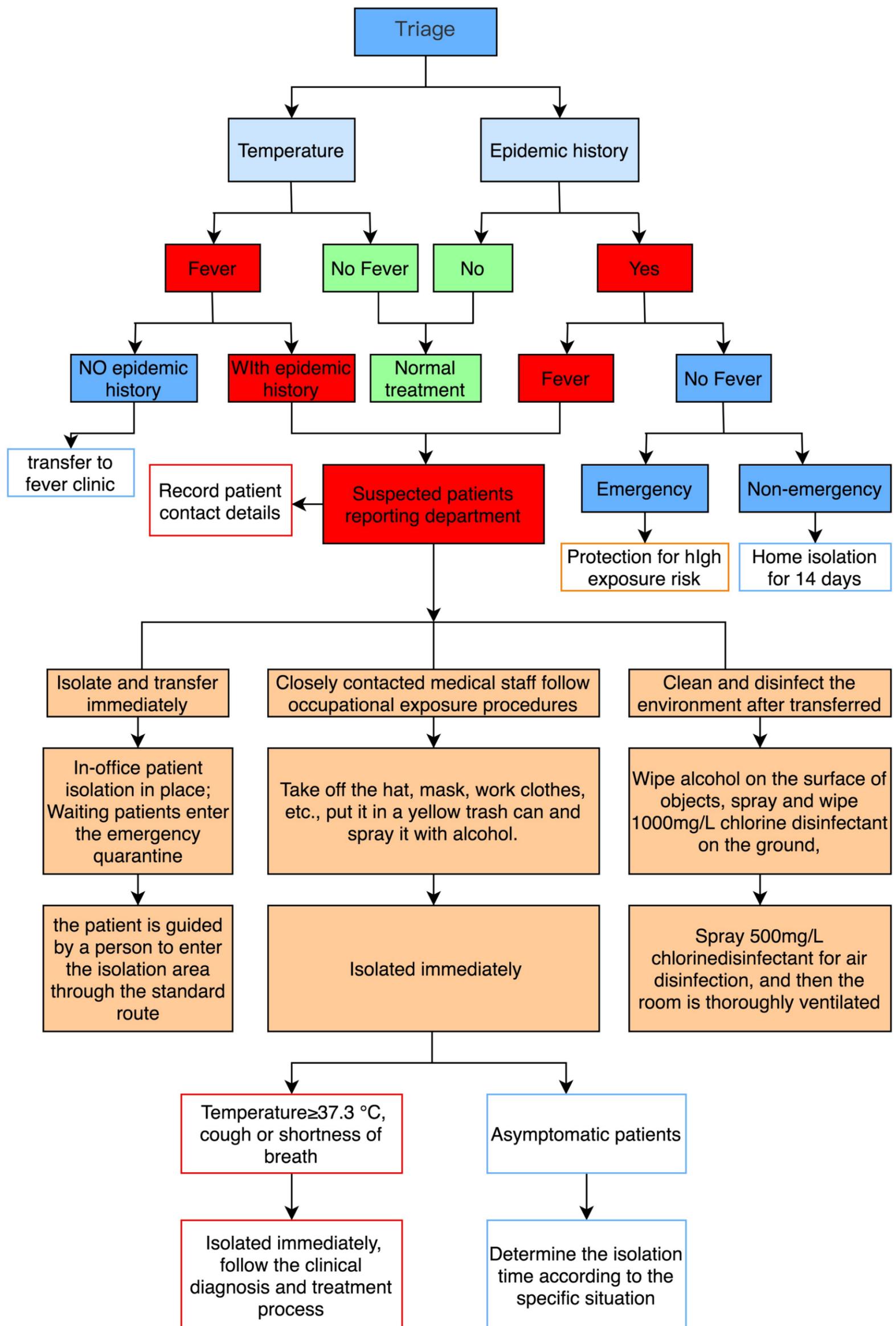


Figure 8 Emergency plan during the outbreak of COVID-19



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