

## Consensus

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## Expert consensus on emergency medicine procedure optimization guided by routine prevention and control strategy for COVID-19

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## ABSTRACT

The outbreak of coronavirus disease 2019 (COVID-19) was declared a global public health emergency on 31 January 2020. Emergency medicine procedures in Emergency Department should be optimized to cope with the current COVID-19 pandemic by providing subspecialty services, reducing the spread of nosocomial infections, and promoting its capabilities to handle emerging diseases. Thus, the Chinese Society of Emergency Medicine and Wuhan Society of Emergency Medicine drafted this consensus together to address concerns of medical staffs who work in Emergency Department. Based on in-depth review of COVID-19 diagnosis and treatment plans, literatures, as well as management approval, this consensus proposes recommendations for improving the rationalization and efficiency of emergency processes, reducing the risk of nosocomial infections, preventing hospital viral transmission, and ensuring patient safety.

**KEYWORDS:** COVID-19; Emergency medicine; Optimization; Control; Consensus

## 1. Introduction

Since the outbreak of novel coronavirus pneumonia (COVID-19) in early 2020, Emergency Departments in various medical institutions have remained steadfast, continuing to deal with a wide range of emergency patients and fighting as frontline responders. The Emergency Department provides multidisciplinary care and operates in a complex environment. Number of daily visits are large and patients frequently experience rapid clinical change. COVID-19 was caused by a new pathogen, a coronavirus, which caused symptoms in multiple systems, particularly the respiratory system. Given all of these factors, the risk of contracting a nosocomial infection while

working in an Emergency Department is exceptionally high.

The ability of all medical institutions to respond to COVID-19 has significantly improved since the pandemic began. Many preventative measures and working procedures have also been implemented. Despite the advancements, emergency medical services and capabilities vary by the medical institution. Also, the number of medical personnel is still insufficient. Aside from staffing, treatment strategies at different institutions vary. As previously stated, Emergency Departments include sub-specialties such as stroke medicine, chest pain centers, and trauma centers. The complexity of these variables continues to be a challenge for many emergency medicine departments. During the COVID-19 pandemics, this multidisciplinary care's operational processes must be optimized to effectively structure sub-specialties services, reduce the risk of nosocomial infections, and develop emergency medicine guidelines to manage the emerging diseases.

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## 2. Methods

In this study, an evidence-based method was used to answer essential questions in a valid, efficient, and accessible way. We drafted this consensus to address the concerns of medical workers in Emergency Department during their clinical duties. This consensus was reached based on in-depth review of COVID-19 diagnosis and treatment plans, relevant literature, and management approval. Before being finalized, the documents and relevant information were revised and integrated after extensive discussions and consultations with experts. Experts were asked to review the consensus and make additional recommendations for improving emergency process rationalization and efficiency, reducing the risk of nosocomial infections, preventing hospital viral transmission, and ensuring patient safety.

The levels of evidence and recommendations in this consensus were determined using the GRADE[1] and the expert group's opinions, as shown in Table 1. Levels of recommendations included strong recommendations (no exceptional circumstances, recommended), weak recommendations (according to the actual situation, consider to be adopted), weak objections (according to the actual situation, consider not to be adopted), and strong objections (no particular circumstances, advised not to adopt).

**Table 1.** Levels of evidence and recommendations[1].

Levels of evidence and recommendations	Type of source literature
Levels of evidence	
Grade I (high)	High-quality randomized controlled trials (RCT); authoritative guidelines; high-quality systematic reviews and meta-analysis
Grade II (medium)	RCT studies; cohort studies; case series studies and case-control studies with certain limitations
Grade III (low)	Case report; expert opinion text
Levels of recommendations	
A (strong)	Most physicians and policy makers will adopt this plan
B (moderate)	Insufficient evidence requires physicians and policy makers to discuss the recommendation and make decision together
C (weak)	Lack of evidence, physicians and policy makers must discuss the recommendation and make a joint decision.

Given the complexities of the Emergency Department, according to the experts' opinions, patients should be evaluated based on their epidemiological history (check the Chinese National Health Committee information on outbreak risk grade website: <http://bmfw.www.gov.cn/yqfjdxjcx/index.html> or official WeChat accounts of each city for regional risk level information), COVID-19 nucleic acid/antibody test result (valid within one week), imaging changes on the chest CT report, and positive COVID-19 history. The specific categories were listed as following:

A. High-risk individuals: those who visited high-risk countries or regions within the previous 14 days, did not complete quarantine and screening procedures, had direct contact with confirmed, suspected, or asymptomatic COVID-19 patients. This group also included those whose lung CT imaging results showed

viral pneumonia evidence and did not have a recent COVID-19 nucleic acid/antibody test result.

B. Medium-risk individuals: those who have had respiratory system-related symptoms within the last 14 days, such as fever (axillary temperature: 37.3 °C, forehead temperature: 36.8 °C) and coughing.

C. Low-risk individuals: those who do not meet the criteria for high-risk or medium-risk.

To improve Emergency Department's triage screening, the experts also recommended using health codes as one of the bases for classifying each individual's risk, as shown in Table 2. It was proposed to deliver appropriate treatment on time based on the individuals' risk level. According to the National Health Commission's guidelines, those with fever were sent to designated clinics for treatment. At the same time, high-risk individuals were referred to designated hospitals for treatment.

**Table 2.** Health code categories and the implications.

Health code*	Implications
Code Red	1. Confirmed cases, suspected cases, asymptomatic infection, and recovered patients or asymptomatic infection who have not completed a 14-day medical observation home (centralized) isolation; 2. Direct contact with confirmed, suspected, and asymptomatic infected people; 3. Patients who have not completed isolation, observation, and investigation from high-risk areas; 4. Isolation in a centralized location where medical observation is carried out.
Code Yellow	1. Person with a body temperature of 37.3 °C or higher, as well as respiratory symptoms (dry cough, expectoration, stuffy nose, sore throat, shortness of breath, dyspnea), physical discomfort (fatigue, muscle soreness, headache, joint soreness), gastrointestinal symptoms (abdominal pain, diarrhea, nausea, vomiting), conjunctival hemorrhage, and so on; 2. A person from a pandemic-affected area; 3. Within the last 14 days, the person may have direct contact with confirmed patients, suspected patients, and asymptomatic patients, such as sharing public transportation or living in the same building unit.
Code Green	Those who do not meet the red and yellow code requirements.

\*The precise definition may differ depending on the guidelines developed by the epidemic prevention and control departments of different regions.

## 3. Evidence retrieval

PubMed, Google Scholar, Wanfang Data, CNKI, WHO, CDC, European Disease Control Center (ECDC), and other relevant government documents and expert guidance texts are searched using specific keywords. A total of 1 525 articles were retrieved. Based on previously raised nine questions, 1 321 articles were excluded due to repetition and inappropriate titles and abstracts. The remaining 204 articles were given a closer look. Based on a comprehensive review of these articles, combining with the actual clinic work experience, the first version draft was formed. After 4 rounds of online deliberations and expert consultation, the inconsistent content was revised several times, and experts from the Chinese Society of Emergency Medicine (CSEM) and Wuhan

Society of Emergency Medicine (WSEM) were invited to review the final version and finally reached an agreement.

Keywords including COVID-19, pre-examination and triage, Emergency Department, management, process, transport procedure, inter-hospital transport, nuclear acid detection, CT, DR, ultrasound, disinfection, bodies, body management, occupational exposure, fever clinic, medical waste, *et al.* were used. The search for the literature is limited to 26 November 2020.

## 4. Recommendations and related questions

### 4.1. Question 1: What are the responsibilities and purposes of the Emergency Department's pre-examination and triage?

#### 4.1.1. Recommendations

In triage station of Emergency Department, preliminary analysis should be conducted to identify emergency patients' risk levels based on their health codes, epidemiological history, and clinical symptoms[2,3].

#### 4.1.2. Practice and interpretation

The process of pre-examination in the triage station should be brief. Individuals with stable vital signs should be checked for their health code and inquired whether they had have been in a high risk country or region within the last 14 days, has had direct contact with confirmed, suspected, or asymptomatic COVID-19 patients, and whether they have shown any of COVID-19 symptoms (fever, cough and other respiratory symptoms[4]). The triage station's pre-examination results are used to guide individuals' treatment plans and medical staff's protection precautions[2]. Patients who do not have fever, respiratory symptoms, or a history of infection may be treated with first-level protection. Patients marked as code yellow or code red (medium-risk or high-risk) should be referred to the fever clinic for additional evaluation and treatment. Patients who can not complete the pre-examination at the triage station (for example, those with unstable vital signs or who are in a critical condition) must be classified as high-risk individuals. The patients will receive emergency treatment under second-level protection. The procedure is summarized as shown in Figure 1.

### 4.1.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

### 4.1.4. Recommendation for a grade

The experts agree that a controlled study for the clinical problem is not feasible. During the COVID-19 epidemic; however, the triage station's rapid pre-examination based on clinical manifestations and epidemiology history provided significant treatment guidance, prevention, and control. It cuts down waste of materials and equipment, resolves personnel shortages problems, and reduces the risk of missed exams in high-risk groups. As a result, it should be regarded as a strong recommendation despite the lack of evidence.

### 4.2. Question 2: How the emergency treatment process can be optimized during the epidemic period?

#### 4.2.1. Recommendations

During the COVID-19 epidemic, Emergency Department staff should update their clinical skills and knowledge to cope with COVID-19 and raise their safety awareness. Simultaneously, each medical institution should assess its current situation and develop work procedures based on relevant documents to address staffing shortages and ensure that patients receive timely treatment.

#### 4.2.2. Practice and interpretation

Although fever clinics are the main institutions for COVID-19 screening and diagnosis, the presence of asymptomatic or non-respiratory system-related symptoms cases makes the Emergency Department a high-risk area due to direct disease exposure. The Emergency Department handled all of the screening, diagnosis, treatment, and emergency resuscitation procedures. Because complex diseases and a crowded environment characterize the department, controlling the patients' mobility is nearly impossible. As a result, rapid diagnosis is critical for optimizing treatment during the pandemic period[5,6]. Some experts have published their opinions on their specialties' emergency-related treatment in the Emergency Department[7-10].

Amid the international epidemic's difficult situation, it is suggested

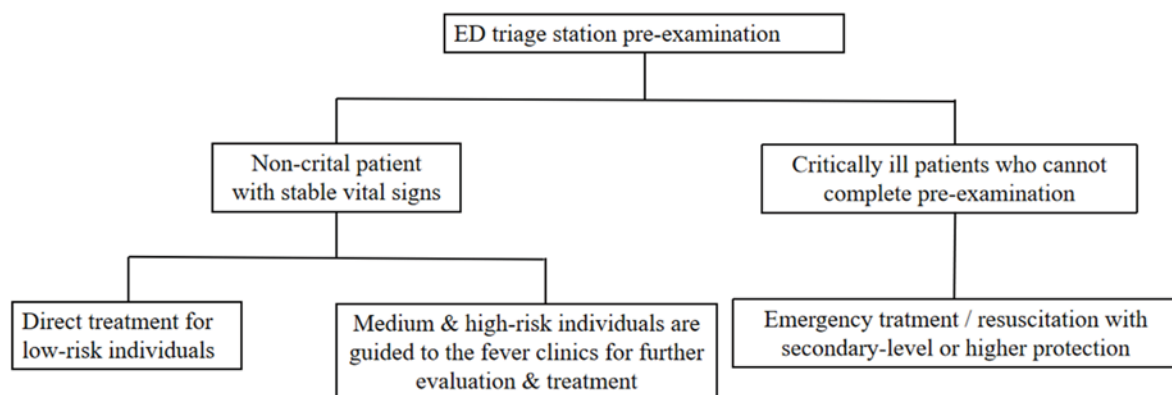


Figure 1. Flow chart of pre-examination in the triage station at Emergency Department.

that the Emergency Department should make any necessary structural and process changes to deal with the unprecedented healthcare burden<sup>[11]</sup>. As a result, it is recommended that emergency treatment procedures be optimized as follows during the pandemic period:

#### (1) Preparation for work

Knowledge preparation: 1) The importance of COVID-19 protection should be better understood by Emergency Department personnel. They should also be informed on the latest prevention, control, diagnosis, and treatment recommendations. Read documents like *COVID-19 prevention and control plan (version 7)*<sup>[4]</sup>, *Diagnosis and treatment plan for COVID-19 (trial version 8)*<sup>[3]</sup>, *Hospital isolation technical specification (WS/T311-2009)*<sup>[12]</sup>, and *Technical guidelines on prevention and control of novel coronavirus infection in medical institutions (first edition)*<sup>[13]</sup>; 2) Staff in the Emergency Department should improve their ability to diagnose critically ill patients and develop treatment plans for them. Also, keep up with the most recent guidelines for common and frequently-occurring diseases in Emergency Departments; 3) COVID-19 hospital management should be familiarized by Emergency Department staff so that patients can be quickly directed for treatment.

Treatment procedure preparation: Medical personnel should adopt an appropriate level of protection based on the individual's risk and the treatment areas of the Emergency Department. In the Emergency Department outpatient area, Emergency Department observation area, intensive care unit area, and when handling patients with low-risk level or have the green health code pre-examination result, the medical staff wears the primary protection level. Secondary or higher-level protection is recommended when the diagnosis for COVID-19 has not been established, when intubation is required for resuscitation, and during the nucleic acid collection procedure. According to the *Specification of hand hygiene for healthcare workers WS/T313-2019*<sup>[14]</sup>, hands should be washed under running water before putting on gloves and after removing gloves or isolation clothing<sup>[15]</sup>.

#### (2) Receiving and inquiring for medical treatment

Medical treatments are carried out following the requirements of the *COVID-19 prevention and control plan (version 7)*<sup>[4]</sup> and *Diagnosis and treatment plan for COVID-19 (trial version 8)*<sup>[3]</sup>. Patients with symptoms of headache, smell sense abnormality, diarrhea, cough, and productive cough should have their body temperature measured again during the consultation. Patients should also be asked whether they had been diagnosed with COVID-19, suspected exposure to COVID-19, or coming from high-risk areas.

#### (3) Optimize the green channel

During non-pandemic periods, the green channels significantly improve critical patient survival rates<sup>[16]</sup>. Hospitals with sufficient conditions should optimize green channel usage procedures to ensure timely treatment of critical patients during the pandemic period, especially when most fever clinics lack personnel and equipment to rescue emergency and critical patients. Following are the specific points: 1) Hospitals must ensure that patients with acute and critical illnesses have access to green channels at all times. 2) For any specific person, take the body temperature and inquire the epidemiological history. 3) If a patient has a fever or a history of COVID-19, medical personnel must take precautions and escort the patient from the fever clinic to the fever clinic treatment room or directly into an isolation resuscitation room that meets COVID-19 prevention and control

standards for treatment. In the isolation room, medical personnel must wear secondary level or higher protective equipment. 4) The patient should be taken to the isolation resuscitation room if he or she has no fever or epidemiological history, no COVID-19 nucleic acid/antibody test result, and needs to be resuscitated right away. In the isolation resuscitation room, medical personnel should wear secondary or tertiary level protection. Patients with an acute critical illness who do not require immediate resuscitation, do not have a fever, have no epidemiological history, and do not have a nucleic acid/antibody test result will be transferred to an isolation ward with resuscitation equipment for further treatment. Meanwhile, nucleic acid/antibody sample collection must be completed as soon as possible. After the nucleic acid/antibody sample is taken, the patient who requires emergency surgery should be transferred to a negative pressure surgery room. The patient will be transferred to the isolation resuscitation room if the COVID-19 nucleic acid/antibody test results have not yet been completed after the surgery. Furthermore, the patient who is not at risk for COVID-19 infection is transferred to the appropriate ward, as per standard emergency surgery procedures. Patients who are not excluded from COVID-19 risk, on the other hand, are transferred to the appropriate ward's isolation room based on their postoperative condition.

#### (4) Timely follow up the patient's nucleic acid/antibody test results

If the patient's nucleic acid/antibody test result came out as positive, the medical staff should report the result directly to China Disease Prevention and Control Information System within 2 hours, according to the *COVID-19 prevention and control plan (version 7)*<sup>[4]</sup>.

### 4.2.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

### 4.2.4. Recommendation for a grade

There is currently no controlled study for the treatment optimization process in the Emergency Department. The evidence level is low because most articles are based on existing policy documents and literature from various medical institutions. The expert panel agreed that the study had an immediate positive clinical impact and that the hospital should consider adopting it based on their current situation.

## 4.3. Question 3: How to optimize the emergency transfer process within and between hospitals?

### 4.3.1. Recommendations

Patients who required emergency treatment and needed to be admitted or transferred must provide their health code status and have their nucleic acid/antibody sample taken<sup>[17]</sup>. Patients who have a green health code and a COVID-19 test result that is negative will be processed using standard procedures. For the transfer procedure of suspected or confirmed COVID-19 patients, please refer to the relevant regulations<sup>[18,19]</sup>. Within their jurisdiction, hospital administrative departments are in charge of COVID-19 patient admission and transfer procedures. Medical personnel should enforce the third-level protection<sup>[15]</sup>. The use of a negative pressure isolation stretcher to transfer patients is recommended for hospitals with sufficient conditions<sup>[19]</sup>. Non-COVID-19 patients will be transferred within and between hospitals via the Emergency Department following various medical institutions' relevant regulations.



### 4.3.2. Practice and interpretation

The Emergency Department should designate a specific area for ambulance vehicles to park and transfer patients. Simultaneously, COVID-19 patients will be transported by specific medical personnel and ambulance drivers[18]. Patients who are suspected or confirmed with COVID-19 should be taken to a designated hospital for treatment[4]. Simultaneously, route planning must be done ahead of time to reduce the number of transits and long-term journeys, and non-essential personnel contact should be minimized. During the transfer, the medical staff should also implement a third level of protection. During the transfer, patients should be isolated temporarily, and a negative pressure isolation stretcher can be used in the Emergency Department (if the department's conditions are sufficient). After arriving at the designated hospital, patients were directed to a green channel where they could quickly complete admission procedures and be admitted to the designated hospital's isolation ward[19].

When suspected or confirmed patients are moved within the hospital, third-level protection should be used by those involved. Those who require emergency surgery should use a dedicated elevator and passage to enter and leave the emergency isolation operating room[9]. Meanwhile, to reduce the risk of exposure, the transfer passage must be cleared ahead of time[9]. Isolation resuscitation rooms should be used to treat patients who require immediate treatment. Non-emergency patients will be moved within the hospital *via* the Emergency Department following each medical institution's regulations.

Patients, escorts, and visitors should cooperate with the hospital's preventive measures, such as temperature testing, registering health code status, and personal information, in the Emergency Department's treatment unit. Restricting the range of activities and movement, improving the Emergency Department's treatment unit's access control and security management, and limiting irrelevant personnel's access[17].

### 4.3.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

### 4.3.4. Recommendation for a grade

A controlled study for the clinical problem is not feasible, according to the expert committee. During the COVID-19 pandemic; however, improving the Emergency Department's infection prevention and control, as well as the efficiency of transfer within and between hospitals, is critical to ensuring adequate diagnosis and treatment of patients. As a result, it should be regarded as a strong recommendation despite the lack of evidence.

## 4.4. Question 4: How to optimize the detection of COVID-19 nucleic acid and antibody in emergency patients?

### 4.4.1. Recommendations

For collecting, testing, and transporting samples from emergency patients, the *Working manual of novel coronavirus nucleic acid detection for medical institutions (trial)* is recommended[20]. The collection and transfer of patient samples must be handled by medical personnel who have been professionally trained.

### 4.4.2. Practice and interpretation

#### (1) Sampling point setting

For classifying patients in the Emergency Department, the Emergency Critical Severity Index (ESI) classification[21] (Table 3) is recommended. For high-risk patients (levels 1 and 2), the sample should be taken at the bedside. Patients with stable vital signs in grades 3, 4, or 5 should have their samples taken at the sampling points. The sampling point should be in a separate location with adequate ventilation, and the clean and polluted areas should be separated. Simultaneously, clear signs, as well as sampling procedures and precautions, must be put in place[20,22].

**Table 3.** Emergency Critical Severity Index (ESI) levels.

Level	Name	Description	Examples
1	Resuscitation	Life-saving intervention is required.	Cardiac arrest; massive blood loss
2	Emergency	There are risks of deterioration or clinical problems that need immediate treatments.	Cardiac-related chest pain; asthma attack
3	Urgent	Under stable condition, need to make a diagnosis and choose treatments, a variety of tests needed (such as lab test or imaging examinations).	Abdominal pain; high fever with cough
4	Less urgent	Under stable condition, only one type of test or treatment procedure is required (such as imaging test only or wound suturing treatment only).	Simple laceration; urination discomfort
5	Not urgent	Under stable condition, tests are not needed. Only oral or topical prescriptions are required.	Rashes; prescription renewal

#### (2) Specimen collection

Nasopharyngeal swab, oropharyngeal swab, and sputum (if available) are the preferred specimen collection sequences. One nasopharyngeal swab and one oropharyngeal swab can be collected in the same specimen collection tube to increase the specimen's positivity rate. Feces can be collected for testing to control the infection spread. The blood of COVID-19 positive patients can be tested to see if the treatment is sufficient[23]. The number of emergency outpatient visits and hospitalizations should be proportional to each medical facility's testing capabilities. The goal is to avoid having too many specimens, invalid specimens, and slow test results feedback. Figure 2 depicts the specific procedure[24].

#### (3) Specimen storage and transportation

For COVID-19 diagnosis, the specimen quality is critical. Because the virus is highly infectious and little is known about it, if specimens are collected and transported carelessly, they will become an infection source, resulting in cross-infection between patients and medical personnel[20]. Specimens should be tested as soon as possible using virus isolation and nucleic acid testing methods. Specimens that can be tested in less than 24 hours should be kept at 4 °C; specimens that need more than 24 hours to be tested should be kept at -70 °C or below (if -70 °C storage is unavailable, they could be temporarily stored in a -20 °C refrigerator)[22,23,25]. The specimen should be transported to the laboratory within 30 minutes of collection, and it should not take more than 2 hours. If specimens must be transferred to another institution, the transfer's time and location should be planned ahead of time[24,25].

(4) Test report

Test results for emergency patients and patients with fever should be available within 4-6 hours[26]. The medical facility should to provide the test report, explain the results, and not refuse to provide test results for any reason[20]. When COVID-19 positive patients are detected, medical facilities should notify the China Disease Prevention and Control Information System within two hours[4].

4.4.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

4.4.4. Recommendation for a grade

According to the expert committee, a controlled study for the

clinical problem is not feasible. However, nucleic acid and antibody detection must be optimized for COVID-19 prevention and control. As a result, despite the lack of evidence, it should be regarded as a strong recommendation.

4.5. Question 5: How can the imaging-related examination for emergency patients be improved?

4.5.1. Recommendations

Patients with acute fevers of 37.3 °C or higher, with or without an epidemiological history and with or without respiratory symptoms, should be directed to the imaging examination room of a fever clinic for imaging examinations. For patients who require urgent imaging-related examinations, *Prevention and control recommendations for*

Table 4. Partition measures and division of each area of the emergency department.

Area	Range	Disinfection measures
Common area	Resuscitation room, gastric lavage room, treatment rooms, patients' waiting area, surgery department consultation room, OBGYN department consultation room, neurology department consultation room, ultrasound examination room, etc.	A. Item's surface & floor: Every 3 hours, wipe with a chlorine-containing disinfectant containing 500 mg/L, then wipe with clean water after 30 minutes; B. Air purification: Turn on the air sterilizer for 1 hour every 4 hours, turn on the ultraviolet light for 1 hour every night when there is no patient, and open the window for ventilation once every 12 hours for 30 minutes.
Enhanced area	Fever triage station, temperature measurement station for low-risk area patients with fever, emergency department triage station, internal medicine department consultation room, pediatric department consultation room.	A. Item's surface & floor: Every 2 hours, wipe with a disinfectant containing 1 000 mg/L chlorine, then wipe with clean water after 30 minutes; B. Air purification: Turn on the air disinfectant for 1 hour every 3 hours, the ultraviolet light for 1 hour every night when there is no patient, and open the window for ventilation once every 8 hours for 30 minutes.
Crucial area	Medical waste disposal room, fever clinic, isolated temperature measurement station for low-risk area patients with fever.	A. Item's surface & floor: Every two hours, spray a disinfectant containing 1 000 mg/L chlorine and wipe with clean water after 30 minutes; B. Air purification: Turn on the air disinfection machine for 1 hour every 2 hours, turn on the ultraviolet light for 1 hour every night when there is no patient, and open the window for ventilation every 6 hours, with a ventilation time of 30 minutes.
Specific area	Isolation room for resuscitation	After the patient has left, disinfect the air, the object's surface, and the floor as soon as possible. The procedure should be the same as that used for crucial areas. All items used by patients should be treated in strict accordance with the <i>Medical Waste Management Regulations</i> requirements.

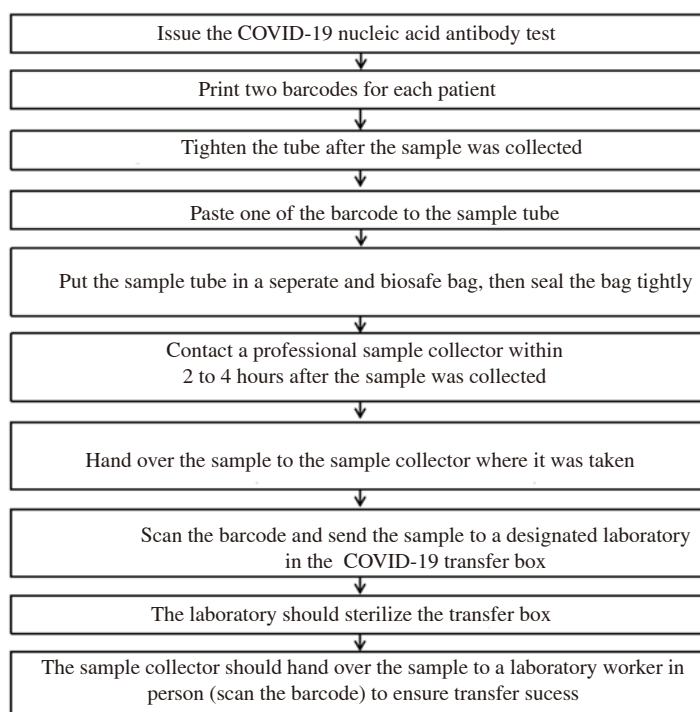


Figure 2. Flow chart of specimen collection and inspection of COVID- 19 patients in emergency department.

the resumption of routine diagnosis and treatment in the ultrasound department during the COVID-19 epidemic[27] and Guidelines for the emergency CT examination procedure for new coronavirus pneumonia fever (first edition)[8] should be referred. Non-emergency patients should wear masks during their examinations, which are conducted systematically.

#### 4.5.2. Practice and interpretation

In ultrasound and CT/DR examination rooms, the principle of Three Zones and Two Passages should be followed. The three zones are the clean zone, buffer zone, diagnosis and treatment zone, and the two passages are employees' and patients' passages, respectively[27]. The ultrasound and CT/DR examination rooms in emergency treatment units could be set up with separate ultrasound and CT/DR examination passages for emergencies from the passages used by staff and patients. It has been suggested that the passage be made one-way[8,28]. The admissions process is summarized as shown in Figure 3.

#### 4.5.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

#### 4.5.4. Recommendation for a grade

A controlled study for the clinical issue, according to the expert committee, is not feasible. The Emergency Department's diagnosis and treatment were greatly aided by optimizing the imaging department's examination processes. As a result, despite the lack of proof, it should be regarded as a strong recommendation.

### 4.6. Question 6: What are the Emergency Department's environmental layout and disinfection management?

#### 4.6.1. Recommendations

Based on the characteristics of the Emergency Department (large quantity of patient visits and complexity of the diseases),

it is recommended that Management specification of air cleaning technique in hospitals WS/T 368-2012[29] and Regulation of disinfection technique in healthcare setting WS/T 367-2012[30] should be followed. The emergency room should create disinfection procedures and divide each area into common, enhanced, crucial, and specific areas. The recommended Emergency Department areas and disinfection measures are shown in Table 4[4,5].

#### 4.6.2. Practice and interpretation

According to article 21 of chapter 2 of the Prevention and control of infectious diseases law of the People's Republic of China (2013 amendment), Hospital monitoring, safety protection, disinfection, isolation, and medical waste disposal are all responsibilities of medical institutions[31]. COVID-19 can be effectively inactivated by UV rays, heat (56 °C for 30 minutes), lipid solvents, ether, 75% ethanol, chlorine-containing disinfectant, peracetic acid, and chloroform[3,32,33]. COVID-19, on the other hand, is resistant to chlorhexidine. Disinfection measures should be developed under relevant national norms[34], and patient visits and case characteristics should be taken into account. The areas were divide into common, enhanced, crucial, and specific area[29-35]. The classification criteria are based on: (1) Number of visits per day; (2) Types of diseases; (3) Daily visit of people and population density; (4) Occupational exposure risk of medical staff. The recommended Emergency Department areas and disinfection measures are shown in Table 5[4,5]. All items touched by suspected or positive with COVID-19 patients should be disinfected one by one. The disinfection supplies, mops, and wipes for each Emergency Department area are labeled and placed in specific locations. In each Emergency Department area, disinfection registers are set up to accurately record the disinfection area, disinfection time, disinfection method, and executor[5].

#### 4.6.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

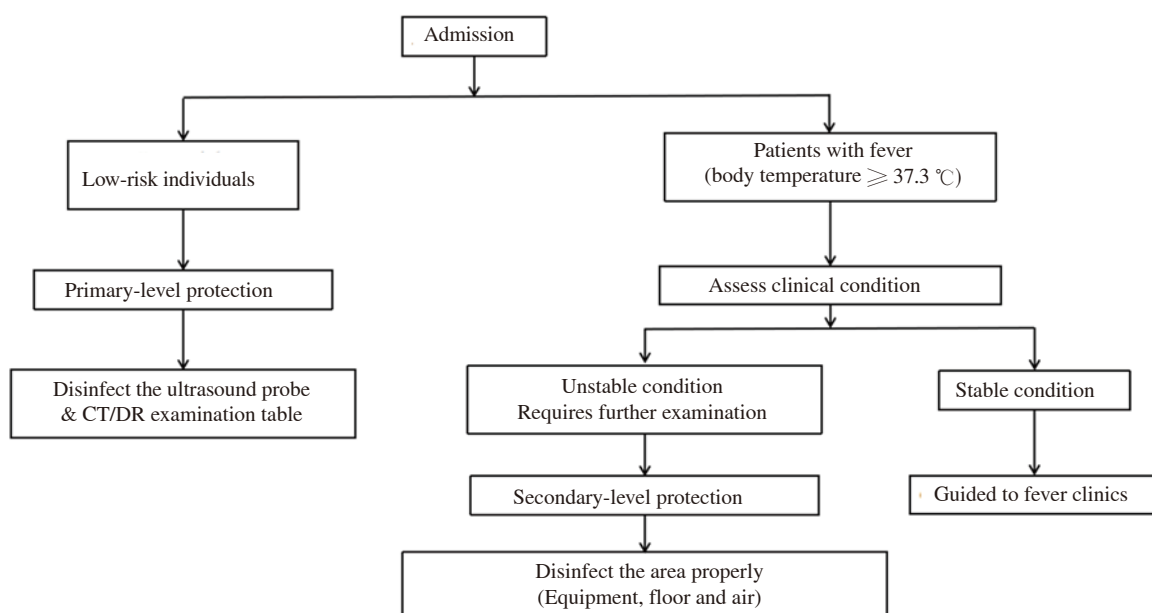


Figure 3. The flowchart of emergency medical imaging examination.

#### 4.6.4. Recommendation for a grade

According to the expert committee, a controlled study for the clinical issue is not feasible. However, scientific environmental layout and disinfection management based on pathogen characteristics are critical for COVID-19 prevention and control. As a result, it should be regarded as a strong suggestion despite the lack of evidence.

#### 4.7. Question 7: What are the procedures for dealing with dead patients in an Emergency Department?

##### 4.7.1. Recommendation

Patients who died in the Emergency Department's treatment unit (including pre-hospital EMS), as well as those who deal with suspected COVID-19 patients (neither green health code nor epidemiological history can be provided) or confirmed COVID-19 patients' remains, can refer to the *Health committee's guidelines for disposing COVID-19 patients' remains (trial)*. Staff who have received adequate training and are wearing appropriate PPE should handle the body properly and transfer it as soon as possible[3,4,35]. Patients' remains should be processed according to each local hospital's Emergency Department's regulations if COVID-19 is not present.

##### 4.7.2. Practice and interpretation

Staff should use secondary-level protection when dealing with the remains of a suspected or confirmed COVID-19 patient[36] and dispose the body as soon as possible. Close all open passages on the body, including the mouth, nose, ear, anus, trachea, and other open passages, with a chlorine-containing disinfectant (3 000-5 000 mg/L) or a 0.5 percent peracetic acid cotton ball; wrap the body in double-layer disinfectant-soaked cloth sheets, and then place it in a double-layer body bag. The civil affairs department should send a specific vehicle to transport the body directly to the designated cremation location as soon as possible to avoid the possibility of infection spread to the surrounding environment. Ascertain that all employees adhere to infection prevention and control (IPC) guidelines, including hand hygiene[37,38].

##### 4.7.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

##### 4.7.4. Recommendation for a grade

The expert committee has not yet found sufficient clinical evidence that COVID-19 will spread during the remains' processing. According to WHO and ECDC, the risk of virus transmission from COVID-19 treatment is still low[37,38]. However, there is evidence that active SARS-CoV-2 can survive on the surface of objects for several days, so body fluids and contaminants associated with the body must still be isolated[39].

#### 4.8. Question 8: What are the basic principles of post-occupational exposure treatment for emergency room medical staff?

##### 4.8.1. Recommendations

Each medical institution's Emergency Department should consider its current conditions when developing an emergency response plan for COVID-19. Post-occupational exposure prevention should begin as soon as possible after exposure, and treatment methods should be chosen based on exposure risk levels.

##### 4.8.2. Practice and interpretation

COVID-19 is a respiratory pathogen-caused infectious disease. Droplet transmission, contact transmission, aerosol transmission, and other transmission modes have been identified[3,40]. High-risk personnel is medical personnel who come into direct contact with patients during diagnosis and treatment. When developing an emergency response plan for COVID-19, each medical institution's Emergency Department should consider its current conditions. The type of treatment should be determined by the risk of exposure[41].

The risk of exposure through the respiratory tract is the highest, while exposure through blood and body fluids and skin is the lowest. When exposed to blood and body fluids, the risk of contracting a blood-borne disease should be considered[15,41,42].

- (1) Treatment after exposure to the respiratory tract
  - A. Leave the site as soon as possible after exposure, or immediately put on a qualified mask and leave the exposure site;
  - B. Report to the hospital's epidemiology and infection control department as soon as possible after leaving the exposure site. Those who have not yet worn a mask should wear a mask as soon as possible;
  - C. The epidemiology and infection control department should assess the exposure risk as soon as possible after receiving the report. The risk of infection is higher if the exposure source is found to be positive for COVID-19. Otherwise, the risk is low;
  - D. If the exposure source is a high-risk individual, the patient must be isolated in a single room, wear a mask, and a medical observation site must be designated for the patient according to the superior's requirements. For 14 days, the patient is quarantined in a single room and not allowed to leave the quarantine area during the quarantine period. After 14 days, if the nucleic acid test shows negative, the isolation can be lifted.
- (2) Disposal following contact with blood or bodily fluids
  - A. When blood and body fluids contaminate the skin, immediately clean it with clean water, wipe it with 75% ethanol or 0.5% iodophor, and then rinse it again with clean water;
  - B. If goggles, protective clothing, or masks become contaminated, replace them right away in the contaminated area;
  - C. If the eyes become contaminated, go to the contaminated area right away and wash them thoroughly with clean water;
  - D. If a needle stick injury occurs, remove the gloves right away and squeeze out the blood from the wound. Change clean gloves after rinsing the wound with running water and disinfecting it with 75% ethanol or 0.5% iodophor. Then treat the wound as if it had been exposed to blood and bodily fluids;
  - E. For further evaluation, all of the above exposures should be reported to the hospital's epidemiology and infection control department.



#### 4.8.3. Evidence-based level

The evidence level is low since the documents included are expert opinion texts and relevant government documents.

#### 4.8.4. Recommendation for a grade

The expert group believes that medical units have enacted stringent regulations regarding post-occupational exposure treatment measures and that the clinical problem is not feasible to study in a controlled setting. Despite the low quality of relevant evidence, the expert group believes that the government-issued post-occupational exposure treatment measures meet Emergency Department epidemiology and infection control needs, are feasible and comprehensive, and thus make a strong recommendation.

### 4.9. Question 9: How to deal with medical waste in emergency medicine?

#### 4.9.1. Recommendations

Medical waste generated by patients with suspected or confirmed COVID-19 should be disposed of following the requirements of the *Medical waste management regulations (revised in 2011)*[43] and the *medical waste management measures for medical and health Institutions*[44]. The emergency treatment unit's waste should be separated into non-infectious general waste and infectious waste for separated collection and disposal[45] (III A).

#### 4.9.2. Practice and interpretation

In the context of the global COVID-19 pandemic, emergency medical personnel must follow the *Medical waste management regulations (revised in 2011)*[43] and *Medical waste management measures for medical and health institutions*[44] to control the medical waste generated by patients in order to deal with potential latent infections. Medical waste generated by patients with COVID-19 is treated as infectious waste and transported in a sealed double-layer yellow medical waste bag, with 1 000 mg/L chlorine disinfectant sprayed outside the yellow medical waste bag before handing it over. Workers or full-time medical waste collectors collect infectious medical wastes, register for handovers, and ensure that airtight transfers are made[4,36]. The medical waste storage area should only be accessible to authorized personnel[46]. Non-infectious waste generated in the emergency outpatient department and waiting areas (such as packages, food waste, and disposable dry towels) can be treated as general waste. It should be kept separate from infectious waste and disposed of in a trash can, bagged and labeled, and treated as general waste. Personal protective equipment (PPE) should be worn by all relevant personnel dealing with the waste generated by emergency medical treatment units[45]. In the case of infectious waste, the medical waste disposal unit must recycle and dispose of it within 48 hours, based on the actual storage volume, and complete both parties' date, quantity, and signature registration work[34].

#### 4.9.3. Evidence-based level

The evidence is deemed sufficient because relevant legal regulations govern medical waste treatment. The medical waste treatment plan for COVID-19 patients is based on expert guidance texts and relevant government documents, so the evidence level is low.

#### 4.9.4. Recommendation for a grade

The clinical expert committee unanimously agreed that relevant laws have strictly regulated medical waste treatment and that a controlled study of this clinical problem is not feasible. Despite the low quality of the relevant evidence, the clinical expert committee believes that the recommendation meets the Emergency Department's needs, is feasible and comprehensive, and should be used when no other option exists.

## 5. Discussion

Since the outbreak of COVID-19 in early 2020, under the leadership of the Party Central Committee, with Comrade Jinping Xi at its core, and through hard work across the country, the national epidemic situation has been further consolidated, and the prevention and control work has shifted from emergency to normalization[47]. In this context, the national health committee issued the *Guiding opinions of the state council on the joint prevention and control mechanism for the prevention and control of the COVID-19 epidemic situation on the normalization of the COVID-19 epidemic*[48] in order to implement further the relevant requirements for normalization epidemic prevention and control, standardization of diagnosis and treatment process in medical institutions, and ensuring the public's needs for medical services. This necessitates the implementation of a clear triage system, establishing a green channel for critical patients, the strict implementation of standard preventive measures, and the enhancement of medical staff awareness and ability in epidemic prevention and control. Every medical institution's Emergency Department is the first contact for all types of acute and critical diseases. Under this situation, it is necessary to deal with the corresponding changes, continue optimizing the diagnosis and treatment process, and reduce the impact of COVID-19 on routine diagnosis and treatment of emergency patients. This expert consensus is based on an emergency response to the epidemic situation and a review of Emergency Departments at all hospitals in Hubei and Wuhan. Based on regular literature and policy retrieval, real-time follow-up of the latest research and literature, and real-time adjustment, we completed the entire process, including question raising, cooperating with a multidisciplinary team, and finalizing the expert group's recommendation on time.

However, this consensus has some limitations: (1) Most of the members of this Consensus Committee come from Hubei, and factors such as geography and gender are not fully balanced due to the nature of the Emergency Department. (2) Respiratory diseases are more likely to occur during the autumn and winter seasons, and standard prevention and control, as well as medical institutions, must be strictly preventive. As a result, the expert committee members can only discuss and reach a consensus based on essential issues due to the situation's uniqueness and urgency. (3) As the epidemic's normalized prevention and control progress, this clinical expert committee will continue to closely oversee related group meetings, focusing on experts from disciplines that have not been represented in this study and other related clinical issues that may arise in the future.

In summary, this consensus is based on literature review and expert opinions. It is appropriate for hospital management, epidemiology and infection control staff, and other medical staff, as this is used for COVID-19 epidemic prevention and control. It could be used as reference for the hospital's Emergency Department's operation guidance and related policy formulation under the COVID-19 epidemic prevention and control period. But it can not be legal basis for any medical dispute or lawsuit.

### Conflict of interest statement

All authors declare that there is no conflict of interest.

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### Authors' contributions

The corresponding authors organized and drafted the consensus. Other members made comments and suggestions on the final version of this consensus.

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## References

- [1] Atkins D, Best D, Briss PA, Eccles M, Falck-Ytter Y, Flottorp S, et al. Grading quality of evidence and strength of recommendations. *BMJ* 2004; **328**(7454): 1490.
- [2] Chen H, Li JR, Wang Y, Lei YN, Zhang WZ, Tong YH, et al. Pre-examination, triage, transfer, protection of infectious diseases and legal advice in pre-hospital emergency work during novel coronavirus pneumonia prevention and control. *China Health Law* 2020; **28**(5): 79-83.
- [3] National Health Commission of the People's Republic of China. Diagnosis and treatment plan for COVID-19 (trial version 8). *Chin J Clin Infect Dis* 2020; **13**(5): 321-328.
- [4] National Health Commission of the People's Republic of China. COVID-19 prevention and control plan (version 7). *Chin J Infect Control* 2020; **19**(11): 1042-1048.
- [5] Zhang XX, Han GJ, Chai YX, Zhang JR, Huang L, Zhao JY, et al. Emergency treatment procedures and prevention and control practices of designated hospitals during the epidemic of COVID-19 infection. *J Qilu Nurs* 2020; **26**(6): 4-7.
- [6] National Health Commission of the People's Republic of China. Guiding opinions of the state council on the joint prevention and control mechanism for the prevention and control of the COVID-19 epidemic situation. *Chin J Pub Health Manag* 2020; **36**(3): 2-3.
- [7] Chinese Medical Doctor Association. Excerpts from *Expert consensus on normalization of chest pain centers during the new coronavirus pneumonia epidemic (1): Triage and admission of patients who come to the hospital by themselves*. *Prac J Card Cere Pneu Vas Dis* 2020; **28**(2): 68.
- [8] The Quality Control and Safety Management Professional Committee of the Radiology Branch of the Chinese Medical Association. Guidelines for the emergency CT examination procedure for new coronavirus pneumonia fever (first edition). *J Clin Radiol* 2020; **39**(5): 841-845.
- [9] Guo L, Gao XL, Chang HC, Xu M, He L, Song L, et al. Infection prevention and control in the operating room for patients with suspected or confirmed coronavirus disease 2019: An expert consensus. *Chin J Infect Control* 2020; **19**(5): 385-392.
- [10] Chinese Neurosurgical Society. Guidelines for process management and prevention and control of neurosurgery to respond to COVID-19. *Natl Med J China* 2020; **100**(31): 2416-2422.
- [11] Giwa AL, Desai A, Duca A. Novel 2019 coronavirus SARS-CoV-2 (COVID-19): An updated overview for emergency clinicians. *Emerg Med Pract* 2020; **22**(5): 1-28.
- [12] Ministry of Health of the People's Republic of China. Technique standard for isolation in hospitals WS/T311-2009. *Chin J Nosocomiol* 2009; **19**(13): 4-8.
- [13] National Health Commission of the People's Republic of China. Technical guidelines on prevention and control of novel coronavirus infection in medical institutions (1st edition). *Chin J Infect Control* 2020; **19**(2): 189-191.
- [14] National Health Commission of the People's Republic of China. Specification of hand hygiene for healthcare workers WS/T313-2019. *Chin J Nosocomiol* 2020; **30**(5): 796-800.
- [15] Li CH, Huang X, Cai F, Chen P, Chen WS, Chen XW, et al. Expert consensus on personal protection in different regional posts of medical institutions during COVID-19 epidemic period. *Chin J Infect Control* 2020; **19**(3): 199-213.
- [16] Guo SY, Liang DD, He Y. The effect of optimizing the reception procedure on the rescue effect of emergency patients. *J Qiqihar Univers Med* 2016; **37**(12): 1629-1630.
- [17] National Health Commission of the People's Republic of China. *Notice of the General Office of the National Health Commission on improving fever clinics and infection prevention and control work in medical institutions*. National Health Office Medical Letter (2020) No.507. [Online]. Available from: <http://www.nhc.gov.cn/xcs/zhengcwj/202006/4e456696ceef482996a5bd2c3fb4c3db.shtml>. [Accessed on 26 March 2021].
- [18] National Health Commission of the People's Republic of China. *Work plan for the transfer of pneumonia cases of COVID-19 infection (trial implementation)*. National Health Office Medical Letter (2020) No.76. [Online]. Available from: [http://www.gov.cn/zhengce/zhengceku/2020-01/29/content\\_5472894.htm](http://www.gov.cn/zhengce/zhengceku/2020-01/29/content_5472894.htm). [Accessed on 26 March 2021].
- [19] Zhang JM, Gao YL, Ye L, Cao Y, Yao R, Li YH, et al. Transport route for COVID-19 patients in emergency department. *Basic Clin Med* 2020; **40**(5): 604-608.
- [20] National Health Commission of the People's Republic of China. Working manual of novel coronavirus nucleic acid detection for medical institutions (Trial). *Chin J Viral Dis* 2020; **10**(4): 241-245.
- [21] Gilboy N, Travers D, Wuerz R. Re-evaluating triage in the new millennium: A comprehensive look at the need for standardization and quality. *J Emerg Nurs* 1999; **25**(6): 468-473.
- [22] Zuo HM, Wang D. Specimen collection and transfer management of patients suspected of new coronavirus infection seeking medical help at a fever clinic. *J Nurs Sci* 2020; **35**(6): 62-64.
- [23] Chinese Society of Laboratory Medicine. Expert consensus on nucleic acid detection of COVID-19. *Natl Med J China* 2020; **100**(13): 968-973.
- [24] Mi YY, Huang HY, Zhu LQ, Zhang SM, Yan PB, Zhang XH, et al. Expert consensus on specimen collection technical in patients with COVID-2019. *J Nurses Train* 2020; **35**(12): 1124-1128.
- [25] Shanghai Society of Laboratory Medicine. Expert consensus on clinical application of COVID-19 nucleic acid and antibody detection. *Int J Lab Med* 2020; **41**(14): 1665-1669.
- [26] National Health Commission of the People's Republic of China. *Notice on the prevention and control of the COVID-19 epidemic in autumn and winter in maternal and child health Institutions*. National Health Office Women and Children Letter (2020) No.879. [Online]. Available from: [http://www.gov.cn/zhengce/zhengceku/2020-11/06/content\\_5557799.htm](http://www.gov.cn/zhengce/zhengceku/2020-11/06/content_5557799.htm). [Accessed on 26 March 2021].
- [27] Lu Q, Qin XJ, Li H, Shang GQ, Feng CH, Zhang DQ, et al. Prevention and control recommendations for the resumption of routine diagnosis and treatment in the ultrasound department during the COVID-19 epidemic. *Chin J Ultrasound Med* 2020; **36**(3): 193-196.
- [28] Tao L. Practice and thinking about infection control in ultrasound department during the outbreak of novel coronavirus pneumonia. *J Clin Ultrasound in Med* 2020; **22**(2): 81-84.
- [29] Ministry of Health of the People's Republic of China. *Management specification of air cleaning technique in hospitals WS/T 368-2012*. [Online]. Available from: <http://www.nhc.gov.cn/wjw/s9496/201204/54511.shtml>. [Accessed on 26 March 2021].
- [30] Ministry of Health of the People's Republic of China. *Regulation of disinfection technique in healthcare setting WS/T 367-2012*. [Online]. Available from: <http://www.nhc.gov.cn/wjw/s9496/201204/54510.shtml>. [Accessed on 26 March 2021].

- [31]National Health Commission of the People's Republic of China. Measures for the implementation of the law of the People's Republic of China on prevention and control of infectious disease. *Chin Prac J Rural Doc* 2018; **25**(10): 1-7.
- [32]National Health Commission of the People's Republic of China. Diagnosis and treatment plan for COVID-19 (trial version 6). *Chin J Infect Control* 2020; **19**(2): 192-195.
- [33]Chen L, Xie JG. Interpretation of *The diagnosis and treatment plan for COVID-19 (the seventh trial edition)*. *Her Med* 2020; **39**(5): 613-615.
- [34]National Health Commission of the People's Republic of China. Regulation for prevention and control of healthcare associated infection in outpatient department and emergency department in healthcare facilities WS/T 591-2018. [Online]. Available from: <http://www.nhc.gov.cn/wjw/s9496/201805/fa830cbf8b5a4ef3a1f6615a46a350a0.shtml>. [Accessed on 26 March 2021].
- [35]National Health Commission of the People's Republic of China. Notice on the issuance of guidelines for the disposal of the remains of COVID-19 infected patients (trial). National Health Office Medical Letter (2020) No.89. [Online]. Available from: <http://www.nhc.gov.cn/yzygj/s7659/202002/163c26a24057489dbf64dba359c59a5f.shtml>. [Accessed on 26 March 2021].
- [36]Hubei Provincial Hospital Infection Management Quality Control Center. Measures and procedures related to the prevention and control of COVID-19 in Hubei Province. Hubei Provincial Hospital Infection Control (2020) No.03. [Online]. Available from: <http://www.taihehospital.com/uploadfile/2020/0219/1582075105137224.pdf>. [Accessed on 26 March 2021].
- [37]World Health Organization. Infection prevention and control for the safe management of a dead body in the context of COVID-19. [Online]. Available from: <https://apps.who.int/iris/handle/10665/334156>. [Accessed on 26 March 2021].
- [38]Anjankar AJ, Anjankar A, Anjankar V. Considerations related to safe handling of dead bodies of deceased persons with covid-19: Issues and review of guidelines. *Medico-Legal Update* 2021; **20**(4): 2512-2517.
- [39]van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med* 2020; **382**(16): 1564-1567.
- [40]National Health Commission of the People's Republic of China. What is aerosol transmission? [Online]. Available from: <http://www.nhc.gov.cn/xcs/nwwd/202002/bb0df3a58cf643aaba47af0ebed98401.shtml>. [Accessed on 26 March 2021].
- [41]Liang TB, Cai HL, Chen Y, Chen ZB, Fang Q, Han WL, et al. Handbook of COVID-19 prevention and treatment. [Online]. Available from: <http://che.zju.edu.cn/cheen/2020/0401/c27758a2021088/page.htm>. [Accessed on 26 March 2021].
- [42]Zhu SC, Qiao F, Luo FM, Yin WH, Yang C, Zheng L, et al. Recommendations on infection prevention and control of resident from medical team for aiding Hubei of West China Hospital of Sichuan University in the period of coronavirus disease 2019 outbreak. *West Chin Med J* 2020; **35**(3): 255-260.
- [43]National Health Commission of the People's Republic of China. Medical waste management regulations (revised in 2011). [Online]. Available from: <http://www.nhc.gov.cn/fz/s3576/201808/e881cd660adb4cf951f9a91455d0d11.shtml>. [Accessed on 26 March 2021].
- [44]Ministry of Health of the People's Republic of China. Medical waste management measures for medical and health institutions. *Chin Nurs Manag* 2003; **3**(5): 15-18.
- [45]World Health Organization. Water, sanitation, hygiene, and waste management for the COVID-19 virus. [Online]. Available from: <https://apps.who.int/iris/handle/10665/331846>. [Accessed on 26 March 2021].
- [46]The Economic and Social Commission for Asia and the Pacific (ESCAP). The safe waste treatment for COVID-19. [Online]. Available from: <http://www.indiaenvironmentportal.org.in/files/file/waste-management-for-COVID-19.pdf>. [Accessed on 26 March 2021].
- [47]National Health Commission of the People's Republic of China. Notice on standardizing the diagnosis and treatment process of medical institutions under the normalized prevention and control of the epidemic. Joint Prevention and Control Mechanism Medical Development (2020) No.272. [Online]. Available from: <http://www.nhc.gov.cn/xcs/zhengcwj/202007/6463d9c855894e67945c769f1c4ecb72.shtml>. [Accessed on 26 March 2021].
- [48]The Central People's Government of the People's Republic of China. Guiding opinions of the state council on the joint prevention and control mechanism for the prevention and control of the COVID-19 epidemic situation on the normalization of the COVID-19 epidemic. [Online]. Available from: [http://www.gov.cn/zhengce/content/2021-01/20/content\\_5581361.htm](http://www.gov.cn/zhengce/content/2021-01/20/content_5581361.htm). [Accessed on 26 March 2021].