The Second Affiliated Hospital
Zhejiang University School of Medicine

COVID-19 Outbreak
Hospital Response Strategy

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PREFACE

This guidebook is a refined recount of the experiences of a large-scale Chinese general hospital's fight against the COVID-19 outbreak. The narration of this guidebook is based on actual practices, which lends general applicability and reference value to a wider audience.

When a raging pandemic is taking the world by storm, hospitals are at the frontier of the battle. Without proper management and targeted response, there was little doubt that hospitals would end up having infections among medical staff or nosocomial infection. When the hospital itself can't even function properly, the care for patients becomes next to impossible. This is a grim challenge not just for the president to tackle but for the whole hospital staff to grapple with.

The hospital that produced this guidebook has 150 years' history and is located in southeastern China. Since the outbreak of COVID-19 in China, on top of receiving and screening huge numbers of patients with fever symptoms, the hospital also sent 7 medical squad of 189 health professionals to help out hard-hit areas like Wuhan, where ordinary wards needed to be quickly converted into ICUs to treat the most critical and severe patients. Up to this date, the hospital hasn't had any medical staff who got infected while treating patients. Nor had they missed out on a single high risk or suspected case. And there was zero delay in the resuscitation and treatment of severe and critical patients.

When the COVID-19 is ebbing away in China, the hospital begun the aftermath by having all the experiences and lessons learned during the fight recorded in this guidebook. The guidebook shed lights on all the administrative measures that we adopted during the COVID-19 outbreak, covering 8 areas including: Human resources, spacial rationalization, prevention of nosocomial infection, medical processes optimization, logistic support, IT support, hospital-government cooperation as well as coordinated prevention and control in the whole society. Know-hows and lessons learned from the hospital's Wuhan experiences were also included.

Should the know-hows be in an adverse position with local laws and regulations, it is advised that local CDC recommendations or standards shall prevail.

A pandemic, knowing no border, is a common enemy to the humanity. It is our wish that this type of sharing could contribute, in whichever possible way, to this global fight against the COVID-19. We also welcome valuable input from health professionals worldwide.

MESSAGE FROM THE PRESIDENT

Wang Jian'An
President of SAHZU

What we are facing is a novel coronavirus that was not known to human beings, and its routes of transmission are yet to be understood. Hospitals, usually with high visitor flows, are shouldering dual responsibilities to contain the spread of COVID-19 among the patients on one hand, and protect our healthcare professionals from being infected on the other. As the epidemic unfolds, challenges such as the shortage of medical resources will be inevitable. All these add up to a hard test on the management capacity of hospitals and the competence of the staff.

To withstand this test, we have to fully understand the ongoing situation and gear up on the organizational, material, technological and facility levels. That means adequate preparedness through optimizing the response plans, implementing process management to control hospital-acquired infection, and rescheduling staff shifts to support key functions and services.

Concrete actions have to be taken to reinforce the awareness of all staff members quickly – every single one of us – including those on temporary assignments and refresher programs. Clear understanding of the disease control and prevention requirements, full compliance with the established processes and daily report on one's health conditions are the very basics.

We need to always bear in mind such keywords as "fever", "epidemiological history", "respiratory symptoms" and "face mask" during the current epidemic and stay alert to potential risks. Epidemiological investigation should be properly carried out to enable early identification of individuals with fever and early consultation following the standard procedures.

The importance of self-protection can never be overemphasized. Therefore, rigorous implementation of the clinical procedures and the requirements on hospital-acquired infection control is necessary to forge the tight defense against the disease. Our goal is ZERO infection of the staff.

No one is immune to the COVID-19 outbreak. In this fight against the epidemic, we are bonded together through our shared destiny as individuals, families, institutions and the society. Let's stand together in solidarity with our commitment to the safety of ourselves, to the health of our loved ones, to the fulfillment of our colleagues and to the well-being of our communities.

J. A. Wang

12 PM, January 18, 2020
Hangzhou, China

Chapter One High-performance Organization

1. Effective organization management

The outbreak of the coronavirus disease 2019 (COVID-19) called for an effective and well-coordinated response system.

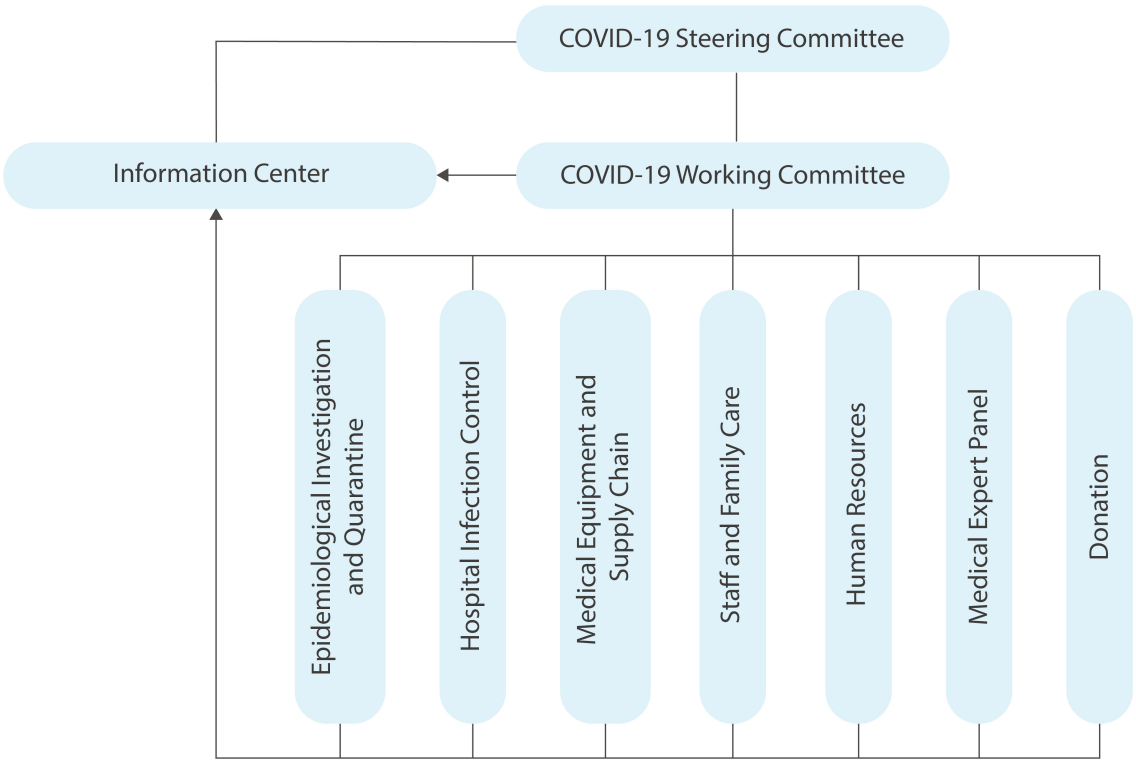
In our hospital, we established the COVID-19 response program which is led by the COVID-19 Steering Committee and operated through the COVID-19 Working Committee and the task forces under its umbrella.

- **The COVID-19 Steering Committee** is chaired by the President of the hospital, vice-chaired by the Vice President (VP) for medical affairs and seated by other hospital leaders and directors of key administrative departments.

The responsibility of the Steering Committee is to lead and make decisions on the activities against the epidemic.

- **The COVID-19 Working Committee** is led by the VP for medical affairs and co-powered by directors of key administrative departments and clinical services.

It is responsible for implementing the decisions made by the Steering Committee and coordinating the response activities across the organization.



2. Target-oriented task forces

Target-oriented task forces can be formed to forge cross-departmental collaboration and realize the effective coordination of resources in a well-organized way.

- **Epidemiological Investigation and Quarantine**

√ Conduct epidemiological history screening on different populations in the hospital, and collect accurate information on the conditions of the patients seen in the Fever Clinic or hospitalized in the isolation ward.

√ Formulate and modify the contents of epidemiological investigation and the protocols of home quarantine monitoring following the ongoing trend of the epidemic and the prevention and control requirements set by the authorities.

√ Carry out daily follow-up visits and provide education on the individuals as per the defined protocols.

√ Implement control measures on the individuals under medical observation and quarantine.

- **Hospital Infection Control**

√ Conduct overall hospital-acquired infection control.

√ Provide standard training and management of infection control personnel.

√ Support personal protection practice.

√ Manage medical waste.

√ Supervise the disinfection, isolation and patient care processes across the organization.

- **Medical Equipment and Supply Chain**

√ Ensure the supply of protective equipment, medical equipment, and daily necessities during the epidemic.

√ Be responsible for the physical modification of spaces and facilities related to the epidemic response.

√ Ensure the functionality and operation of equipment and facilities.

√ Ensure food service.

- **Staff and Family Care**

√ Understand the staff's needs and challenges regarding their daily life and work, and coordinate the supporting efforts.

√ Provide mental and daily life support to staff with special needs.

√ Identify and improve the staff and family support services during the epidemic response across the organization.

- **Human Resources**

√ Allocate and coordinate human resources across the organization in a centralized way.

- **Medical Expert Panel**

√ Discuss, formulate and update the screening and clinical treatment procedures and protocols according to the most current COVID-19 clinical guidance, epidemic containment programs and other documents released by the national government.

√ Provide training and guidance on the clinical practice and epidemic prevention and control.

√ Guide the follow-up practice on the individuals under home quarantine/medical observation.

- **Donation**

√ Search for and contact sources of potential donation.

√ Manage the donation hotline and communicate with organization/individual donors.

√ Be responsible for the liaison and reception of the donations; check the quality of the donated products; establish and keep the inventory; and ensure information transparency.

- **Information Center**

√ Collect, aggregate and archive the information of the epidemic response program, including the documents released by the hospital, reported data, work logs of the task forces, minutes of meetings, etc.

√ Organize and release the information from the government, society and the task forces of the hospital.

√ Communicate with media agencies to release the information about the hospital's epidemic response.

√ Monitor the public opinions.

Medical Expert Panel and Its Role

The Medical Expert Panel formulates the epidemic containment policies and interprets the development of the epidemic according to the most current clinical guidance and prevention and control programs released in both China and other countries to ensure control and prevent missed diagnosis.

The Medical Expert Panel may include a Core Expert Team and a Clinical Advisory Team.

Core Expert Team

Members: experienced attending physicians of the Infectious Disease Department, the Respiratory Medicine Department and the Intensive Care Unit.

Responsibilities:

1. Interpret the diagnostic criteria of COVID-19 and the prevention guidance released by the national government.

2. Advise the prevention and control of the epidemic and develop clinical procedures.

3. Train the clinical physicians and explain the most current diagnostic criteria.

4. Discuss complicated/complex COVID-19 cases and decide on individualized care plans.

Clinical Advisory Team

Members: attending physicians of the Infectious Disease Department, the Respiratory Medicine Department and the Intensive Care Unit, as well as trained attending physicians of other clinical specialties (preferably from the internal medicine-related specialties, with a complementary input from surgical departments).

Responsibilities:

1.Ensure 24-hours on-call coverage on the campus to provide consultation to the COVID-19 cases in the hospital.

2.Implement the criteria for isolation, diagnosis and exclusion of suspected cases.

3.Support the COVID-19 screening on patients for emergency surgeries/procedures to identify necessary protective measures.

4.Decide on the termination of follow-up activities on the individuals under the follow-up monitoring.

3. Rapid and accurate information communication

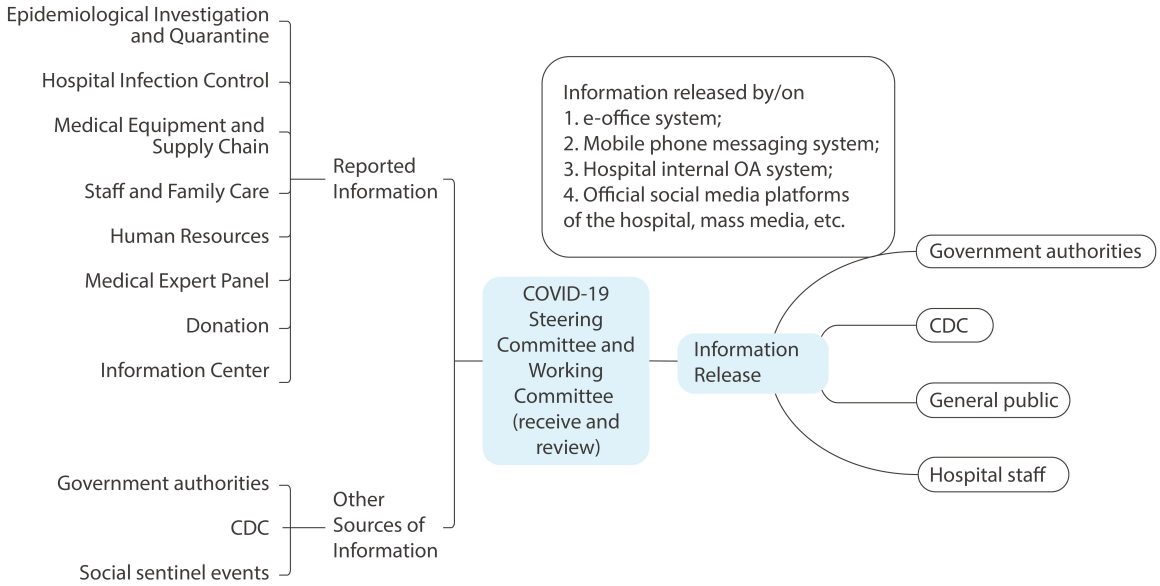
It is important to ensure the timeliness, accuracy and integrity of the epidemic-related information during its collection and release. A designated communication structure for centralized information release would play a key role in preventing information overflow, redundancy, inconsistency, data variance, and process variations.

Within the framework of our response program, all task forces are required to report all information to the Information Center. Any information to be publicized is first reviewed and approved by the COVID-19 Working Committee through the established pathways and procedures. Important issues are communicated further to the COVID-19 Steering Committee for review and approval before officially released by the Information Center.

3.1 Information classification and communication platforms

Classification	Contents	Target Recipients	Communication Platforms
Category I	• Epidemic prevention and control measures of the hospital • Information on clinical consultation and care provision in the hospital during the epidemic outbreak • Public education on the epidemic prevention and control • News updates ……	General public	Official social media platforms of the hospital, public media, etc.
Category II	• Clinical protocols • Epidemic trend • Contingency plans • Guidance on epidemiological investigations • Guidance on prevention and treatment • Information on prevention and control • Social sentinel events ……	Hospital staff	e-office system; hospital internal OA system; video conference system
Category III	• Hospital decisions • Discussion of complicated/complex cases • Patient information • Guidance on prevention and control • Minutes of meetings • Results of monitoring and reviews ……	Need-to-know basis	

3.2 Standardized information sources and release



A designated information release section, "The Epidemic Updates", has been created on the hospital intranet platform to ensure staff's easy access to the information and full implementation of certain activities. The information that can be viewed on both mobile and computer terminals, include important news and updates (trend of the epidemic, guidance on epidemiological investigation, guidance on prevention and control, etc.), current protocols and procedures adopted by the hospital, clinical protocols and training, donation information, good deeds, undesired behaviors and settlement, and forms for download (all kinds of forms used during the epidemic response).

3.3 Uniform communication

The key of outgoing and internally circulating information management is standardization and uniformity. But it is also important to define the roles of personnel involved in the information cycles to ensure "correct information and correct people".

The personnel in the information cycles can be mainly divided into the decision makers and the decision performers. To ensure effective and timely communication, specific communication groups are formed on the platform with uniform management, including the group names, members (group owners, group administrators and members) and the mission tasks.

Decision makers include the hospital leaders and the members on the Medical Expert Panel who lead discussions on the platform and make decisions within their respective scope of responsibilities.

Decision performers are middle-level managers of the hospital, bridging the top-down communication to convey the latest leadership decisions, interpret policies and ensure front-line implementation. They are also responsible for the bottom-up communication through the group to give input to the decision-making processes.

Group administrators are the ones maintaining the teams and ground rules of the groups.

Chapter Two Practical Know-hows

1. Staff management

- **Centralized emergency deployment**

In the fight against the pandemic, hospitals need to centralize staff management. The Human Resources task force is given emergency authorization to allocate all hospital staff in a centralized manner.

Staff	Supported area	Team	Detailed requirements	Responsibility
Physician	Inside the hospital	Core expert panel	Experienced attending physicians from Infectious Diseases, Respiratory Medicine and ICU	1. Interpret the Clinical Guidance for COVID-19 Diagnosis and Treatment issued by national authority; 2. Advise on epidemic prevention and control and formulate hospital diagnosis and treatment processes; 3. Train clinicians and explain the latest diagnostic criteria; 4. Discuss critical and difficult COVID-19 cases and decide on treatment plan.
		Clinical advisory team	Attending physicians from Infection Diseases, Respiratory Medicine and ICU, attending physicians from other specialties with special training	1.24-hour on-site shift to provide consultation on suspected COVID-19 cases; 2. Confirmation and exclusion of suspected cases, formulation of treatment plans; 3. COVID-19 screening for patients in need of emergency surgery/procedure and determination of protective measures; 4. Decide on whether to discontinue the follow-up.
		Back-up team	Medical workers and technicians from all departments	Support fever clinic, isolation wards, sampling station, intensive care unit, etc. 4-8 hours per shift.
Nurse		The first emergency-response team	Sufficiently staffed to support at least 2 weeks of work in fever clinic and isolation wards	Work in fever clinic and isolation ward. Working time per nursing shift in fever clinic is 4-6 hours. Working time per nursing shift in the isolation wards for mild cases is 8-12 hours.
		The second emergency-response team	Double the size of the first emergency-response team	Rotate with the first emergency team and support fever clinic and isolation wards for a relatively long period. Back-up support for outpatient and screening teams when they are understaffed.
		Emergency medicine team	Nurses with experience of working in emergency	Support the emergency medicine department
		ICU team	Nurses with experience of intensive care	Support ICU. Working time per nursing shift in ICU is 4-6 hours.
Physician	Outside the hospital	Teams supporting other hospitals	From relevant specialties including ICU, Infectious Diseases, Respiratory Medicine, Anesthesiology, Cardiology, etc.	Support anti-epidemic efforts
Nurse		Teams supporting other hospitals	Mostly ICU nurses, from multiple departments with different experience levels	
Admininstrator	Inside the hospital	Teams supporting other hospitals	Medical background	Hospital infection, inspection, follow-up, epidemiology survey
		Teams supporting own hospital	Non-medical background	Staff and resource allocation, summary and publication of information, staff mental support, donation management, clinical team support and general administrative responsibility, etc.
	Outside the hospital	Teams supporting other hospitals	Staff from departments of Clinical Engineering, Medical Administration department, Nursing, Hospital Infection Control and Logistics	Responsible for hospital infection prevention and control, staff management, facility management, material procurement and management, etc.

Physician emergency response pipeline

When the epidemic hits, the fever clinic will be overwhelmed by the sudden surge in patient visits. Hospitals are recommended to establish centralized staff deployment, especially the medical staff pipeline for emergency response. It will help to ensure timely reinforcement to key areas including fever clinic and isolation wards, etc.

Range of reallocation: mainly from internal medicine departments. When short of staff, reinforcement can also come from all disciplines of the hospital.

Principle of reallocation

1. All reinforcement staff need to undergo and pass standardized training before on board.
2. The reinforcement team in principle will support fever clinic, isolation wards, centralized sampling positions, which require full time dedication.
3. Centralized on-demand scheduling is arranged according to evolving pandemic is ar ranged.
4. 4-8 hour each shift is recommended according to intensity of workload. The reinforce ment period will usually last for one month.

- **Standardized training**

Continuous training should be insisted upon medical staff for them to learn and apply the latest guidelines for treatment and diagnosis as well as requirements for disease prevention and control.

1) Type, target and content of training

Type	Target	Content
All staff training	All staff	The latest hospital requirements of COVID-19 prevention and personal protection
Stratified training	Physicians	The diagnosis and treatment plan, diagnosis and treatment procedure and disease prevention guideline of COVID-19, etc.
	Medical technicians	Operation procedures related to COVID-19
	Nurses	The rules of nursing COVID-19 patients, such as epidemiology survey, visitor management, and the nursing of COVID-19 patients, etc.
	Logistics staff	Training of personal protection against COVID-19, disinfection procedures of healthcare environment, etc.
Key training	First-line workers of COVID-19 prevention and control, such as medical staff working in nucleic acid sampling and testing, fever clinic and isolation wards.	Targeted training is conducted according to post requirements, including specifically technical standards related to the diagnosis and treatment of COVID-19, operation procedures, personal protection levels and protection procedures, etc.

2) Form of training:

Including online training and on-site training.

Online training: online training is the recommended form of training during the COVID-19 outbreak. Training in the forms of video conferencing or teleconferencing via Apps could minimize unnecessary gatherings.

On-site training: it mainly targets key personnel to equip them with the operational knowledge about SARS-CoV-2 nucleic acid sampling and the procedures to wear PPEs; it also applies to staff who cannot adopt online training.

Recommendation: the on-site training is better held outdoors or in a well-ventilated space; all participants are suggested to maintain "social distance" by keeping at least one meter apart from each other. If available, all participants are recommended to wear surgical masks; personnel with fever or respiratory symptoms are not recommended to attend the training.

- **Health safeguards for staff**

Well-thought-out health safeguards for front-line health care workers can maintain their physical and mental health and lower the risk of infections among health care workers due to depleted immunity resulted from high work intensity, stress, etc.

√ Priority should be given to front-line health workers in terms of PPE supplies.

√ The shift scheduling mechanism should be optimized by arranging multiple groups rotating for the posts directly engaged with high risk patients, to shorten the duration of each shift so as to preserve health workers' physical strength.

√ Dedicated consultation areas are established for staff. In case of fever or respiratory symptoms in staff, he/she is entitled to one-stop visit for diagnosis and treatment.

√ Accommodations are arranged uniformly for personnel working in fever clinics, isolation wards and SARS-CoV-2 nucleic acid sampling stations to avoid cross-infection.

√ Psychiatrists are arranged to relieve the tension, fear and anxiety among staff.

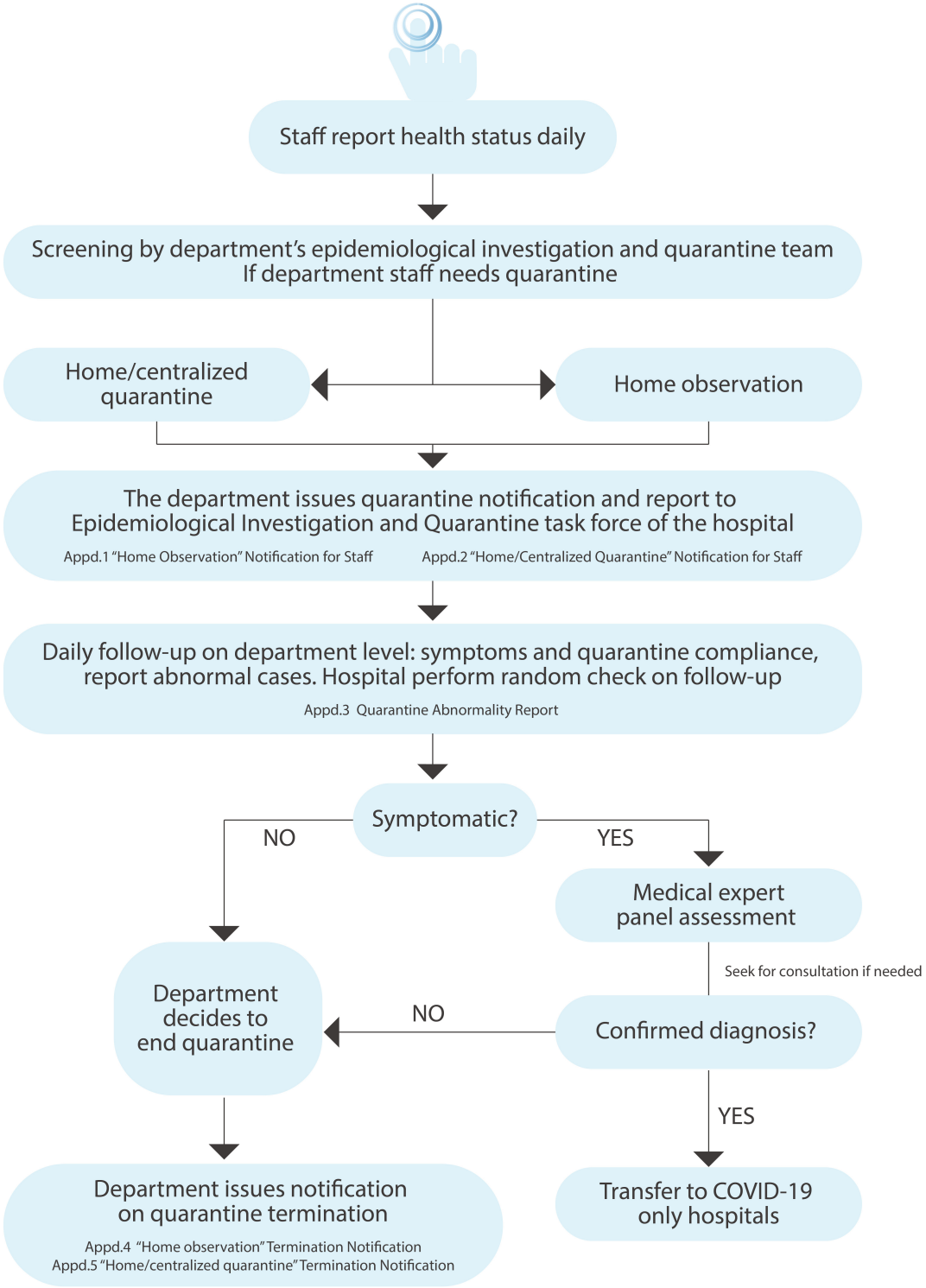
- **Strategies for epidemiology survey**

Staff management

All the hospital staff, including staff on outsourced contracts, students, trainees, doctors in training, etc.

Timely collecting staff epidemiology condition helps to detect positive cases or staff exhibiting fever, respiratory and digestive symptoms. Immediate quarantine and follow-up are recommended in case of any findings.

Staff Screening Process



Remarks

Epidemiology and quarantine supervision mechanisms within a department is recommended. Department heads, head nurses and designated personnel are recommended to oversee the epidemiology survey, management and training of all staff in the department.

Conditions and requirements for quarantine: quarantine could be divided into 3 types, home observation, home quarantine and centralized quarantine. The scope and duration of these three types of quarantine could be defined according to the development of the pandemic as well as local policy.

Home observation: mainly applicable for potentially infected personnel, such as people returning from other areas that are not hard-hit. These people are recommended to reduce the times of going out and their own temperatures are better monitored daily. They must always wear a face mask if they have to go out and be compliant with hand hygiene.

Home quarantine: mainly applicable for personnel who have been in contact with suspected or confirmed COVID-19 patients or returned from the hard-hit areas. Going out is strictly prohibited during quarantine. Such personnel is required to follow the quarantine requirements strictly, such as eating and drinking alone and having isolated space at home. Contact with other family members is better avoided. If the conditions at their homes do not allow such strict rules, they are recommended to be isolated at a site designated by the hospital.

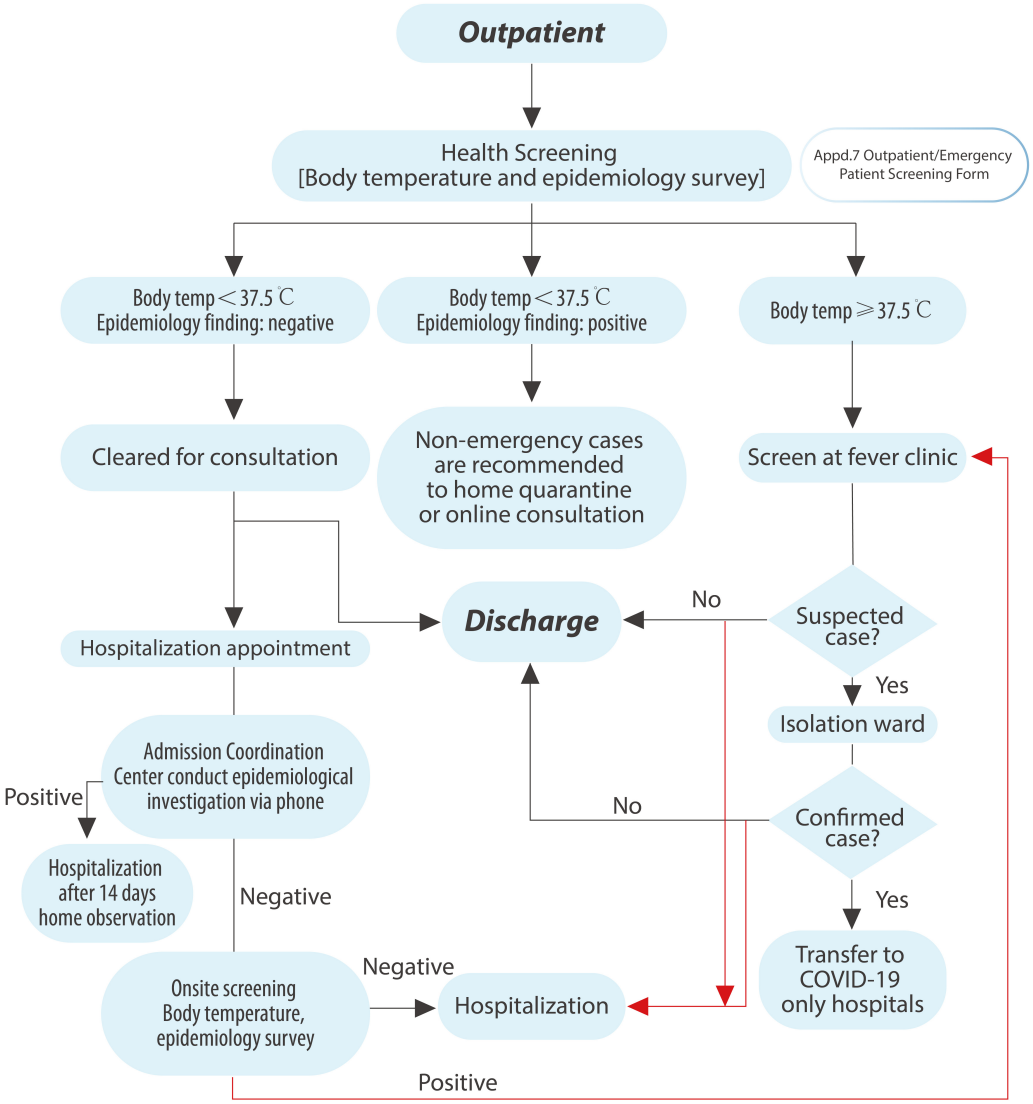
Centralized quarantine: mainly applicable for people in close contact with confirmed patients, people returning from the hard-hit areas and people rotating on high-risk posts such as isolation wards. They are recommended to be isolated in individual rooms of the sites designated by the hospital. They are advised against going out and contacting with other people. Daily monitoring of temperature is necessary.

Staff are recommended to make daily health report via smart phone Apps or by filling in the printed "Health Screening Form".

(Appendix 6 Employee Health Screening Form)

- **Management of patients and their escorts**

1) Outpatient screening



Convenient and precise epidemiological survey

At the entrance, patients and their escorts will have their temperature measured with the "Epidemiological Screening Form" completed. They need to present this form before consultation, hospitalization, examination, etc. This form is only valid till the end of that day.

If concerns about certain patients' recent travels are raised, we would use one-click quick search on www.gov.cn to check their domestic and overseas itinerary of the past 14 days to identify their stay and travel history in hard-hit areas.

2) Screening and management of emergency patients

Screening at emergency:

√ Patients with unstable vital signs and in need of immediate resuscitation: when receiving the patient, nurses are expected to conduct medical and epidemiological assessment. If a patient is epidemiological positive or uncertain, resuscitation will be conducted in separate rooms in Area A with level III protection; if a patient is epidemiological negative, resuscitation will be conducted with level II protection.

√ Patients not in immediate mortal danger: suspected patients will be transferred through special transportation channel and hospitlized in negative pressure wards. Level III protection will be applied. If negative pressure wards are not available, patients will be transferred to isolation wards or isolation ICUs depending on patients' condition. Unsuspected cases will be treated following routine ER process.

3) Surgery/procedure patient management

SARS-CoV-2 nucleic acid sampling + chest CT are prioritized for the patients scheduled for surgery/procedure.

The "Surgery/procedure Patient SARS-CoV-2 Screening Information Reconfirmation Form" will be completed before surgery and brought to the operating theatre. And the surgery team should strengthen personal protection in the operating theatre.

COVID-19 negative patients could undergo regular surgeries. For suspected/confirmed COVID-19 patients, specified transfer route, negative pressure operating theatre, and sterilizable flow sensor anesthesia machine are better to be arranged, and the surgery team should conduct surgeries under level III protection.

4) Management of hospitalized patients and their escorts

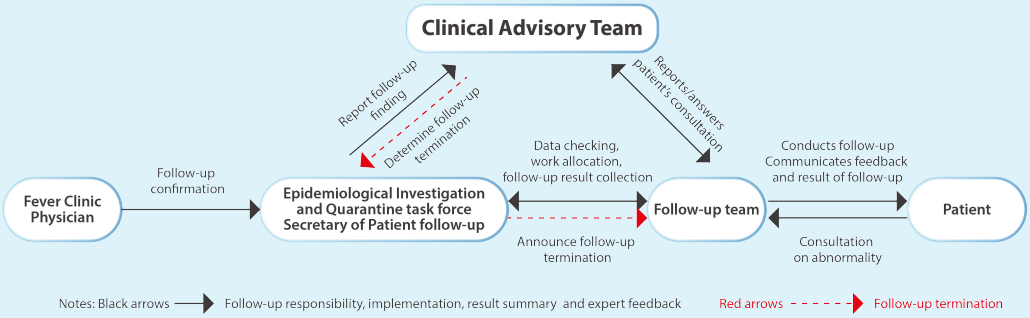
One escort pass for each patient who is allowed to have one designated escort. The passes can only be used by the owners themselves. The change of escort requires a change of escort pass. The escort can only go in and out of wards with the pass.

Designated escort needs daily temperature monitoring and epidemiology survey conducted by the corresponding department, with the same method as outpatient diagnostic survey being applied and recorded in the SAHZU Inpatient Escort Daily Checklist (Appendix 8).

Patient follow-up

Follow-up patients indicate personnel deemed by experts according to their specific conditions in need of being included in the patient follow-up group after visiting the fever clinic.

Follow-up procedure:



Standardized follow-up spreadsheet (Appendix 9)

How do patients establish quick contact with the hospital?

Special Hotline: The hotline is set up by follow-up center with designated person covering this line to answer and collect inquiries of patients waiting to be admitted, contact supervising physicians, and give feedbacks to patients and their family members.

- **Care for medical staff and their families**

The pandemic has a great impact on the work and personal life of staff, including commuting, limited material supply, inability to tend for families due to quarantine, etc. The hospital can establish a communication mechanism to collect and summarize the challenges faced by staff and play a significant role in coordinating resources and solving problems.

We provide the following support to the front-line medical staff:

√ Nutrient-rich meals are provided to make sure the staff has daily intake of fresh vegetables, fruits, quality proteins and milk.

√ If the couple both work at the front-line, staggered shifts will be arranged.

√ Birthday celebration will be held to boost morale.

√ Hospital will visit and comfort staff families (with their consent), and provide them with material support within the hospital's capability.

2. Space management

To isolate COVID-19 confirmed patients, suspected patients and non-COVID-19 patients from each other to prevent cross-infection, sufficient space management could be conducted by the hospital.

- **Management of specialized areas**

Area	Space setting principle
Fever clinic	The fever clinic is set up in a relatively independent area at the hospital entrance.
Respiratory medicine clinic	Relatively independent space is set up to isolate suspected COVID-19 patients from other patients.
Isolation wards	The isolation wards are set up near the fever clinic with two independent one-directional passageways, one for staff and one for patients.
Catering area	People should be one meter apart when waiting in line and avoid sitting face-to-face with each other.
Other outpatient clinic and emergency	People should be one meter apart when waiting in line; one-directional circulation passageways should be set up separately for patients and staff; one doctor receives one patient in one single room.

- **Space routing**

1) Fever clinic:

Spaciousness:
An additional fever clinic diagnostic and treatment area immediately could be set up based on the anticipation of COVID-19 development.

Separate entrances for different categories of patients:
Separate consultation and waiting areas are set for patients from hard-hit areas.
The consultation rooms of fever clinic are further divided with clear signs for patients without epidemic history (regular consultation room) and patients with epidemic history (designated consultation room).

One-stop:

Sterile area functions: shower, hand-washing, toilet, office work, expert discussion, resting for person on duty, changing clothes, donning protective equipment, etc.

Semi-contaminated area functions: a buffer area for staff going from contaminated areas to sterile areas with functions including hand-washing, removing personal protective equipment, storing medical wastes and recycle washing and disinfection supplies.

Contaminated areas functions: patient diagnostic and examination areas, concentrated medical consultation rooms, sample collection rooms, imaging examination rooms, laboratories, and pharmacies. These areas have all been installed with negative pressure equipment or air disinfection machine.

2) Isolation wards

Full consideration in advance: it is difficult to predict the number of patients that need to be received at the early stage of the epidemic. Our hospital set up fever clinics, isolation units and intensive care units, which can be activated to cope with the changing situation of the epidemic.

When there is an outbreak, regular wards can be transformed into isolation wards.

3) Passageways

The hospital passageways are divided into two types: outer and inner passageways.

Outer passageway: Passageways directly connecting the inside and outside of the hospital. Staff manning the outer passageway will take the temperatures and conduct epidemiological screening for all personnel going through the outer passageway.

Inner passageway: Passageways connecting different buildings inside the hospital. Traffic between different buildings should be controlled, with staff work badge, patient wristbands, and escort pass checked in these passageways according to the functions of different buildings.

The Building Chief Mechanism

We assigned a designated building chief in each building.

The building chiefs are fully responsible for personnel protection and control, check-in and check-out, temperature screening, face mask wearing, disinfection and quarantine, etc.

3. Medical procedure management

As the outbreak unfolds, the diagnostic and treatment services opened at the hospital could be updated accordingly.

1) Evaluation for infection risks

Suspension of diagnosis and treatment operations that generate much aerosol is recommended during the COVID-19 pandemic. For example, routine operations in Dentistry (tooth implantation, teeth cleaning and tooth extraction), ENT (rhinoscopy and laryngoscopy), pulmonary function test, endoscopy (bronchoscopy, gastrointestinal endoscopy), breath test (Helicobacter pylori). Specialty services could be only provided under emergency.

2) Silo management

A specialized diagnostic and treatment area inside the fever clinic could be set up for patients with positive results of epidemiological investigation. Pharmacies, nucleic acid test sampling station and dedicated CT scanner could be equipped to limit patient movement.

Isolation wards could be set up to receive patients who needs to be isolated after COVID-19 nucleic acid tests; the negative pressure wards are used to receive suspected and confirmed patients.

3) Priority to "Internet + healthcare"

The "internet + healthcare" model could be leveraged during the prevention and control of the pandemic, providing online medical consultation, telemedicine and diagnostic services, etc.

4. Hospital infection management

- **Infection control at hospital isolation areas**

The infection control of isolation areas is implemented strictly according to the isolation technical regulations, technical guidance for SARS-CoV-2 infection prevention and control, as well as prevention and control protocol, which aims to prevent staff from being infected and cross-infection among patients while avoiding transmission.

1) Adaptable conditions:

Fever clinic, isolation observation unit, isolation unit and isolation ICU.

Fever clinic: consultation rooms designated to screen suspected cases, treat patients with fever (ear temperature at or above 37.5°C without severe underlying diseases).

Isolation observation unit: wards designated to hospitalize patients that are COVID-19 positive and have serious specialty diseases, and sufficiently equipped for isolation and medical protection.

Isolation unit: wards designated to suspected patients waiting for screening result and stable cases confirmed with COVID-19, and sufficiently equipped for isolation and medical protection.

Isolation ICU: wards designated to critical patients who either waiting for screening result or already confirmed with COVID-19, and sufficiently equipped for isolation and medical protection.

2) Layout and set up:

Take the isolation observation unit of SAHZU's Jiefang Campus as an example.

Isolation Ward

1. Regular wards could be temporarily transformed as isolation wards to meet the principal of shortest outdoor transport distance and minimal contact.
2. The personnel flow direction in isolation areas should conform to the principal of "two passageways in three areas", meaning contaminated area, semi-contaminated area, sterile area, staff passageway and patient passageway.

Fever Clinic

1. Fever clinic could be arranged in a separate place. Patients are screened and triaged at the entrance. The diagnostic and treatment areas inside the clinic could be further divided into areas for suspected patients and regular feverish patients.
2. Patient registration, diagnostics, examination, tests, medicine collection, admission and discharge should all be completed in the fever clinic.

3) Management of work:

√ Staff working in the insolation area are required to receive strict training and assessed for their infection control knowledge and skills before on board.

√ Each area should have an infection control supervisor to oversee the implementation of control measures.

√ Staff are allocated in a reasonable manner to avoid fatigue. Accommodation for health care workers could be arranged. (Please refer to personnel management: protection of staff health)

√ Daily temperature and symptom of staff are monitored to allow immediate report should any discomfort occurs.

4) Patient management:

√ Patient education about COVID-19 prevention and protection measures, such as how to wear face masks, wash hands and cough properly, could be conducted.

√ Suspected or confirmed patients shall be isolated in single rooms in a timely manner, for whom visitors and escorts should not be allowed.

5) Disinfection management

√ The cleaning and disinfection of the air, object surfaces, medical instruments, diagnostic and treatment materials should be conducted strictly according to requirements.

√ All materials cannot be taken out of contaminated areas before being disinfected.

6) Transport management:

√ Patients could be accompanied by designated personnel if examination outside the wards are required, and they could be transferred through designated routes or using designated elevators. All these places shall be evacuated in advance.

√ Test samples of SARS-CoV-2 could be transported by designated personnel and in designated vehicles and sealed boxes. The handover records shall be completed.

√ The transportation needs prevention and protection throughout the whole process with disinfection procedures conforming regulations.

7) Medical waste management:

√ Medical waste from isolated areas should be collected, transported and disposed according to requirements.

- **Disinfection procedures at the isolation areas of hospital.**

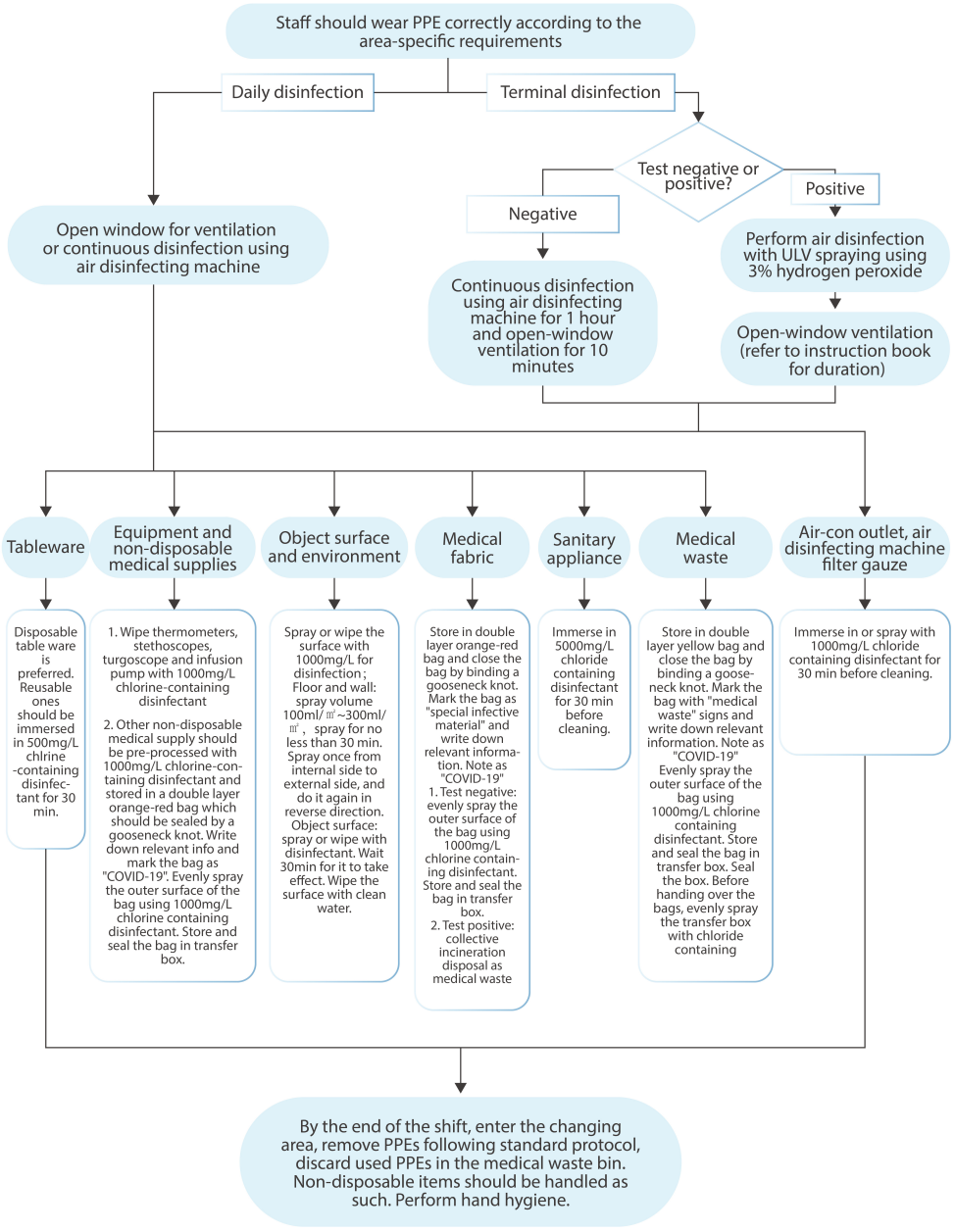
1) Objective: To clean and remove pathogenic microbes on transmission medias to achieve a hazard-free treatment.

2) Requirement: All measures should be implemented in accordance with local COVID-19 prevention and control plan.

3) Adaptation conditions: Fever clinics, isolation observation units, isolation units, isolation ICUs

4) Disinfection procedures:

Cleaning and disinfection process for confirmed/suspected COVID-19 patients



Notes:

1. Terminal disinfection should be conducted twice and 10 minutes apart. Wait for 30 minutes for disinfectant to work before wiping with clean water.
2. When cleaning object surface, do it from top to bottom, from inside to outside and from mildly to severely polluted area.
3. Before cleaning, first remove all contaminant (blood, secretion, vomit and excretion) and then perform disinfection.
4. Before removing blood, process secretion, vomit and excretion, process with 5000-10000mg/L chlorine containing disinfectant ordisinfecting wet/dry wipes with high intensiveness for 30 minutes.
5. Recommended disinfectant are chlorine containing disinfectant or 75% alcohol. For disinfection of equipment, please refer to the instruction book.

- **Personal protection management**

Personal protective equipment tend to be scarce during the outbreak. The hospital could formulate protection levels according to the different risk levels of occupational exposure to guide staff on the correct use of medical supplies in order to minimize infection risks.

1) Requirements:

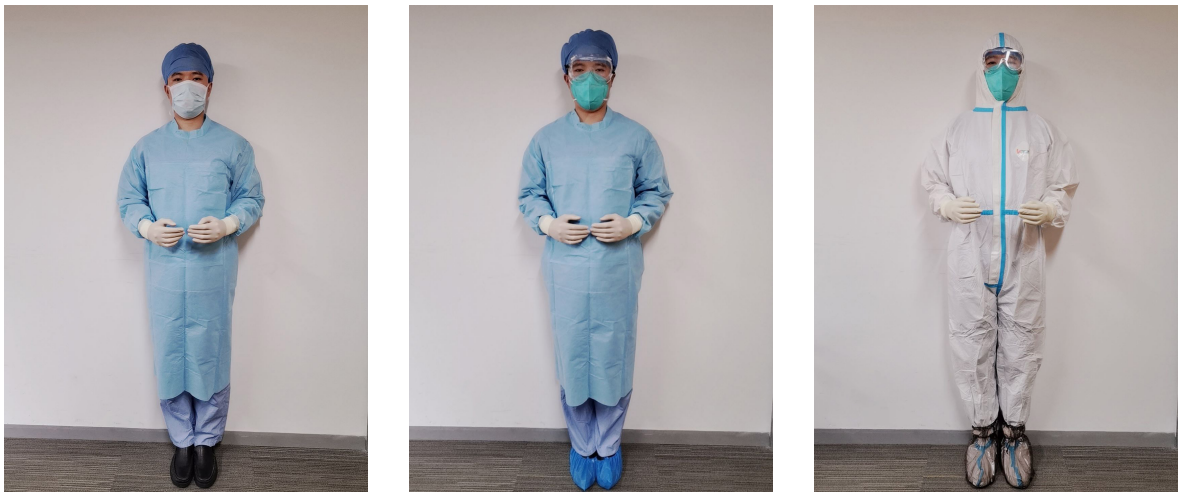
PPE supplies could be used appropriately according to different requirements during the outbreak.

2) Applicable conditions:

Different risk groups within the hospital for COVID-19 prevention and control.

3) Protection requirements of different levels:

Protection levels	Protective Supplies							
Level I Protection	Disposable working hat	Disposable surgical mask	work uniform	Disposable latex gloves	Hand sanitizer	Disposable isolation gown		
Level II Protection	Disposable working hat	N95 respirator	work uniform	Disposable latex gloves	Hand sanitizer	Disposable isolation gown	Disposable shoe covers/ working shoes	Goggles/face shield (if needed)
Level III Protection	Disposable working hat	N95 respirator	work uniform	Disposable latex gloves	Hand sanitizer	Disposable coverall	Disposable shoe covers	Goggles/face shield/positive pressure headgear



Pic: from left to right, the medical staff is under level I protection, level II protection and level III protection respectively.

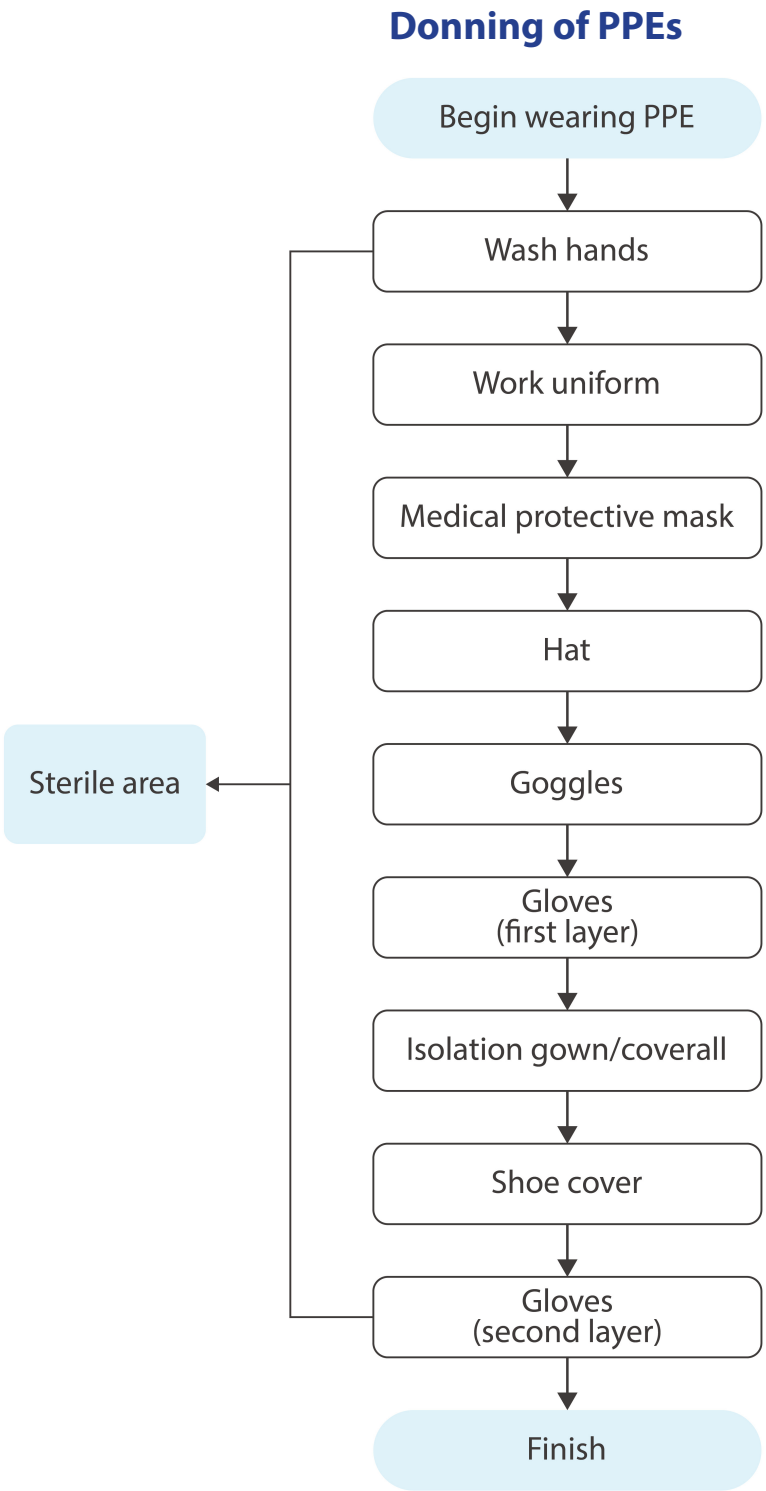
Personal protection requirements of different posts during the COVID-19 epidemic

Posts	Work content or areas	Protection levels	Disposable surgical masks	N95 respirator	Goggles/ face shield/ positive pressure headgear	Working hat	Work uniform	Disposable isolation gown	Disposable coverall	Disposable latex gloves	Disposable protection shoe cover/ work shoes	Hand sanitizer	Remarks
Special clinics	Respiratory outpatient clinic, pediatric outpatient clinic, infectious disease outpatient clinic, ENT outpatient clinic, oral medicine outpatient, pulmonary function room	Level 2		●	☆	●	●	●		●	●	●	
Emergency	Triage of emergency patients; treatment and care of patients; cleaning and medical waste disposal; treatment and care of critical patients ; nursing (such as tracheotomy, intubation and sputum suction)	Level 2		●	☆	●	●	●		●	●	●	
Fever clinic	Regular fever diagnostic and treatment area	Level 2		●	●	●	●	●		●	●	●	
	Epidemiological history positive specific area diagnostic room	Level 3		●	●	●	●		●	● Double layer	●	●	
	Sampling and examination of suspected/ confirmed patients	Level 3		●	●	●	●	☆	●	● Double layer	●	●	
General unit/ICU	Diagnostic, treatment and nursing of patients in single room quarantine (medical observation)	Level 2		●	☆	●	●	●		●	●	●	Set up independent area
	Diagnostic, treatment and nursing of patients in single room quarantine (suspected/ confirmed)	Level 3		●	●	●	●	☆	●	● Double layer	●	●	Set up independent area
Diagnostic and treatment procedures	Procedures that might produce aerosol such as respiratory tract sample collection, trachea intubation, tracheotomy, noninvasive ventilation and sputum suction etc. for regular patients.	Level 2		●	●	●	●	●		●	●	●	
	Procedures that might produce aerosol such as respiratory tract sampling, trachea intubation, tracheotomy, noninvasive ventilation and sputum suction etc. for suspected/confirmed patients	Level 3		●	●	●	●	☆	●	● Double layer	●	●	Set up independent area
Quarantine units	Treatment and nursing of suspected/confirmed patients, disposal of medical waste, operations that might produce splash and aerosol involving blood, body fluids and vomits	Level 3		●	●	●	●	☆	●	● Double layer	●	●	

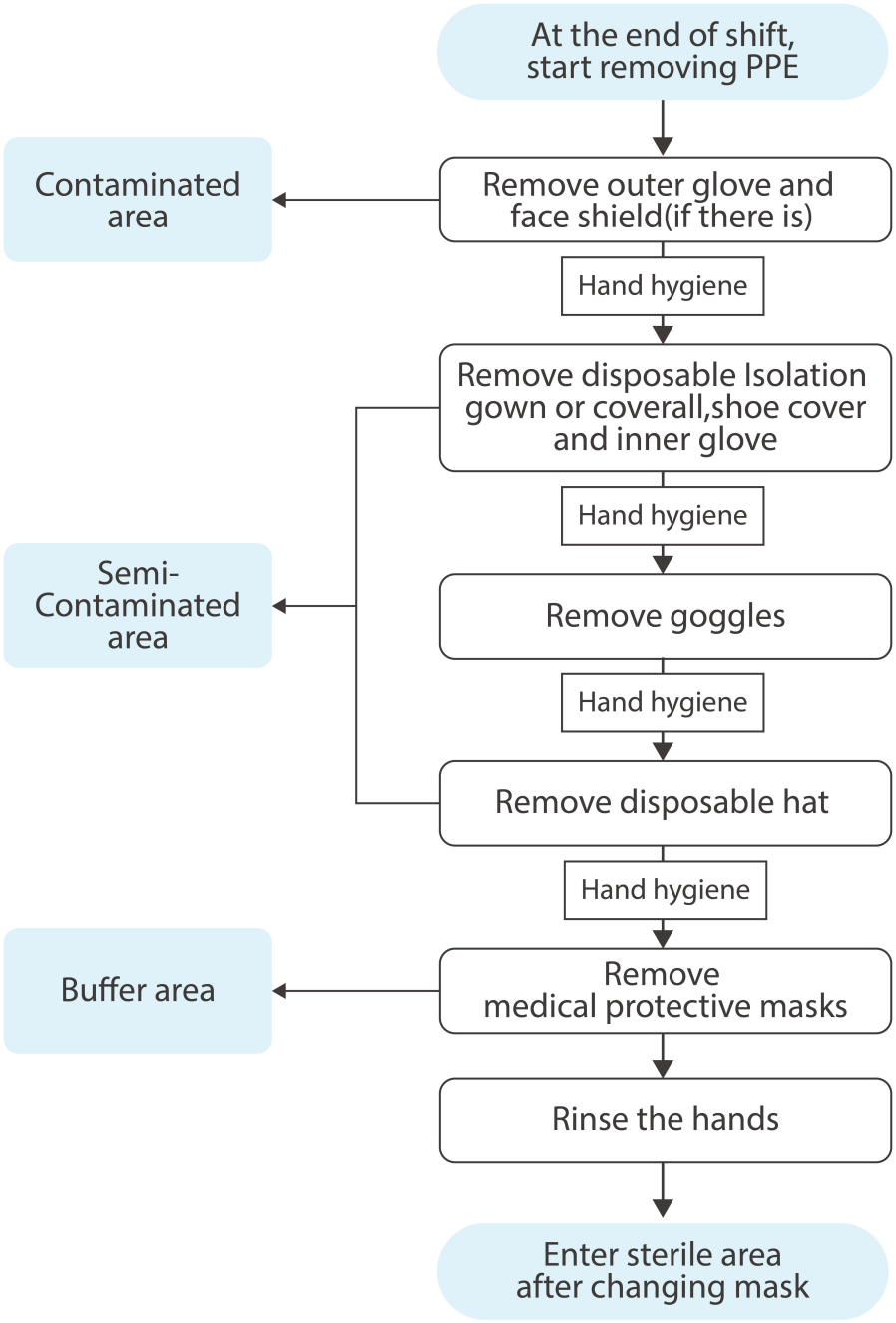
Posts	Work content or areas	Protection levels	Disposable surgical masks	N95 respirator	Goggles/ face shield/ positive pressure headgear	Working hat	Work suit	Disposable isolation gown	Disposable coverall	Disposable latex gloves	Disposable protection shoe cover/ work shoes	Hand sanitizer	Remarks
Clinical laboratory	COVID-19 virus nucleic acid test	Level 3		●	●	●	●	☆	●	● Double layer	●	●	Add Positive pressure headgear
	Collection and transport of COVID-19 samples	Level 2		●	☆	●	●	●		●	●	●	
Radiology and other examination departments	Examine suspected/ confirmed patients	Level 3		●	●	●	●	☆	●	● Double layer	●	●	Set up independent area
Surgeries, intervention	Surgery for regular patients	Level 1	●		☆	●	●	surgical gown/ isolation gown		●	●	●	
	Perform surgery on suspected/confirmed patients	Level 3		●	●	●	●	☆	●	● Double layer	●	●	
Endoscopic center	Examine regular patients	Level 2		●	●	●	●	●		●	●	●	
	Examination for suspected/confirmed patients	Level 3		●	●	●	●	☆	●	● Double layer	●	●	
Cleaning staff	Cleaning for suspected/confirmed patients	Level 3		●	●	●	●	☆	●	● +long sleeve extra thick latex gloves	●	●	
Collection and transport of medical waste within the hospital	Collection of medical waste (medical waste of suspected/ confirmed patients)	Level 2		●	●	●	●	●		● +long sleeve extra thick latex gloves	●	●	Set up independent area for storage
CSSD	Recycle, washing and disinfection of COVID-19 virus soiled materials in contaminated areas	Level 2		●	●	●	●	●		●	●	●	Set up independent area
Logistics And transportation	Transportation of key department (emergency, fever clinic, respiratory outpatient clinic)	Level 2		●	☆	●	●	●		●	●	●	
	Transport suspected/ confirmed	Level 3		●	●	●	●	☆	●	● Double layer	●	●	
Security	Fever clinic	Level 2		●	●	●	●	●		●	●	●	
Corpse disposal personnel	Regular corpses	Level 1	●			●	●	●		●		●	
	Suspected/confirmed corpses	Level 3		●	●	●	●	☆	●	● +long sleeve extra thick latex gloves	●	●	

Remarks: ● indicates mandatory choices, ☆ indicates choices according to exposure risks

4) Wearing and removing PPEs



Doffing of PPEs



- **Inspection on patient service processes**

1) Objective

The hospital could conduct timely inspection and provide guidance for the implementation of infection control requirements for COVID-19, while preventing cross-infection within the hospital as much as possible to make sure that the medical services are performed steadily during the pandemic.

2) Requirements

Targeted inspection is recommended in accordance with the technical guide and prevention plan for SARS-CoV-2 prevention and control.

3) Applicable areas

Hospital-wide

4) Form

Members of the inspection group: hospital leadership, Infection Control Department, Nursing Department, Medical Administration Department, etc.

Special Inspection Form for Disinfection and Quarantine during COVID-19 Pandemic (Key Unit, General Unit) (Appendix 10)

5. General mobilization of material security

When the pandemic is raging, medical protective materials might be consumed quickly. And the lives of medical staff and patients tend to be severely affected due to shortage of emergency medical equipment. One of the pressing tasks for the hospital to control the pandemic is to make reasonable allocation and raise materials as soon as possible.

- **Medical equipment guarantee**

Non-communicable diseases hospitals usually have insufficient reserves for clinical diagnosis and treatment of COVID-19 and disinfection & sterilization medical equipment. The following table lists relevant medical equipment that might be in short supply due to the pandemic, including that for screening, diagnostic treatment, life support, disinfection & sterilization and others.

COVID-19 diagnosis & treatment and disinfection & sterilization medical equipment

Serial number	Equipment name	Shortage under pandemic	Remarks
1	Stethoscope		Equipped in each isolation ward
2	Thermometer		
3	Sphygmomanometer		
4	Oxygen flowmeter		
5	Oxygen saturation monitor		
6	Air disinfection machine	√	
7	Crash cart		Equipped in each ward
8	Defibrillator		
9	Monitor		
10	Micro-injection pump		
11	Sputum elimination machine	√	
12	Non-invasive ventilator	√	Hospital co-ordinated allocation
13	Invasive ventilator	√	
14	CRRT	√	
15	ECMO	√	
16	Designated CT	√	
17	PCR machine	√	
18	Nucleic acid detector	√	
19	Ultraviolet disinfection machine		
20	Hydrogen peroxide disinfection machine	√	
21	Anesthesia machine, ventilator circuit disinfection machine		
22	Infrared thermal imager		
23	Forehead thermometer	√	

- **Material allocation principle**

√ By referencing inventory and actual use, priorities could be given to isolation wards, fever clinics, sampling & test stations and other positions with higher risk.

√ Supply priority of materials with high protection level could be given to high-risk areas, and avoid material waste due to excessive protection in other areas.

√ In principle, it is not suggested to use materials with insufficient protection level in high-risk areas in the attempt to avoid medical personnel infection.

- **Power from society**

With current infectious diseases, medical supplies are consumed extremely fast. Raising medical protection materials and preparing for a long-term battle become an important task for hospitals.

Hospital could formulate donation information. Donation channel, contact information and types of acceptable materials could be publicized to the society at the earliest convenience.

Acceptable donation materials: see Appendix 11 List of Acceptable Donation Materials

Management of donated materials:

The donated materials could be uniformly received and assigned by the hospital, and allocated according to the risk level based on needs, in an efficient, orderly and transparent manner.

Establish a list of material donation and money acceptance so that there are accounts to check and fine management is employed.

Hospital could express appreciation to donors in time.

Once the pandemic is over, the remaining donated materials could be taken as hospital assets and included in daily management.

6. Telemedicine and relevant online support

- **Online diagnosis and treatment service**

By combining off-line medical resources and medical institutions and the Internet, hospitals might be able to provide medical and healthcare consultation to the masses safely and orderly. Online service could also help screen out potential COVID-19 patients from ordinary patients, mitigate the anxiety and panic among the public, and assist patients who need but cannot come on-site due to the epidemic, as well as provide online pharmacy service to patients with chronic or common diseases.

Take SAHZU e-Hospital as an example, the portal provides the following service during the epidemic:

Online consultation

√ Features:

Professional and targeted solution: set up COVID-19 special consultation channel on the SAHZU e-Hospital Portal;

Multiple portal access: mobile APP, website and telephone, etc.

Interdepartmental and multi-disciplinary care: physicians, specialty nurses and pharmacists are encouraged to volunteer for online consultation;

Professional support team: including IT team and service team for experts and customers inside hospital.

√ Tailored consultation service for patients with different demands:

Target: Patients with suspicion of catching COVID-19 themselves

Main service provider: General Practitioner

FAQs:

1. How do I know whether I have COVID-19?
2. When people physically around me are diagnosed with COVID-19, how do I know if I am considered as having a history of close contact with them?
3. Under what situation should I go to a doctor?
4. What kind of mask should I wear?
5. What prevention measures should be adopted at home?

Target: People developing anxiety, insomnia and other psychological problems due to the spread of COVID-19.

Main service provider: Psychiatrists

FAQs:

1. How to cope with anxiety and panic arisen from COVID-19?
2. How to cope with the epidemic's impact on pre-existing psychiatric conditions?
3. What to do if I develop temporary insomnia and depression?

Target: Patients with other medical conditions and concerns about going to hospital due to the epidemic.

Main service provider: a team of experts drafted from clinical departments

FAQs:

1. Is hospital visit necessary when family members, especially children, develop certain physical symptoms?
2. Patients with chronic diseases regularly consult with physicians on their medical condition and medica tion plan.

Online pharmacy service

√ Features:

Physicians and pharmacists work in shifts to provide timely response to online requests.

Convenient medicine pick-up service that includes door-to-door delivery or medicine pick-up at designated pharmacies is offered.

√ Diseases recommended for online medicine top-up:

Common and chronic diseases, including hypertension, diabetes, coronary heart disease, chronic kidney disease, chronic obstructive pulmonary disease (COPD), chronic liver disease, Parkinson's disease, rheumatoid arthritis, certain categories of tumor patients, etc.

• Telemedicine service

Shortage of medical supplies is a massive challenge during the outbreak. We might make full use of telemedicine platform to overcome distance to provide quality medical care to hard-hit and remote areas in order to alleviate the shortage of medical experts across the country.

√ If medical institutions fall into the following categories, remote consultation is recommended, which allows medical resource sharing.

Applicable scenario	Suitable users	Infrastructure	Network parameters
Bottleneck in the treatment of critical or difficult cases and the need for expert input	Domestic and overseas medical institutions in need of group consultation on (COVID-19) typical or critical and difficult cases.	Hi-Fi video conference system (including app and devices)	Up-link 2Mbps Down-link 2Mbps
When multidisciplinary recommendation on treatment is nee ded			

√ If your medical institution falls into the following categories, tele-education platform is recommended for remote education and discussion of typical or difficult cases:

Applicable scenario	Suitable users	Infrastructure	Network parameter
When frontline medical staff needs knowledge of epidemic prevention and control and skill training	Domestic and overseas me dical institutions in need of communication about prevention and treatment of COVID-19	Output/input terminals: · Hi-Fi audio and video conference system · Laptop · Mobile phone	2Mbps
When educational discussion on typical or difficult cases is needed			
When communication or discussion of COVID-19 pr evention and treatment with medical institutions at home and abroad is needed			

7. IT-enabled administration

To minimize gathering and physical contact as well as to better cope with emergencies during the pandemic, information technology is recommended to standardize work flow, change communication mode and improve administrative efficiency in the prevention and control of COVID-19.

• Web conference

Web conference system or audioconference facility could enable online conference regardless of physical constraints and help to avoid gathering and physical contact.

1) Types of conference:

Hospital level: situation briefing, government policy notification, epidemic prevention and control strategy and routine hospital meeting.

Department level: hospital policy notification, department work allocation and implementation, etc.

Online education: online courses and educational rounds.

2) Devices:

Smart phone, Pad, PC and meeting room console, etc.

• Working during pandemic

Given the extraordinary COVID-19 situation, it is recommended that flexible working hours could be adopted and staff is recommended to work from home. It helps to ensure smooth functioning of medical institutions under the premise of reasonable cost control.

Recommended safeguard measures for office environment: good ventilation; central air-con is ill-advised; partition raised between work stations to avoid face-to-face contact; in an open office, staff are recommended to wear masks during office hours.

Staff who can work off-site are encouraged to work from home to lower the risk of cross infection and achieve economizing of PPE; audioconference, video conference and OA system are employed to allow staff to take part in meetings and to handle routine work at any time.

8. Coordinated prevention and control effort by government departments and hospitals

As an open public place, the hospital might need to take rigorous measures and work in coordination with government agencies including the CDC on the prevention and control. Such coordination is indispensable for the containment of infection by public gatherings.

• Coordination on information sharing:

According to local rules or regulations, epidemic information might need to be reported to the government timely. Hospitals might have to communicate, follow and implement government orders and keep the information flowing.

• Coordination on epidemiology survey:

√ If local CDCs are responsible for epidemiology survey of confirmed/suspected cases and screening of close contacts, hospitals usually are expected to prepare personnel, CCTV footage as well as archives on relevant materials in place.

√ Local CDCs pass down policy and orders via local COVID-19 Steering Committees and organize multi-disciplinary efforts in centralized/home quarantine of close contacts of confirmed/suspected cases.

√ Local COVID-19 Steering Committees work in conjunction with designated hospitals to transfer confirmed cases and cured cases and direct post-discharge management of COVID-19 patients.

√ Hospitals could invite local CDCs to provide guidance for on-site instruction of epidemiology survey and epidemic prevention and control.

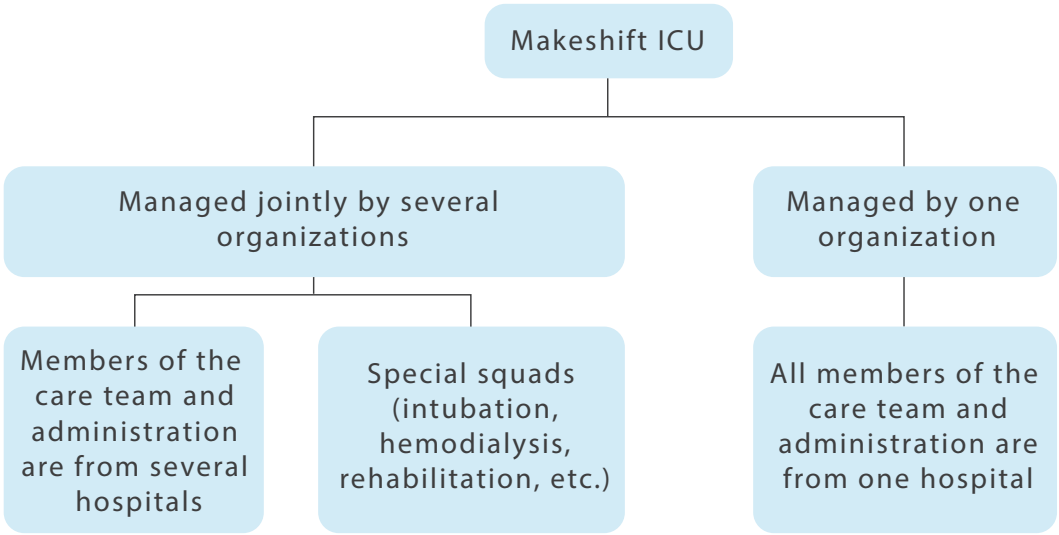
√ The SARS-CoV-2 is highly infectious, even during the incubation period. Therefore, we recommend strict home medical observation for close contacts of confirmed cases during the incubation period (detailed requirements and duration can be the same as that of centralized quarantine). We recommend coordinated effort among local communities in managing these patients to minimize possibility of infections caused by social gathering.

Chapter Three On the Frontline in Wuhan

Since the COVID-19 outbreak, we have sent 171 healthcare staff to Wuhan where they took the full responsibility to operate a makeshift Intensive Care Units (ICUs). Experience from the front-line is laid out in this chapter.

1. Advantage of the single-organization ICU

Makeshift ICUs in Wuhan came in two models based on the staff composition: a single-organization ICU, where the staff are from one hospital, versus a joint ICU, where staff from different hospitals work together.



The single-organization ICU team bears advantages of:

1. There are few barriers in communication, management and task assignment among the staff as they had been working in the same organization.

2. Being with familiar colleagues helps staff work with higher productivity and less anxiety and stress as they throw themselves in a new environment with an influx of severe COVID-19 patients.

3. Continuous and integral care for the severe and critical cases is better ensured and clinical challenges are readily addressed within the care group, or the entire care team, or the MDT between the field (Wuhan) and the headquarters (Hangzhou).

4. If intensive care, infectious diseases, respiratory medicine, and cardiology are well represented in a team, we could get away with the consumption of staffing and supplies in the special squad settings.

2. Team assembly

2.1 Team structure

Based on the number of beds allocated, we try our best to assign one doctor and three nurses for each bed whose backgrounds are primarily intensive care and emergency, respiratory medicine and infectious diseases. Besides, infection control specialists, medical engineers, logistical support staff and administrators (coordinators) join the team. When available, the psychologist is a valuable member as well.

Selecting group leaders: physicians experienced in hospital management are recommended.

2.2 Grouping of healthcare providers

A senior intensivist serves as the director of this makeshift ICU, while a senior nurse with intensive care background becomes the nursing director. They have a general picture of how every patient is doing and provide overall guidance to the care team. Meanwhile, they work closely with the medical team leaders and coordinators to make decisions for the entire team.

The staff is assigned to medical and nursing groups based on their years of practice and expertise to ensure the specialties and skillsets are well represented in each group. Preferably, staff from the same department or specialty are allocated to the same group. When coming to and getting off work, all the members of the team could proceed together. A leader is designated in each care group, and each patient is assigned to the group leader for optimal continuity of care and care plan modification whenever the patient's condition requires.

Staff work four to six hours and stay for six to eight hours (including time to don and doff PPEs) in the hospital per day to balance among staff safety, continuity of patient care and protective supply consumption.

2.3 Essentials in management

Communication:

The decision-makers meet every day to discuss the patients' clinical course, staff, supply inventory and government policies on the epidemic control and generated daily reports. When needed, the meeting also involves all the group leaders or the entire care team.

The meeting is held on the Internet-based platform, e-mail, or audio call to reduce congregation.

When the care for the critical and severe cases exceeds the ICU care capacity, we discuss with the local hospital administrators and local health authorities for the proper strategy of care.

Infection control practice of staff:

√ Accommodations: door handles, counters, toilet seats, and other frequently used surfaces are disinfected at least once daily with 75% alcohol or chloride solution of 500 mg/L. The windows are kept open for twice, each lasting at least one hour, to increase air circulation. Assigning only one person in one room is strongly recommended. The central air conditioner is not recommended.

√ Staff always wear a surgical mask when they leave their rooms. Do not touch eyes, face, nose or mouth with unwashed hands, and perform hand hygiene after touching surfaces in public areas.

√ Stay at least one meter apart. Do not congregate or eat together. Observe respiratory etiquette.

√ Do not visit colleagues back in the hotel room and use a telephone or video call instead for a discussion. When face-to-face communication is needed, do so outside the room wearing masks and one meter apart from each other.

√ Make a report and request to the group leader if one needs to go out during off-hours.

√ Follow the schedules and plans to ensure safety, and turn to the group leader when one finds anything unclear.

√ Take the temperature in the morning and evening, and report to the group leader immediately if one feels unwell.

√ Always be mindful of patient privacy.

Standard-based training

Training and evaluation are carried out as planned. There are daily scheduled training and additional ones as the situation requires.

Staff is oriented on a series of topics before taking care of patients, such as ICU layout, infection control procedures, electronic medical record system, and facilities of the inpatient wards.

Additional training is provided whenever appropriate, such as laws, regulations and government policies, care protocol, nursing protocol, rehabilitation procedure, prone ventilation, the use and disinfection of advance life support equipment, and discharge and referral processes.

3. Ward set-up

3.1 Criteria of air for isolation-competent ICU: set up with negative pressure with a frequency of air exchanges at or above 20 times per hour.

• Negative pressure equipment: It involves air compressor and vacuum systems;

• Medical air: Ensure adequately powered wall oxygen;

• Disinfection equipment: Air disinfector, air purifier, hospital bed disinfector, spray bottles, etc.

• Equipment for emergency care: Adequate numbers of crash carts, oxygen cylinders, cardiac monitors, electrocardiographs, defibrillators, infusion pumps, intubation kits, portable negative pressure units, non-invasive ventilators, invasive ventilators, hemodialyzers, ECMO (Extracorporeal membrane oxygenation), etc.

• Medications for emergency care.

3.2 When bed capacity is overwhelmed with severe cases, regular wards could be repurposed into makeshift ICUs. For optimal patient care and safety, recommendations are as follow:

Preferred sites: Buildings or patient floors that allow the "three zones and two accesses" principle (clean, buffer, and contaminated zones; staff and patient accesses);

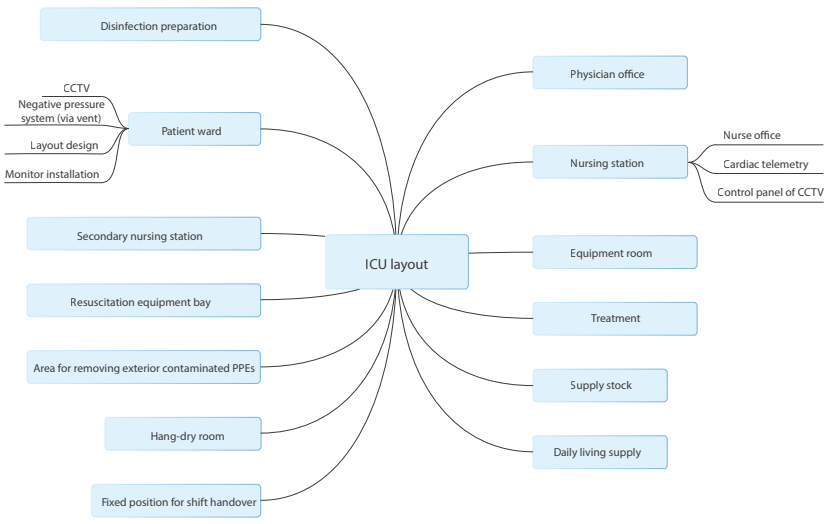
Ward air ventilation: Increased ventilation is achieved with open windows or ventilation machines. Avoid using centralized air conditioner;

Beds are 1.5 meters apart at least;

Beds are equipped with electricity outlets, oxygen, cardiac monitor, ventilator, and other essential devices;

Adequate numbers of air disinfectors are available to ensure air and surface disinfection.

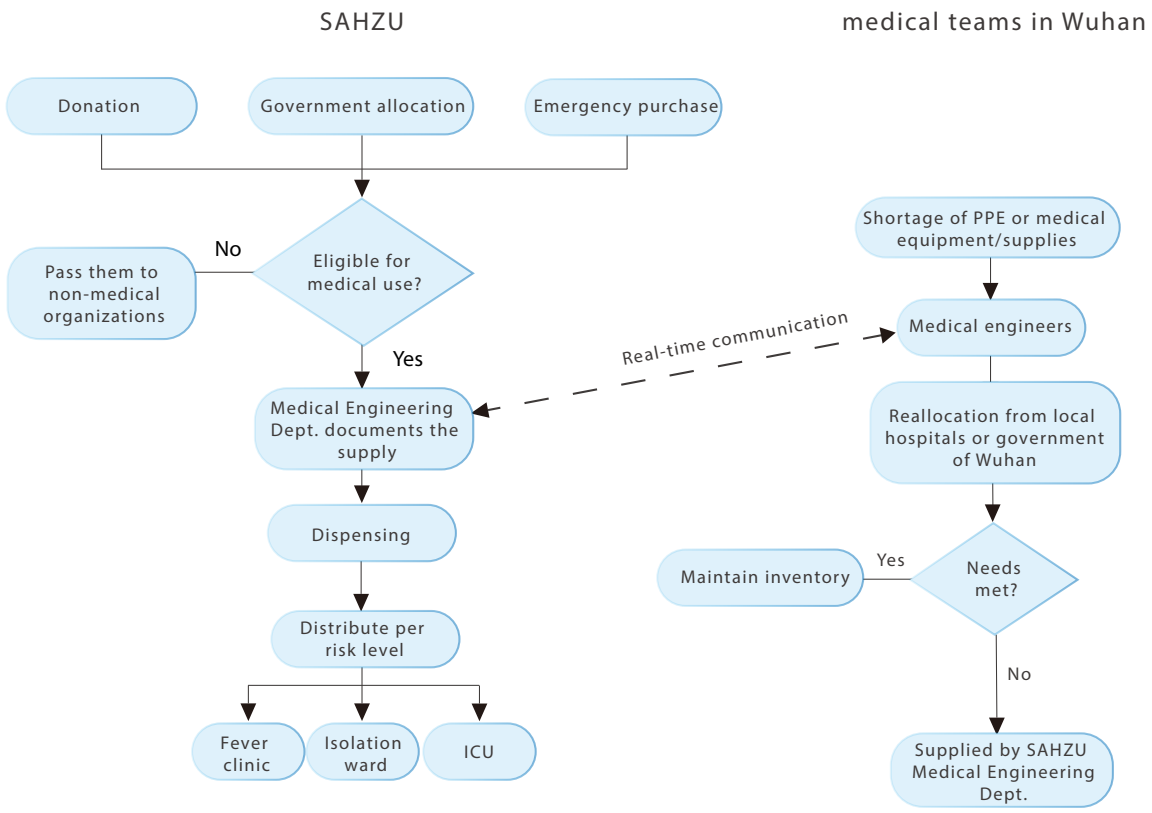
The functional layout of makeshift isolation-competent ICUs is shown in the following diagram.



3.3 Medical equipment and supplies guaranteed when the field team works closely with the headquarters.

Equipment	Equipment
Invasive ventilator	Vital sign monitor
Non-invasive ventilator	Video laryngoscope and intubation scope
High-flow oxygen therapy machine	Air disinfector
Defibrillator	Portable ultrasound
ECMO	Infusion system

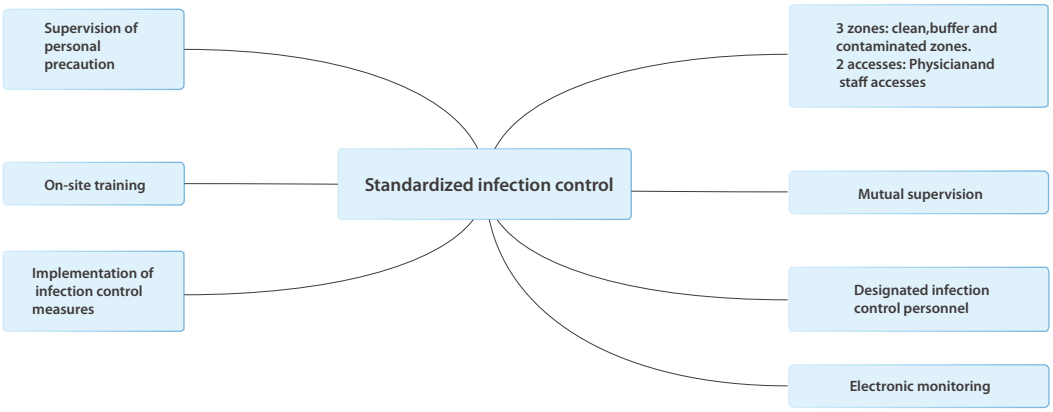
Medical equipment for the field medical team



Flowchart of the coordinated mechanism for medical equipment and supplies provision

4. Staff precaution

Given that it is more likely to get infected in a high-prevalence region than a low one, and that the risk in ICU is particularly alarming, we decided to adopt staff precaution above the regular infection control standards.



The "three zones and two accesses" defined

Principles of repurposing the designated and makeshift hospitals: exhibition centers, factory plants, and hospitals can be redesigned for COVID-19 response where wind direction, ventilation system, and sewage treatment are eligible. Accesses and functions are designated to reduce cross-infection, including patient entrance, staff entrance, clean zone, semi-contaminated zone, contaminated zone, buffer zone, supply delivery route, and waste disposal route. Disinfection and cleaning procedures are specified for each zone.

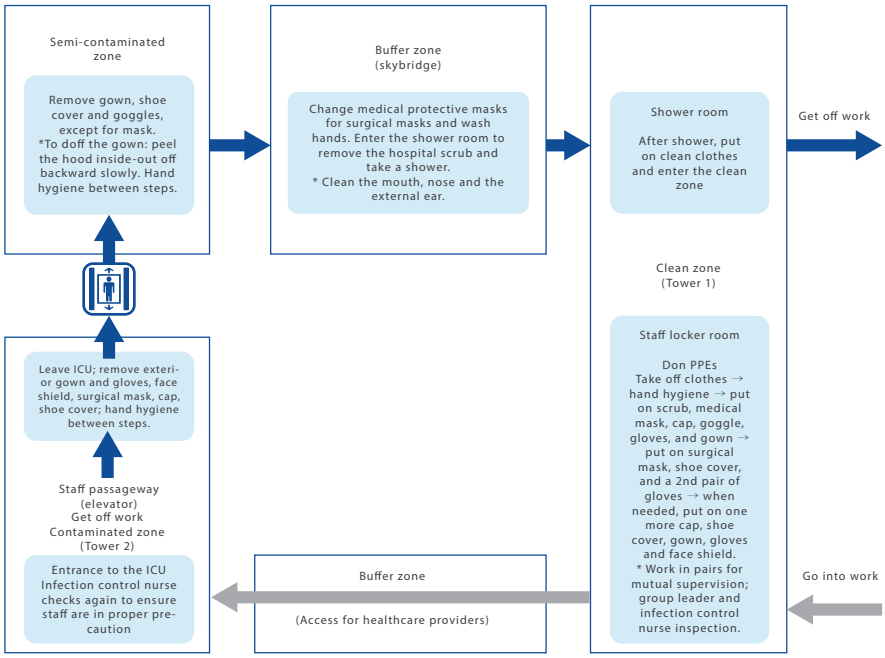


Diagram: Staff flow in the repurposed designated hospital

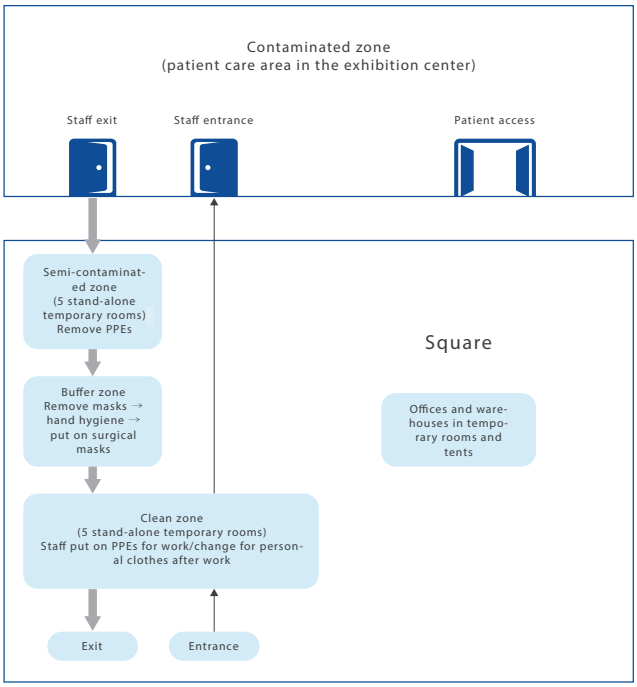


Diagram: Infection control zoning of a makeshift (Fangcang) hospital in Wuhan

Standard operation procedures defined from accommodation to clinical care, guaranteed with mutual supervision

When setting off work, staff wear masks, leave their rooms, take the elevators dedicated for healthcare providers (so that they do not meet other hotel guests) to the first floor, enter the "clean zone" (a tent abutting the hotel gate) to take off clothes, and move to the "buffer zone" (in the next tent) to put on clothes for the commute.

After arriving at the clean zone of the hospital, staff enters the staff locker room to take off clothes for commute, wash hands, put on hospital scrubs, medical masks, caps, goggles, gloves, and protective gowns. Then they put on surgical masks, shoe covers, and another pair of gloves. When needed, they put on one more cap, shoe cover, isolation gown, face shield, and the third pair of gloves.

During this supervised donning process, every two staff members work in pairs to supervise each other, in addition to the supervision by the group leader and infection control nurse. Errors will be immediately corrected once identified.

These hazmat-suited health professionals arrive at the first floor via the designated elevator, enter the contaminated zone through the external passage (buffer zone) and take the designated elevator to the ICU. They are rechecked by infection control nurses before entering the ICU.

The health care workers go through "four zones" when leaving the medical area:

First, the contaminated zone. Right outside the ICU, health care workers remove their exterior gowns, face shields, surgical masks, caps, the exterior shoe covers and gloves in this zone. Hand hygiene is practiced after each step.

Second, the semi-contaminated zone. Via the dedicated passageway, staff removes their protective gowns, interior shoe covers, and goggles, except for masks. When taking off the gown, they are required to peel the hood of the gown inside-out off backward slowly to avoid contamination. As always, hand hygiene is required between steps.

Third, the buffer zone on the skybridge. Staff change their medical protective masks to surgical masks and wash hands and enter the shower room to remove the hospital scrub and take a shower when they also clean mouth, nose and the external ear.

Fourth, the clean zone. Staff put on clean clothes and enter the clean zone after a shower.

Commute back to the accommodation: chartered coaches are used for commute. Before entering the hotel, health care workers take off clothes in the "buffer" tent and move to the "clean" tent to put on clean clothes.

Precautions based on risk levels

Appendix 12. ICU Infection Control Checklist, Oncology Center, Wuhan Union Hospital (by SAHZU Medical team)

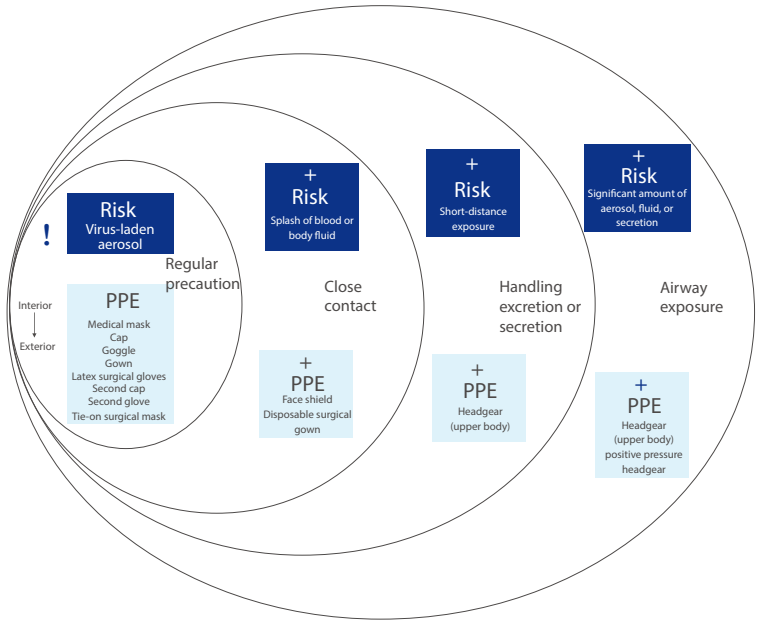


Diagram of precaution standards

Supervised infection control practice where staff work in pairs; key points for infection control summarized in rhymes.

Two infection control nurses work in pairs during each shift to monitor health care workers putting on and removing PPEs and check infection control measures. The nurses inspect every step taken by health care workers and ancillary workers to identify and correct loophole in the process.

Key points of infection control practice in the ICU are summaried, which involve intubation, sputum suction, swab sampling, venipuncture, cleaning, and disinfection, as well as PPE removal.

Always take higher level of precaution for higher-risk procedures.

For example, in tracheotomy, intubation, sputum suctioning, health providers wear extra precaution of positive pressure respirator.

A health provider in standard precaution with a positive pressure headgear

A health provider in standard precaution with a face shield

Safety needles are used for the collection of venous or arterial blood, or body fluid, and medication administration. In this way, the needle automatically retracts to reduce occupational exposure to infection risk.

5. Hospital Management

Shift handover: Critical COVID-19 patients usually experience complicated and fast-changing conditions. To meet their needs, the model of "online + written shift handover" is recommended to ensure timely and complete information communication and improved quality of care.

Individualized care: Patient-specific care plans are developed depending on their age, overall health conditions, and the progression of COVID-19 with a special focus on the treatment of their respiratory symptoms.

Airway management: As silent hypoxia is one of the typical clinical features of COVID-19 patients, early intubation is preferred, and prone ventilation is recommended to be applied sequentially before intubation/during mechanical ventilation/after extubation.

Experience with anti-viral medications/convalescent plasma transfusion/tocilizumab: Due to the limitations and uncertainties of the anti-viral therapies in the treatment of COVID-19, the side effects of the drugs need to be carefully monitored to allow timely adjustment of the treatment plan. The convalescent plasma can be administered at an early stage, and the outcome should be monitored. Screening on the patients to identify those who may benefit from tocilizumab is recommended.

Patient-centered mental support, nutrition therapies, and rehabilitation interventions: During the treatment, both the physical and mental needs of the patients should be adequately assessed to cheer them up and boost their confidence. Appropriate diet plans and early nutrition interventions such as enteral nutrition should be provided based on patients' clinical conditions. Also, early rehabilitation plans should be developed according to their lung functions.

The Value of High Flow Nasal Cannula (HFNC) Oxygen Therapy

HFNC oxygen therapy, as one of the fundamental but crucial treatment methods, can be relatively effective on patients who do not require endotracheal intubation or invasive ventilation yet.

1. Duration: For COVID-19 patients, especially severe and critical cases, HFNC oxygen therapy is usually no shorter than 2 weeks with the potential to be prolonged to 1 month. It can help to reduce the need for intubation and prevent complications such as VAP and DVT.

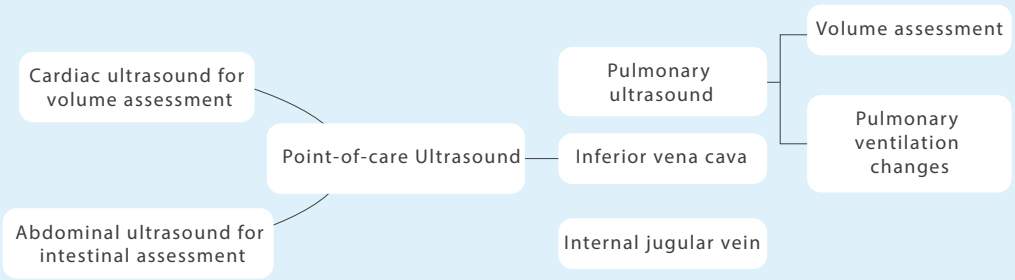
2. Infection control: No extra precaution is required for healthcare staff. If the resource availability permits, surgical face masks can be used on patients to reduce the expiratory flow.

3. Special focus: Oxygenation and the changes in respiratory rate should be monitored closely. If deterioration continues, mechanical ventilation should be considered to prevent life-threatening development due to delayed intubation.

If the signs of respiratory failure persist or progressively deteriorate and at least two of the following criteria are met, intubation is applied: (1) respiration rate > 40 bpm; (2) no improvement in high respiratory load; (3) excessive airway secretion; respiratory acidosis (pH< 7.35); (4) SpO2<90% for at least 5min (technical machine failure excluded).

The Value of Point-of-care Ultrasound (PoCUS)

Fluid volume assessment is an important part of the treatment and assessment of critical COVID-19 patients. Since the ICU resources could be sparse, monitoring strategies such as invasive blood pressure monitoring, CVP, PiCCO, and Swan-Ganz catheterization may not be viable. To minimize the workload and stress on the healthcare staff, limit the infection induced by invasive procedures and downgrade the exposure risks of the staff, PoCUS can be an ideal tool for accurate assessment of the volume status of critical patients.



6. Sophisticated nursing care

Mixed nursing skills for higher competence and efficiency

√ The nursing teams can be organized based on their years of experience and competence in different services such as intensive care, infectious diseases, respiratory treatment, wound care, and infection control. Nurses with similar clinical backgrounds are assigned to the same team if possible.

√ Mixed-skill teams can be grouped to take care of patients with clearly defined roles and task assignments.

√ The nursing staff performs their due responsibilities to support patients' needs while ensuring human resources management.

Standard nursing strategies

Standard Nursing Strategies for Critical COVID-19 Patients		
Nursing Quality	Close monitoring based on the level of nursing care	Critical nursing care: Monitor HR, R, BP, and SpO2 once/hour.
		Level-1 nursing care: Monitor HR, R, BP, and SpO2 based on the conditions but at least once/shift.
		Monitor temperature at Q4H.
	Accurate documentation of intake & output	Use the measuring cup, digital scale, drainage bag, and other tools if available to measure and document patient's ins & outs.

Nursing Quality	VAP prevention	Elevate the bed head by 30°and mark the position with a protractor.
		Maintain the pressure of the airway balloon at 25~30 CMH2O. Monitor and document the balloon pressure once every 4 hours.
		Clear the subglottic secretion promptly.
		Develop individualized respiratory rehabilitation exercises based on the patient's respiration and lung function.
	Skin management	Turn the patient regularly. Use bed cushion and turning wedge. Choose pressure relief pad, hydrocolloid, foam, and Sanyrene for dressing.
	Rehabilitation	Regular rehab: respiration, extremity, and core muscle exercise. Special rehab: oxygen therapy, airway clearance therapy, and respiratory muscle rehabilitation.
	Patient information communication	Shift handover documentation on critical and severe patients Daily log on new ICU admissions on each shift.
Nursing care for severe patients	Oxygen therapy and respiratory support	Apply the lung-protective mechanical ventilation strategy to reduce ventilator-associated lung injury: low tidal volume (6~8 ml/kg IBW) and limited plateau pressure (≤30 CMH2O).
		Ventilator and circuit management: 1. For invasive ventilation, heat and moisture exchanger with bacteria filtration is preferred to reduce water condensation. 2. Disposable circuits and exhalation valves are recommended. Viral filters are used on both the inspiration and expiration cycles and are changed ONLY when contaminated or during mechanical failure. 3. Interruption of the ventilator should be avoided. Turn the ventilator into the standby mode if the machine has to be halted from operation.
	Individualized nursing	Develop diet plans. Perform timely daily hygiene care. Provide daily necessities.
	Nursing care during convalescent plasma administration	1. Assist the signing of informed consent. 2. Follow the aseptic techniques and blood transfusion protocols. 3. Closely monitor the vitals, consciousness and skin conditions of the patient, especially during the first 15-20min after the transfusion starts. Slow administration to finish the transfusion within 1-4 hours is preferred. 4. Handle the blood bag properly after the transfusion. The empty blood bags are put in double-layered yellow medical waste bags. Keep documentation. Ensure that the information of both the donor and the patient can be traced.
	Prone ventilation	Consider prone ventilation for at least 12 hours per day when staffing allows.
	Psychological assessment and intervention	The Patient Health Questionnaire-4 (PHQ4) is recommended for sufficient psychological assessment on every patient to identify their needs and problems.
		Keep communicating with patients with artificial airways through eye contact, touching, nodding, handshaking, thumbs-up gestures and even writing boards and pictures to provide emotional support and encouragement.

7. Psychological support

To support the frontline staff's morale and mental health, psychiatrists were assigned to our Wuhan medical teams, responsible for providing closed-loop mental health management and consultation at different stages and on different levels.

Daily Health Self-report

Self-assessment on body temperature, physical conditions, sleep, and mental status could be required to be reported by the healthcare staff to ensure early identification and intervention for physical and/or psychological issues.

The patterns of mental status changes can also be concluded from individual cases to indicate specific interventions, including:

√ Online mental health lectures and consultation for the team;

√ "Balint Online" program providing psychological consultation to individuals in need;

√ Psychological interventions for staff required to be quarantined.

In addition to online psychological consultations, flexible, supportive psychological therapy, cognitive behavioral therapy, relaxation therapy, mindfulness-based cognitive therapy, hypnotherapy, and music therapy can also be delivered to the frontline team through audio, video and VR means for timely and effective support.

"0-1-2-3" Psychological Prescription

0: Empty your burden - zero stress.

1: Focus on one mission - clinical care.

2: Seek support in two ways - yourself and your organization.

3: Always remember the three things: Accept yourself. Change yourself. Let yourself be part of the team.

Chapter Four Global Sharing for Pandemic Response

Virus knows no boundaries. We have been working with the rest of the world to share our first-hand clinical and containment experience against the COVID-19 epidemic in the hope of improving the disease prevention and treatment capacity and effectively bringing the epidemic in check through joint efforts.

1. Audience-specific information sharing

Target audience	Shared information
Government authorities (e.g. responsible government departments)	Importance of the infection source control; means of cutting off community transmission paths; information technology tools; key criteria of population epidemiological screening.
State-level associations (e.g. board members of the COVID-19 Emergency Response Committee)	Evidence-based information related to the novel coronavirus; suggestions on healthcare personnel protection.
Hospital leadership (e.g. COO of a hospital)	Modification of physical space in hospitals; patient triage methods; guidance on the healthcare personnel PPE use; allocation of medical resources and supplies.
Clinical physicians (e.g. doctors specialized in intensive care, infectious disease doctors other relevant clinical services)	Experience in clinical diagnosis and treatment, including the criteria of case confirmation, admission/discharge criteria, the efficacy of anti-viral drugs, clinical features of disease progression, adjuvant treatment, and nursing care.
General public	Importance of social distancing, public education on COVID-19 (e.g. virus transmission routes, symptoms)

2. Diverse communication channels

Video conference has become the main way of communication among healthcare organizations around the world.

For our hospital, we also attended the television interviews, including the ones conducted by national televisions and broadcasters, to share the information of COVID-19 to the general audience.

Other platforms such as the Global MediXchange for Combating COVID-19 (GMCC) have also been utilized for online live learning sessions to share knowledge and response experience globally. In our case, email correspondence has also served as an important pathway of information sharing to explain the use of ventilators.

Frequently Asked Questions

Clinical Care

Is there any specific clinical feature before mild COVID-19 cases progress into the severe stage?

What is your experience in oxygen therapy and respiratory support?

For what kind of patients should we consider immune therapy? What is the timing of intervention?

Management

How to reduce the infection rate among healthcare staff?

How to expand the coverage of RT-PCR screening?

What kind of patients can receive chemotherapy during the outbreak?

Resources supply

How to ensure resources supply when there is a shortage of PPEs?

What types of ventilator products are recommended for clinical use?

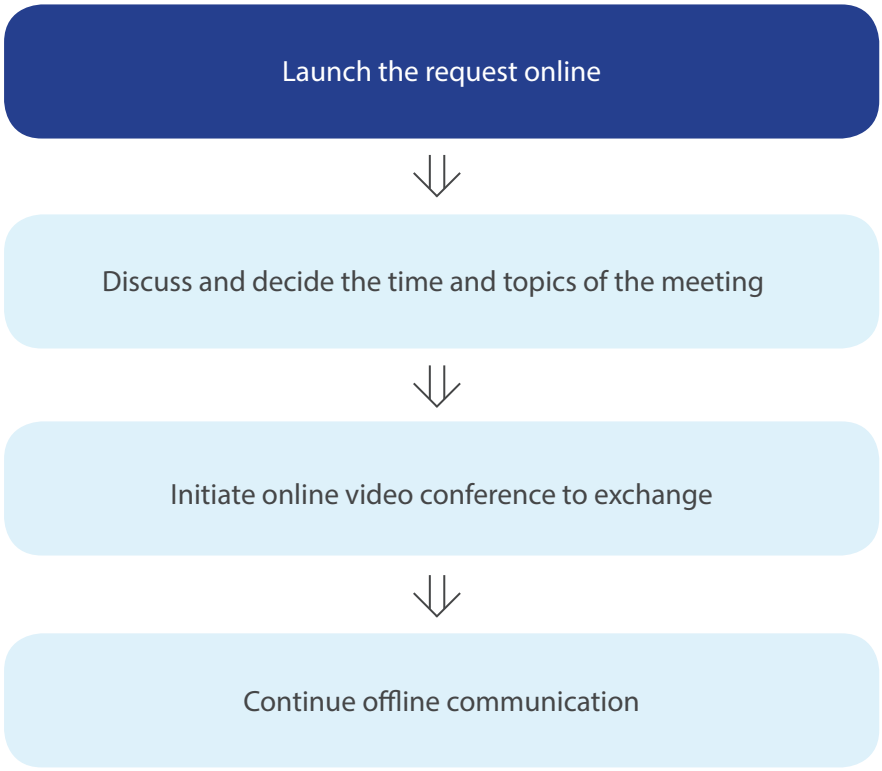
General public

Why is social distancing so important?

When should self-quarantine be implemented?

Will the virus disappear when the weather gets warmer?

3. Whole-process communication: an example of the online video conference



4. Contact information

International Affairs Office, SAHZU

Tel: +86-571-87315108

E-mail: iao_sahzu@zju.edu.cn

Website: http://en.z2hospital.com/

Scan the QR code to consult with our doctors on SAHZU Doctors

Scan the QR code to consult with our doctors by DingTalk

Appendixes

Appendix 6-10 are subject to future adjustment following the ongoing development of the pandemic.

Appendix 1. "Home Observation" Notification for Staff

The Second Affiliated Hospital Zhejiang University School of Medicine

"Home Observation" Notification for Staff

Dear_____,

Due to the following situation, you are under "home observation".

☐ Symptom-free personnel returning to Hangzhou from non-epidemic area using public transportation.

☐ Symptom-free personnel ending shifts in Fever Clinic/Isolation Ward.

Requirements of home observation are as follows:

1. Duration:_____ days
2. Requirements:
    1) Restrain outdoor activities during the period. If there has to be outdoor activities, wear mask and comply with hand-hygiene at all moments.
    2) Avoid mass gathering, including dinning together or parties.
    3) Keep shared space like corridor and living room at your home well ventilated. Thorough ventilation should be conducted for more than 30 minutes once every 4 hours.
    4) Drink profusely and take enough sleep.
    5) During the observation period, if you are informed by the police that you have used the same transportation vehicle with confirmed or suspected cases, please inform your department immediately and follow the instruction of the police, CDC and your community.
    6) If you have any discomfort, including fever or respiratory symptoms, visit fever clinic in a timely manner (wear mask and do not use public transportation).
    7) Measure and record body temperature every day after waking up and before dinner. Designated staff of your department will contact you. If you need consultation, please tell the follow-up staff, who will contact physician.
    8) Make sure that you can be reached by phone. If there weren't any discomfort during the period, the department will inform you when the observation period is terminated. If there were any abnormalities, please tell the follow-up staff truthfully.

Thank you for your cooperation!

Informed person
Signature: Date:

Head of Department's Epidemiological Investigation and Quarantine team
Signature: Date:

Appendix 2. "Home /Centralized Quarantine" Notification for Staff

The Second Affiliated Hospital Zhejiang University School of Medicine

"Home/Centralized Quarantine" Notification for Staff

Dear_____,

To protect your health and public health and safeguard social and public health security, according to *Law of the People's Republic of China on prevention and control of infectious diseases* and respiratory infectious disease prevention and control requirement, you are under □home quarantine/□ centralized quarantine. Recruitment of the quarantine are as follows:

1. Duration:_____days
2. Requirements:

1) You are strictly banned from going out during home/centralized quarantine.
2) Personnel under quarantine or medical observation at home need to be under strict isolation in a well-ventilated room. Eating, drinking and other activity need to be done under strict isolation. If it is not possible at home, you must go to designated area for centralized isolation. Frequently ventilate the isolation room by opening the windows; door of the isolation room needs to be always closed. Before opening the door to shared space, open your window and ventilate the room first.
3) Keep shared space like corridor and living room at your home well ventilated. Thorough ventilation should be conducted for more than 30 minutes once every 4 hours.
4) Do not use central air-conditioning. Do not use carpets in your rooms and the living room.
5) Mask is not required when you are in the isolation room. Don't leave the isolation room at will. When you must leave the room, wear surgical mask, wash or disinfect your hands before leaving the room. Wash hands between masks.
6) Minimize your contact with family members. Keep at least 1 meter away from them in the downwind direction.
7) Use separate set of daily supplies to avoid cross infection. People under quarantine should use disposable tableware if available. Otherwise, use designated tableware and drinking cup. Disinfect them after use by boiling it for more than 15 minutes or dish sterilizer.
8) Clean and disinfect items after use. Wash, wipe or spray 1000mg/L chlorine containing disinfectant or 75% alcohol on tables and chairs every day after use, and wipe again with water after at least 30 minutes.
9) Wash clothes, linen, bath towel or face towel in 60-90℃ hot water. Dry thoroughly in machine.
10) Household waste and disposable masks should be sealed in disposable plastic bag and disposed as unrecyclable waste.
11) If the quarantined personnel is diagnosed or suspected as COVID-19 patient, the isolation room need thorough and complete terminal disinfection after the patient is transferred. (It will be done by professionals).
12) Have adequate rest and sufficient nutrition. Avoid using public bathroom. If you must share bathroom, use it at a designated time period and keep the room well ventilated. Rub the surface that your body touches with disinfectants like alcohol.
13) Practice cough etiquette. Cover your mouth and nose with paper towel when coughing. Don't spit on the ground. Put the paper towel in a designated waste bin with cover after use.
14) Measure body temp every morning and evening. When feeling fever, measure and record body temperature immediately. If you have acute respiratory symptoms like fever, cough and short of breath, visit fever clinic immediately (wear surgical mask and do not use public transportation).
15) Make sure that you can be reached by phone. Designated staff of the department will contact you. If you need consultation, please tell the follow-up staff, who will contact physician.
16) **By the end of the quarantine, medical expert panel will refer to the follow-up report and decide whether you can come out of quarantine.**
17) Stop breast feeding if you are diagnosed or suspected as a COVID-19 patient.

Thank you for your cooperation!

Informed person
Signature: Date:

Head of Department's Epidemiological Investigation and Quarantine team
Signature: Date:

Appendix 3. Quarantine Abnormality Report

Only report addition or termination of quarantine

Quarantine Abnormality Report

No.	Dept.	Name	Staff ID	Category	Tel.	Quaranine status	Quarantine address	Quarantine Type	Reason of quarantine	Date of contact/return	Quarantine starting date	Planned ending date	Have been to epidemic area over the past 14 days?	Confirmed/suspected case in the previous residence?	Abide by quarantine requirement or not	**Summary of quarantine (filled when applying for quarantine termination by medical expert panel)**	
																Result of nucleic acid test	**Summary of follow-up (brief medical history)**

Notes: 1. Quanrantine status include: new home observation, new home quarantine, new centralized quarantine, apply for termination of quarantine by exeprt panel, automatic termination of quarantine by the department.
2. Ways of quarantine: 1) Home observation: personnel returning to Hangzhou via public transportation over the past 14 days who is now at home; 2) home quarantine: staff who have contacted suspected COVID-19 patients, staff returning to Hangzhou from epidemic area (Hubei, Wenzhou ,etc.) over the past 14 days; 3) centralized quarantine: staff who have been in close contact with confirmed patients and are now under collective quarantine

Appendix 4. "Home Observation" Termination Notification

The Second Affiliated Hospital Zhejiang University School of Medicine

"Home observation" Termination Notification

Dear_____,

Due to the following situation, you are under "home observation".

☐ Symptom-free personnel returning to Hangzhou from non-epidemic area using public transportation.

☐ Symptom-free personnel ending shifts in Fever Clinic/Isolation Ward.

To protect your health and public health, you were put under "home observation" from 2020/__/__ to 2020/__/__. During the "home observation", no abnormality was found. The "home observation" is terminated starting from today. You are allowed to return to work. Make sure that you abide by regulations and wear masks when going out. **If there were any abnormality**, contact the departmental Quarantine and Daily Monitor Team.

Thank you for your understanding and cooperation during the "home observation"

Informed person
Signature: Date:

☐ Head of Department's Epidemiological Investigation and Quarantine team
☐ Member of Epidemiological Investigation and Quarantine task force
Signature: Date:

Appendix 5. "Home/Centralized Quarantine" Termination Notification

The Second Affiliated Hospital Zhejiang University School of Medicine

"Home/centralized quarantine" Termination Notification

Dear_____,

To protect your health and public health, you were put under ____days of "home/centralized quarantine" from 2020/__/__ to 2020/__/__. As reviewed by the hospital expert panel, you have met the requirements of termination of "home/centralized quarantine". The quarantine is terminated starting from today. If there were anything unclear or if you have any discomfort, please contact the department. Make sure that you abide by regulations and wear masks when going out.
Thank you for your cooperation!

Informed person (signature):

Date:

☐ Head of Department's Epidemiological Investigation and Quarantine team
☐ Member of Epidemiological Investigation and Quarantine task force

Signature:

Date:

Appendix 6. Employee Health Screening Form (Printed Version)

Employee Health Screening Form (Printed Version)

Please complete the form timely and truthfully every day, tick √ in □, sign and report. And department director / head nurse keeps it in the archives.

1. Current health condition (single choice)
   □Healthy □With fever, cough and other symptoms □Others
2. Current city: ____ City ____ District
3. Current location:_____
4. Are you under medical observation today? (Single choice)
   □No □At home □Home quarantine □Centralized isolation
5. If you are under medical observation, please fill in the deadline_____MMDD
6. If you are under medical observation, please fill in the medical observation address:
   _____
7. Where have you been today? (Multiple choices)
   □Hospital □Home □Other
8. What kind of transportation do you take today? (Multiple choices)
   □No transportation taken □Self-driving/Bicycle/Electric motorbike □Taxi/Internet taxi □Bus
   □Airliner/Train □Other
9. Body temperature _____ (please fill in if you have fever, not required)
10. Have you returned to Hangzhou from outside Zhejiang Province in the last 48 hours? (Single choice)
    □No □Yes
11. In the past 14 days: Have you had close contact with personnel from Wuhan and surrounding areas or foreign countries and regions with severe epidemics? Do you have travel or residence history in other communities with reported cases? Have you had contact with patients with fever or respiratory symptoms from the above areas? Do you have a history of contact with people infected with the new coronavirus? (Single choice)
    □No □Yes
12. Has anyone in your family returned to Hangzhou from abroad in the last 14 days? If yes, does the family currently have fever, respiratory or other symptoms? (If any, please select [Other] and describe in detail)
    □No □Other:_____
13. Is there any family under home quarantine? (Single choice)
    □No
    □Yes, the family members have been effectively isolated, and other family members have not gone out to work
    □Yes, the family members have been effectively separated, and other family members have gone out to work
    □Other
14. Is there any person with fever in your family or colleagues? (If any, please select [Other] and describe in detail)
    □No □Other:_____

Personal signature_____

_____YYMMDD

Appendix 7. Outpatient/Emergency Patient Screening Form (2020.3.9 version)

Outpatient/Emergency Patient Screening Form (2020.3.9 version)

Dear patients:

In order to prevent Coronavirus Disease 2019 (COVID-19) from spreading, please provide below information truthfully. Any misinformation may lead to legal consequences.

1. Patient Personal Information

Name: _____ Medical Record No.: _____

Passport No.: _____

Current Add: _____ Province _____ City _____ District _____ Neighborhood _____ Community _____

Patient's Cell Number: _____

Emergency Contact: _____

2. Travel History and Condition of the Patient

(Please provide below information truthfully. Patient's treatment plan may rely on this information. Please tick in the box before the answer that suits patient condition. Thank you for your cooperation.)

1) Have you traveled to or resided in Wuhan or neighboring cities, or domestic neighborhood that has reported confirmed cases before, or epidemic countries or regions outside China, in the past 14 days?	□Yes □否 No
2) Have you used any public transportation (flight, train, coach bus, ship etc.) departing from or passing by key epidemic areas in the past 14 days?	□Yes □No
3) Have you had contact with confirmed COVID-19 patients in the past 14 days?	□Yes □No
4) Have you had contact with people with fever and/or respiratory symptoms coming from Wuhan or neighboring cities, or domestic neighborhood that has reported confirmed cases before, or epidemic countries or regions outside China, in the past 14 days?	□Yes □No
5) Are there 2 or more people having fever and/or showing respiratory symptoms around you (in your family, office, school class, factory workshop, etc.) in the past 14 days?	□Yes □No
6) Have you had fever in the past 14 days?	□Yes □No
● If you had fever, your body temperature was _____℃. (If you didn't take your temperature, please write "unknown".)	
● If you had fever, have you taken any medication to manage the fever?	□Yes □No
7) Have you had any below symptoms in the past 14 days? Please tick in the box.	□Yes □No

□ Cough	□ Sore throat	□ Running nose	□ Nasal congestion
□ Chest tightness	□ Chest pain	□ Gasping after exertion	□ Shortness of breath
□ Fatigue	□ Muscle soreness and/or aches	□ Headache	□ Diarrhea

3. Information of Accompanying Person

(Please provide below information truthfully. Please tick in the box.)

□Name: _____ Chinese Citizen ID No./Passport No.: _____

(If the patient is accompanied to the hospital, please fill and tick)

□Accompanying person is negative in all above screening questions.

□Accompanying person is positive in question_____.

□ No accompanying person

Notice: For your own health, if your condition fits the consultation criteria of fever clinic, please wear a face mask and follow the guidance to the fever clinic.

Patient/Patient Family Signature: _____

Time: ____(YY)____(M)____(D)____(Hr)____(Min)

Triage Signature: _____

Time: ____(YY)____(M)____(D)____(Hr)____(Min)

Doctor Signature: _____

Time: ____(YY)____(M)____(D)____(Hr)____(Min)

1. Patients must keep good care of the form and hand it to their consultation doctor. If multiple consultations are needed, a photo of the form can be presented to the next triage nurse and consultation doctor after initial consultation. Patients will be asked to refill the form if he/she fails to present the form or photo.
2. Consultation doctors must check the form. If any mistake is identified, please ask the patient to refill the form. Signatures from the patient and doctor is a must. The form will be archived.

Appendix 8. SAHZU Inpatient Escort Daily Checklist (20200302 version)

SAHZU Inpatient Escort Daily Checklist (20200302 version)

In order to actively prevent and control COVID-19 and cross-infection and effectively safeguard public health and safety, the head nurse and charge nurse shall manage the escort who should be cooperative. One form for each escort and checked daily. Fill in the following truthfully, thank you!

Name of escort: **Patient name:** **Patient medical record number:**

No.	Date	Time	Escort ID is consistent with the escort pass	Escort body temperature	Escort Are there any respiratory or other symptoms	Escort signature	Charge nurse signature / employee number	Notes
1			☐Yes ☐No		☐No ☐Cough ☐Sore throat ☐Runny nose ☐Nasal congestion ☐Chest tightness ☐Chest pain ☐Fatigue ☐Asthma after exercise ☐Dyspnea ☐Muscle soreness ☐Headache ☐Diarrhea			
2			☐Yes ☐No		☐No ☐Cough ☐Sore throat ☐Runny nose ☐Nasal congestion ☐Chest tightness ☐Chest pain ☐Fatigue ☐Asthma after exercise ☐Dyspnea ☐Muscle soreness ☐Headache ☐Diarrhea			
3			☐Yes ☐No		☐No ☐Cough ☐Sore throat ☐Runny nose ☐Nasal congestion ☐Chest tightness ☐Chest pain ☐Fatigue ☐Asthma after exercise ☐Dyspnea ☐Muscle soreness ☐Headache ☐Diarrhea			
4			☐Yes ☐No		☐No ☐Cough ☐Sore throat ☐Runny nose ☐Nasal congestion ☐Chest tightness ☐Chest pain ☐Fatigue ☐Asthma after exercise ☐Dyspnea ☐Muscle soreness ☐Headache ☐Diarrhea			

Notes: the department is responsible for implementing, registering and uniformly managing this form.

Appendix 9. Follow-up checklist

Date of hospital visit	Campus of hospital visit	Time	Name	Medical record number	Age	Gender	Residential address	Contact number	Epidemiology history	Body temperature (Tmax)	Clinical symptoms	Signs	Examination & test results
*	*	*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*	*	*

Treatment	nCOV results	Whereabouts	Whereabouts update	Followed by	Follow-up date	Name	Medical record number	Body temperature taken 4 times a day (record specific temperature)									
	*	*		*													
	*	*		*													

Symptoms (filling yes for those with symptoms, none for asymptomatic)										Home quarantine precaution education explained term by term and ask whether they implement strictly						

Appendix 10. Special Inspection Form for Disinfection and Isolation during COVID-19 pandemic (Key Unit)

Special Inspection Form for Disinfection and Isolation during COVID-19 pandemic (Key Unit)

Evaluation time: YYYYMMDDHH Evaluated by:

Explanation:
1. Scoring criteria: Fully met is indicated by " √ ", if there is an issue, please write in the "Remarks" column
If not applicable, use "/"
2. Personnel category: doctor, nurse, medical technician, trainee, worker, others (such as security guard, property, etc.)

Department	
Personnel category	
Name	
Employee number	

Number		Content	Inspection results	Remarks
1	Staff protection	All new members have undergone orientation training, are familiar with protection process, and conduct personal occupational protection according to the epidemic situation		
2		Medical treatment process for staff with fever in line with the diagnostic and treatment process of fever clinic		
3		Employees wear masks properly in the hospital		
4		Implement hand hygiene properly (palm, back, cross, bow, thumb, fingertip, wrist)		
5		Do not enter the cafeteria wearing lab coat (work clothes)		
6	Surroundings Layout	Triage proper, operation procedure meeting infection control requirements		
7		Reasonable layout, clear signage, reasonable placement and use of hand disinfection liquid		
8	Disinfection Isolation	Environment clean, furniture, items, floor and toilets are disinfected according to specifications		
9		Cleaners prepare disinfection liquid properly, the working process meets the infection control requirements, and the environment cleaning and disinfecting is supervised.		
10		Check the CT examination process of fever patients: the prescribing doctor contacts radiology department, and the nursing worker of the radiology department takes the patient to the specific CT machine room		
11		Keep good ventilation and air disinfection, and register. Use the air disinfecting machine as required, and keep it 24-hour continuous operation when being used		
12	Medical Waste and Reusable Supplies Disposal	Strictly follow relevant regulations on isolation and protection		
13		Reusable items used by infection patients under isolation should be wrapped in double orange-red bags and sticked with "Infection Item Handover Label" (special infection) indicating "SARS-CoV2 Infection" for transport, and contact disinfection supply center in advance		
14		Medical waste disposed correctly, and "Novel Coronavirus" medical waste disposal is implemented in accordance with national regulations. (Medical waste and sharps boxes should be wrapped in double-layered yellow garbage bags with layered goose neck tie and sticked with "Medical Waste Outer Packing Warning Label" and marked with		
15	Health Education	Patients/families in the hospital wear masks		
16		Health education materials for infectious diseases prevention and control are available		
17		Cover mouth and nose with tissues, handkerchiefs, sleeves or elbows when coughing or sneezing, and do good hand hygiene in time		
18		Check the completeness of patient screening information form (spot check at least 3 patients)		

Remarks: 1. This form is used for key department inspection: emergency department/respiratory clinic/fever clinic/isolation observation ward/cafeteria/Designated CT room for fever patients

Special Inspection Form for Disinfection and Isolation during "COVID-19 Pandemic (General Unit)

Special Inspection Form for Disinfection and Isolation during "COVID-19 Pandemic (General Unit)

Evaluation time: YYYYMMDDHH Evaluated by:

Explanation:
1. Scoring criteria: Fully met is indicated by "√", if there is an issue, please write in the "Remarks" column
If not applicable, use "/"
2. Personnel category: doctor, nurse, medical technician, trainee, worker, others (such as security guard, property staff, etc.)

Department	
Personnel category	
Name	
Employee number	

Number	Content	Inspection results	Remarks
1	Employees wear masks properly in the hospital		
2	Implement hand hygiene properly (palm, back, cross, bow, thumb, fingertip, wrist)		
3	Reusable items, instruments and equipment are disinfected after each use for each person		
4	Cover mouth and nose with tissues, handkerchiefs, sleeves or elbows when coughing or sneezing, and be compliant with hand hygiene		
5	Doctors master diagnostic criteria and screening key points for suspected cases (spot check 3 doctors)		
6	Medical staff knows the key inquiry points of patient epidemiology history: whether there is travel or residence history in the epidemic area in the past 14 days; those who have contacted fever patients with respiratory symptoms from epidemic area or communities with reported cases in the		
7	Strict door control management in the ward (especially when there is no designated person to manage entrances or exits)		
8	Ward escort management regulations: for each patient, one escort at most. Check the name and ID number on the escort pass are the same as the person (spot check 2-5 escort pass in each ward)		
9	Patient/Accompanying person Screening Information Form is completed (spot check 2 patients/2 escort in each ward)		
10	In and out registration is available at each building or ward entrance, and strictly managed by a designated person		
11	Surroundings are clean, medical wastes are disposed properly		
12	Check the CT examination process of fever patients: the prescribing doctor contacts radiology department, and the nursing worker of the radiology department takes the patient to the specific CT machine room		
13	Reconfirm patient screening information before surgery/procedure, and check screening form		

Remarks: daily inspection covers at least 4-5 general units

Appendix 11. Donation List

Item	Description	Medical specifications (conforming or higher)	Manufacturer / Model
1. N95 respirator	N95 respirator (requiring high-pressure liquid splash proof, CDC catalog, requiring anti-bacterial and anti-virus) must not contain exhalation valve	Chinese standard GB 19083-2010 United States NIOSH certification, N95/N99+Fluidresistant (US CDC, refer tohttps://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/respsource3surgicaln95.html) EU: FFP2/FFP3+TypeIIR (fluidresistant) Japan: JIST8151 JIST 8062 Protective clothing for infectious substances - masks - test method for permeation resistance of synthetic blood	3M: 1860, 1860S, 1870+, 9132
2. coverall	Coverall (with color adhesive tape, meeting Type 4, 5, 6 levels)	Chinese standard GB19082-2003 or GB19082-2009 United States ASTMF1671-97A EU EN14126+Type4 EN 14605 and above Japan JIS T 8122; JIS T 8115 JIS T 8060; JIS T 8061 JIS T 8033	3M: 4565, 4570 Dupont: 1422A, or Tyvek800J/600/500expert Tychem 2000 Fukelei: Medical disposable protective clothing AMN 428ETS UVEX 4B
3. Disposable surgical gown Or isolation gown	Waterproof material		It is recommended that products with relevant medical device registration certificates be given priority
4. Medical surgical mask	Disposable medical surgical masks (requiring separate packaging) Particle passing rate> 95% Fluidresistant> 120mmhg	GB YY-0469-2011 US ASTMF2100-II (level 2&3) EU EN14683 + typeII	It is recommended that products with medical device registration certificates be given priority
5. Protective face shield, protective shoe cover	Cover the entire facial area; protective shoe cover is waterproof and able to cover till the knee	No relevant standards	
6. Medical protective Goggles	Medical protective Goggles (fully covering, anti-fog)	Chinese standard GB/T 14866 or level two and above level medical goggles: compatible with myopic glasses, with wide vision field, must be splash-proof, sealed around, anti-fog	3M: 1621AF (anti-fog)
* According to the requirements of the Chinese Medical Products Administration, for imported products without medical device registration certificates, the marketing certificate and inspection report for products from overseas companies shall be provided, and product quality safety commitment made. The product is only used as an emergency for this epidemic.			

Appendix 12. ICU Infection Control Checklist, Oncology Center, Union Hospital, Wuhan (by SAHZU Medical Team)

ICU Infection Control Checklist

Oncology Center, Union Hospital, Wuhan

(by SAHZU Medical Team)

Inspector: Date:

No.	Criteria	Score	Findings	Improvement suggestions
1	Wear and remove PPEs correctly.			
2	PPE use is supervised. Peer observation is performed.			
3	Shift handover is performed as required in designated areas.			
4	Environment is clean, and objects are stored in designated areas.			
5	Patient rooms are kept closed and ventilated through windows. Air circulating fans are on.			
6	Air disinfection machines are used appropriately.			
7	Equipment and machines are put in fixed areas and kept clean.			
8	Hand hygiene facilities are accessible. Hand hygiene is correctly performed.			
9	Disinfectant solution is adequate, and is mixed and used correctly.			
10	The cleaning and disinfection of the environment is performed as per the protocol. Both routine and terminal disinfections are well performed when needed.			
11	Standard precaution and proper personal protection measures are adopted during clinical activities. No practice with infection risk is observed.			
12	VAP prevention measures are implemented.			
13	CLABSI prevention measures are implemented.			
14	CAUTI prevention measures are implemented.			
15	Sharps injury prevention measures are implemented. Occupational exposure is checked.			
16	Housekeepers can correctly prepare the disinfection solution and perform environment cleaning and disinfection.			
17	Vomitus is handled appropriately.			
18	Bed units are kept clean. Linen is handled appropriately.			
19	Bed units are disinfected.			
20	Medical waste is handled correctly.			
	Total			

5 for each item. Partially met is 3. Not met is 0.

References:

1. Notice on the Release of Technical Guidance on Internal Prevention and Control of COVID-19 of Healthcare Organizations (1st Edition) by General Office of National Health Commission

2. Notice on the Release of Guidance for Prevention and Control of COVID-19 (3rd Edition) by General Office of National Health Commission

3. Prevention and Control Guide for COVID-19 (Interim 5th Edition)

4. Clinical Guidance for COVID-19 (6th Edition)

5. Clinical Guidance for COVID-19 (Interim 7th Edition)

6. Protocol of Isolation Techniques in Hospitals, WS/T311-2009

7. Protocol of Prevention and Control of Air-borne Transmissible Diseases for Hospitals, WS/T511-2016

8. Notice on Medical Waste Management in Healthcare Organizations during COVID-19 Outbreak by General Office of National Health Commission

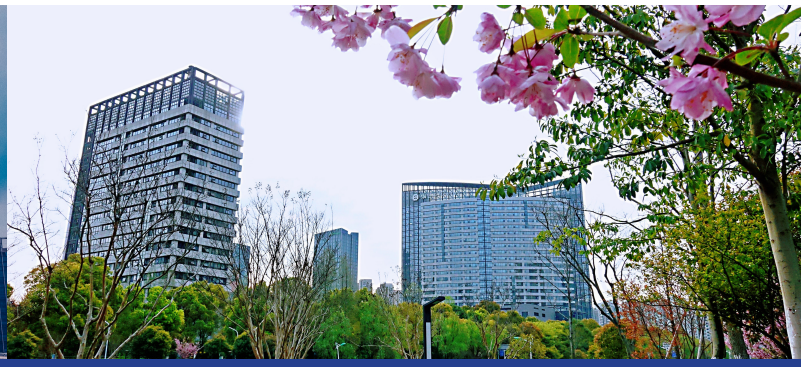
9. Notice on Guidance for PPEs in Healthcare Settings during Prevention and Control of COVID-19 in Healthcare Organizations (Interim) by General Office of National Health Commission

10. Notice on the Release of Technical Guidance for the Prevention and Control of COVID-19 by Healthcare Professionals (Interim) by General Office of National Health Commission

11. Prevention and Control Guidance for Home Quarantine and Medical Observation of COVID-19 (Interim)

12. Notice on Protocol of Nursing Techniques for Severe and Critical COVID-19 Patients

13. ICD Coding Guideline for COVID-19 Cases



About SAHZU

The Second Affiliated Hospital Zhejiang University School of Medicine (SAHZU) is located in Hangzhou, China, where the 2016 G20 Summit was held. Originally founded in 1869 by the British Church Missionary Society, SAHZU is often considered as the cradle of western medicine in the province. SAHZU was recognized by the Ministry of Health as the first tertiary care hospital in China, and became the first Joint Commission International–accredited Academic Medical Center in the world. It homes National Medical Centers of Excellence recognized by National Health Commission. It is ranked by the Nature Index among top 100 hospitals in the world.

The hospital has two campuses with a total of 3,200 beds and about 6000 employees, including 3,000 physicians and researchers in 50 clinical departments, many of which are national clinical departments or disciplines approved by National Health Commission. SAHZU has become the role model for Chinese hospitals in the field of transcatheter valve intervention ("Hangzhou Solution"), the micro-incision cataract surgery, the diagnosis and treatment of colorectal cancer, and the management of severe burns. With almost 6 million outpatients, 190,000 inpatients, and 150,000 surgeries, SAHZU is one of the most efficient general public hospitals in China. While being famous for its superb rescue and treatment skills in major diseases and its quality outcome, the hospital is also a pioneer in telemedicine in China. During 2016 Hangzhou G20 Summit, SAHZU was the only designated health care service provider for presidential delegation of the United States and many other countries. And it attracts numerous foreign physicians with its ACGME (the Accreditation Council for Graduate Medical Education in the United States)–recognized international joint physician training programs and FRCP (the Federation of Royal College of Physician in the United Kingdom)–accredited education.

Over the past 150 years, SAHZU has become China's biggest medical research pipeline, with several disease-specific research institutes, that has the research capacity from benchside to bedside. Via Guangji Innovation Club, it is establishing efficient collaborations among hospitals, academic institutions, government, industry, and venture capitals.

In its pursuit of safeguarding people's health, SAHZU always put the needs of patients and customers first while remaining truthful to its founding mission of saving lives and spreading benevolence. It is vigorously exploring and innovating, striving to be the destination hospital for more patients.

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Special thanks to ZHU Junjun, LAI Xinping, and SHI Jian for their beautiful photos.

The needs of patients and customers come first.

The photograph was taken in the Second Affiliated Hospital Zhejiang University School of Medicine located in Hangzhou, China in early 20th century. The scene captures Dr. David Duncan Main, a British physician and the first Hospital president, greeted a pediatric patient with reciprocal humility and respect. It symbolizes the hospital's core value today: "The Needs of Patients and Customers Come First."

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