Protocol on Prevention and Control of Novel Coronavirus Pneumonia

(Edition 6)

(March 7, 2020, National Health Commission)

In order to prevent and control novel coronavirus pneumonia (COVID-19), ensure "early detection, early reporting, early isolation and early treatment", prevent the spread of the outbreak, reduce infection rate, improve treatment rate and cure rate, reduce case fatality rate, protect people's safety and health and maintain social stability, the 5th Edition of *the Novel Coronavirus Pneumonia Prevention and Control Protocol* is now revised to this 6th Edition according to the policy that novel coronavirus pneumonia is classified as a category B infectious disease but regulated as a category-A infectious disease and based on the epidemic evolution across the country and research advances, in order to implement evidence-based, tailored and specific approaches for different regions and stages in the prevention and control of the diseases.

I. Purposes

To guide local efforts in timely detecting and reporting novel coronavirus pneumonia cases and clusters, conducting epidemiological investigations and outbreak responses, and standardizing close contact management in the prevention and control of the disease.

II. Etiology and epidemiological characteristics

Novel coronavirus belongs to β-type coronavirus and its genetic characteristics are significantly different from SARSr-CoV and MERSr-CoV. The virus is sensitive to ultraviolet rays and heat. It can be killed by heating for a time period of 30 minutes at 56°C and lipid solvents such as ether, 75% ethanol, chlorine-containing disinfectant, peracetic acid and chloroform can also effectively inactivate the virus. Based on current epidemiological survey and research results, the incubation period is 1-14 days, mostly 3-7 days. The source of infection is mainly patients infected by novel coronavirus and asymptomatic infected persons may also become source of infection. Main transmission routes are droplet transmission and contact transmission. In a relatively closed setting exposed to high concentrations of aerosols for a long time, there exists the possibility of aerosol transmission, and other transmission routes still needs further investigation. All population is susceptible.

III. Surveillance case definitions

1. Suspect cases

Considering both the following epidemiological history and clinical manifestations:

(1) Epidemiological history

1) History of travel to or residence in Wuhan and its surrounding areas, or other communities in China where cases have been reported, or other countries/areas with severe outbreaks, within 14 days prior to the onset of the disease;

2) In contact with novel coronavirus infected people (with positive results for the nucleic acid test) within 14 days prior to the onset of the disease;

3) In contact with patients who have fever or respiratory symptoms from Wuhan and its surrounding area, or from communities where confirmed cases have been reported, or from other countries/areas with severe outbreaks, within 14 days before the onset of the disease; or

4) Clustered cases (2 or more cases with fever and/or respiratory symptoms in a small area such families, offices, schools, workshops etc within 14 days).

(2) Clinical manifestations

1) Fever and/or respiratory symptoms;

2) The aforementioned imaging characteristics of NCP;

3) Normal or decreased WBC count, normal or decreased lymphocyte count in the early stage of onset.

A suspect case has any of the epidemiological history plus any two clinical manifestations or all three clinical manifestations if there is no clear epidemiological history.

2. Confirmed cases

Suspect cases with one of the following etiological or serological evidences:

(1) Real-time fluorescent RT-PCR indicates positive for new coronavirus nucleic acid;

(2) Viral gene sequence is highly homologous to known new coronaviruses.

(3) NCP virus specific Ig M and IgG are detectable in serum; NCP virus specific IgG is detectable or reaches a titration of at least 4-fold increase during convalescence compared with the acute phase.

3. Asymptomatic infected persons

Asymptomatic people with COVID-19 virus detected in respiratory specimens or IgM detected in serum.

They are mainly found through close contact tracing, investigation of clusters and infection source tracing.

4. Cluster of cases

Clusters of cases refer to 2 or more confirmed cases or asymptomatic infected persons in a small area such families, offices, schools, workshops etc within 14 days, with the possibility of human-to-human transmission or common exposures.

5. Close contacts

People who had unprotected close contact with a confirmed or suspect case within two days before illness onset, or with an asymptomatic infected person within two days before sampling.

IV. Prevention and control measures

1. Precise prevention and control tailored to specific areas and levels.

In accordance with *the law of the People's Republic of China on the Prevention and Treatment of Infectious Diseases* and *the Regulations on Emergency Response to Public Health Emergencies*, precise tailored prevention and control measures are to be implemented for different regions and at different levels. Every county/district (as a unit), based on its demographic and epidemiological situation, shall assess its epidemic risk level, and determine its adapted prevention and control strategies.

1) **In low risk areas**, the strategy is to "strictly prevent importation". It includes strengthen the tracking and management of incoming people from areas with severe outbreaks and high-risk areas and enhance health monitoring and services. Fever clinics should strengthen the monitoring, detection and reporting of outpatients with fever, and the CDCs should carry out timely epidemiological investigations and management of close contacts. The government should urge and provide guidance to the urban and rural communities, government agencies, enterprises and public institutions to strictly implement community prevention and control measures, improve environmental hygiene, and popularize knowledge and skills of disease prevention to the general public.
2) **In middle risk areas,** the strategy is "to prevent importation and stop transmission internally". It includes various measures taken for low-risk areas, and also the preparations for medical treatment, personnel, materials and venues required for disease prevention and control efforts, and isolated medical observation and management of close contacts. School class, building unit,

factory workshop and workplace office will serve as the smallest unit, the resources such as location and personnel for prevention and control and tailored measures can be determined and implemented based on the case discovery clue, epidemiological investigation and epidemic analysis. The townships, streets and urban and rural communities without confirmed cases can implement prevention and control measures with reference to low-risk areas.

3) **In high risk areas,** the strategy is "to stop transmission internally, prevent exportation and implement strict prevention and control measure". In addition to measures for the middle risk area, stopping aggregation activities and implement regional traffic control with the approval in accordance with the law and procedures. Every county should conduct a comprehensive screening of patients with fever, timely admission and management of suspect cases, confirmed cases and asymptomatic infected patients, close contacts are isolated and put under medical observation. Disinfection shall be conducted in sites with community transmission or clustered outbreaks in urban residential areas or rural natural villages, and control measures shall be taken to restrict the gathering, entry and exit of people from the above sites.

   Carry out the dynamic research and analysis, adjust risk level in a timely manner, reduce emergency response level or terminate emergency response after the case number keeps declining steadily and the risk of epidemic spread is effectively controlled.

2. Early detection.

1) Health care facilities at various levels should raise awareness of diagnosing and reporting COVID-19 cases. For cases with respiratory symptoms such as fever and dry cough and digestive tract symptoms such as diarrhea caused by unknown reasons, their epidemiological history should be considered, and expert joint consultations organized while specimens collected for pathogenic testing.

2) Primary level organizations should put more efforts on screening people who travelled to or resided in Wuhan and its surrounding areas within recent 14 days, people who travelled to or resided in communities where confirmed cases have been reported and people who have respiratory symptoms, fever, chills, fatigue, diarrhea, conjunctival congestion and so forth. These people are key risk groups for screening. Their sampling and testing should be performed by professional institutions.

3) Make use of the existing surveillance networks of pneumonia of unknown causes, ILI cases and

hospitalized SARI cases to strengthen etiological surveillance.

4) Port health quarantine should be strengthened by strictly implementing temperature monitoring and medical inspection at the port. For people with respiratory symptoms such as fever and dry cough and digestive tract symptoms such as diarrhea, epidemiological investigation and medical screening should be conducted, and specimens collected according to the requirements.

5) Close contacts should be monitored of their health status. Patients with respiratory symptoms such as fever and dry cough and digestive tract symptoms such as diarrhea should be timely transferred to the designated healthcare facilities with their specimens collected.

3. Early reporting.

1) Case reporting. When suspect cases, confirmed cases and asymptomatic infected persons are detected, healthcare facilities at all levels and of all types should report the cases immediately via online direct reporting system. CDCs, upon receiving the report, should conduct investigation immediately, verify the report and complete the three-level confirmation and review within 2 hours in the online direct reporting system. Healthcare facilities without online direct reporting capacity should make a prompt report to the local county/district CDC and send out the notifiable disease reporting cards within 2 hours. The local county/district CDC should make online direct report upon receiving the notification and ensure the correction of subsequent information.

2) Revising report. Once suspect cases are confirmed or ruled out, the information should be corrected timely. If the asymptomatic infected persons have developed clinical manifestations, they should be corrected timely as “confirmed cases”. “Clinical severity” of all cases should be timely amended according to the progression of illness condition, with the most severe condition of the case as its final severity status. For dead cases, date of death should be entered within 24 hours.

   When reporting asymptomatic infection cases, the “date of onset” should be “collection date of positive specimen” and “date of diagnosis” should be the “positivity detection date”. If the “asymptomatic infected persons” have been amended to “confirmed cases”, the “date of onset” should be the date when clinical symptoms appear.

3) Reporting of emergencies. According to the requirements of *the National Public Health Emergency Response Contingency Plan* and *the National Public Health Emergency Related Information Reporting and Management Rules (Trial)*, the index novel coronavirus pneumonia

confirmed case or cluster in the county/district should be reported within two hours by the local CDC in the jurisdiction through online direct reporting system for public health emergencies. The emergency level can be categorized as "unclassified" for the time being and should be adjusted and reported timely based on the investigation findings and assessment.

4. **Early isolation.**

   1) **Case management.** Suspect cases and confirmed cases should be isolated and treated in single rooms in the designated healthcare facilities. Suspect cases should be isolated and treated in single rooms and can be ruled out as a suspect case if tested negative twice consecutively on the virus nuclear acid test (with at least 24-hour interval between two samplings) and specific IgM and IgG tested negative 7 days after onset.
   2) **Management after discharge.** After the case meets discharge criteria and is discharged, it is recommended the patients continue to be monitored of their health status in isolation for 14 days. When possible, the provinces are encouraged to strengthen the follow up of discharged cases and testing of their respiratory specimens; those tested positive should be put centralized isolation for medical observation with the information submitted to China CDC.
   3) **Management of asymptomatic infected persons.** Asymptomatic infected persons should be put under centralized isolation for 14 days. In principle, those tested twice consecutively on virus nuclear acid (with at least 24-hour interval between two samplings) can be removed from isolation.

5. **Early treatment.**

   Healthcare facilities of all levels and of all types should transfer the detected suspect cases to the designated hospitals in a timely manner. The designated hospitals should be well prepared for case treatment in terms of personnel, medicines, facilities, equipment and personal protective equipment and provide treatment according to the most update COVID-19 diagnosis and treatment protocol. Efforts should be made to ensure that "all in need are tested, admitted, treated and isolated" so as to improve admission rate and cure rate, reduce infection rate and case fatality rate.

6. **Epidemiological investigation.**

1) Case investigation. The county/district CDC, upon receiving the report, should complete the epidemiological investigation of cases and asymptomatic infected persons within 24 hours. The investigation should be conducted following the requirements set out in the COVID-19 epidemiological investigation protocol issued by China CDC. Close contact tracing and registration should also be conducted following the requirements set out in the COVID-19 close contact investigation and management protocol issued by China CDC. For suspect cases, basic information of the case and close contacts should be registered.

2) Cluster investigation. The county/district CDC should conduct immediate investigation of clusters meeting the definition based on the online reported information and case investigation findings following the requirements set out in the COVID-19 epidemiological investigation protocol issued by China CDC.

3) Information reporting. The county/district CDC, upon completion of the case investigation of confirmed cases or asymptomatic infected persons, or investigation of clusters, should submit the case investigation form and investigation report timely via the online reporting system.

7. Close contact tracing and management.

Close contact tracing and management are organized and implemented by the county/district health authority along with relevant departments. Close contacts are put under centralized isolation and medical observation; if not feasible, home isolation and medical observation can be implemented. The close contacts should be monitored of their temperature at least twice a day and asked whether they have respiratory symptoms such as fever and dry cough or digestive tract symptoms such as diarrhea. The medical observation period for close contacts is 14 days after the last unprotected contact with a case or an asymptomatic infected person. If a suspect case is ruled out as a suspect, his or her close contacts can be removed from medical observation following the requirements set out in the COVID-19 close contact investigation and management protocol issued by China CDC.

8. Specimen collection and lab testing.

Healthcare facilities receiving the cases should collect relevant clinical specimens timely. The laboratories undertaking the testing of the specimens (eligible healthcare facilities, CDCs or third-party labs) should feedback the test result within 12 hours. Specimen collection, transportation, storage and

testing should be practised strictly in accordance with the requirements set out in the lab testing protocol issued by China CDD.

All the original specimens of clusters of five or more novel coronavirus pneumonia cases in each region should be sent to the Chinese Center for Disease Control and Prevention for verification and confirmation.

9. Strengthen prevention and control measures targeting at key settings, institutions and populations.

Strengthen the multi-sectoral joint prevention and control mechanism to minimize public gathering activities, and implement measures such as ventilation, disinfection and temperature taking in places with large population flow such as train stations, airports, ports, shopping malls, public toilets and closed vehicles such as cars, trains, and airplanes.

The health authorities should guide the enterprises to organize their employees to return to work in phases and batches, strictly conduct the ventilation, disinfection, temperature detection and other prevention and control work, provide the employees with necessary personal protective equipment, and adopt the approaches of partition operation and scattered dining, to effectively reduce the concentration of people; also provide health education among migrant workers from rural areas and strengthen temperature screening before their returning to work. Once abnormal situation is detected, timely reporting, screening and identification and response measures should follow to stop the risk people from going out.

After the school and kindergarten institutions re-open, the health authorities shall provide the health tips to and guide the health management of returning teachers and students and supervise the implementation of prevention and control measures such as morning /afternoon check, tracing and registration of illness absence/attendance. When a epidemic report is received, epidemiological investigation, response measures, guidance to the disinfection work in affected region should be carried out quickly.

For special institutions such as nursing homes, welfare institutions for the disabled, detention places, the government should further standardize the management of personnel entry and exit, strict ventilation, daily cleaning, disinfection and other health measures, and strengthen personal protection measures,

health monitoring, and the daily management of incapacitated and semi-incapacitated people.

Implement health inspection and quarantine at ports for people entering China. Enhance health management of people coming to China from countries and areas with serious epidemic situations; conduct screening, investigation, diagnosis, treatment and medical observation of suspect cases, confirmed cases and close contacts to strictly prevent the cross-border spread of the epidemic.

10. Nosocomial infection control, disinfection of specific settings and personal protection.

Healthcare facilities should follow the requirements set out in the technical protocol for novel coronavirus infection control and prevention in healthcare facilities to strictly implement nosocomial infection control and prevention measures. At the same time, strictly follow the requirements in the *Technical Guidelines for Disinfection in Healthcare Facilities* and *Hospital Air Purification Management Guidelines* to clean and disinfect medical equipment, contaminated articles, surfaces and floors, as well follow the *Medical Waste Disposal Regulations* and the *Measures for Medical Waste Management in Healthcare Facilities* for the disposal and management of medical wastes.

Implement effective disinfection of specific places used by COVID-19 cases and asymptomatic infected persons such as their households, isolation wards in healthcare facilities, transportation vehicles and medical observation sites. Ensure effective protection of professionals who carry out epidemiological investigations, work in isolation wards and medical observation sites, are involve in transporting of cases, infected persons and dead bodies, as well as environmental cleaning and disinfection, specimen collection and laboratory work. For requirements, see “Guidelines for site-specific disinfection” and “Guidelines for personal protection of specific groups” issued by China CDC.

11. Public education and risk communication.

Disseminate knowledge on COVID-19 prevention and control. Health education and risk communication shall be enhanced for key populations. Guide the public on personal protection through a variety of ways to reduce possible contact or exposure. With the progress in epidemic prevention and control efforts and better understanding of COVID-19, health education strategies should be adjusted timely and corresponding scientific public education should also be timely organized. Actively carry out public opinion monitoring; promptly respond to concerns and questions of the public and conduct risk communicating in relation to epidemic prevention and control.

V. Supportive measures

1. Strengthening organization and leadership. Local governments should strengthen their leadership in the responses to the outbreak, ensure the availability of funding and materials, and implement prevention and control measures following the principles of “prevention first, integration of prevention and treatment, scientific guidance, and timely treatment”.

2. Enhancing joint prevention and control efforts. Strengthen cross-sectoral information sharing and regularly discuss and assess the epidemic trend. The health authorities at all levels are responsible for the overall guidance of epidemic control work. CDCs at all levels are responsible for case surveillance, epidemiological investigations, close contact management and lab testing. Healthcare facilities at all levels are responsible for case finding and reporting, isolation, diagnosis, treatment and clinical management, specimen collection and nosocomial infection control and prevention.

3. Strengthening capacity building. Provide technical training to health professionals in medical and health facilities on novel coronavirus pneumonia with focus on proactive prevention first. Strengthen scientific researches and give full play to the role of information technology in the prevention and control of infectious diseases. Conduct extensive investigations on the COVID-19 transmission dynamics, clinical features, and strategy assessment to provide scientific evidences for the optimization of prevention and control strategies. The use of traditional Chinese medicine in the prevention and treatment of infectious diseases is encouraged and supported.

Annex 1

Guidelines for COVID-19 Epidemiological Investigation

These Guidelines are developed to provide guidance on standardized epidemiological investigation of COVID-19 by CDCs at various localities and gather epidemiological information such as the onset, exposure history and contact history of COVID-19COVID-19 cases, analyze transmission characteristics and transmission chains of clustered cases, trace close contacts and prevent the spread and COVID-19 transmission.

I. Purpose of investigation

1. To investigate the source of infection and trace and determine close contacts;

2. To investigate the onset and treatment of patients, clinical characteristics, and risk factors;

3. To investigate and analyze transmission characteristics and transmission chains of clustered cases.

II. Targets of investigation

COVID-19 suspect cases, confirmed cases, asymptomatic infected persons and clustered cases.

III. Investigation contents and methods

1. Case investigation

County/district level CDCs, upon receiving report of COVID-19 cases, should complete the initial epidemiological investigation within 24 hours. The investigation can be carried out by reviewing documents, inquiring the patient, informants and the attending doctors. When the 14-day isolation and health condition monitoring of discharged patients have been completed, CDCs should complete, collect and report information on patient specimen collection and testing as best as they can.

Case investigation should be focused on basic information, onset and care seeking information, risk factors and exposure history, and laboratory findings of suspect cases, confirmed cases and asymptomatic infected persons, which should be filed in the Case Investigation Questionnaire (see Appendix 1) where only basic information such as name, gender, and ID number should be filed in for suspect cases. At the same time, for people determined to be closed contacts of patients after tracing and investigation, information should be filed in the Medical Observation and Health Condition Monitoring Form of COVID-19 Cases in the *Guidelines for COVID-19 Close Contact Management.*

2. Cluster investigation

Based on online direct report information and case investigation findings, the county/district CDC

shall conduct investigation immediately of clustered cases that meet the definition. Investigations should include information such as source of infection of cases and close contacts, and focus on epidemiological links among cases. Chain of transmission and transmission routes should be analyzed. For the investigation and analysis method, please refer to Appendix 2.

IV. Organization and implementation

In accordance with the principle of "localized management", the county/district health authority of the area where the case seeks medical care shall organize the CDC to carry out the epidemiological investigation of the case. The investigation unit shall promptly set up a field investigation team, specify the purpose of investigation, develop the investigation plan, and determine team members and their respective duties and tasks. During the investigation, investigators should take proper personal protection. The prefecture, provincial and national CDCs can go to the field whenever necessary to participate in the field epidemiological investigation.

V. Reporting and analysis of information

Once the investigation of confirmed cases, asymptomatic infected people and case clusters is completed, the county/district CDC should submit the case investigation form or investigation report through the online reporting system. The local authorities should review the quality of epidemiological investigation information, and complete and correct relevant information in a timely manner as investigations progress.

For cluster investigation findings, basic information and initial, progress and final reports should be submitted, and key information of clustered cases (see Appendix 2) should be included in the final report according to *National Protocol for Reporting and Management of Public Health Emergency Related Information (Trial).*

Appendix: 1. Investigation Questionnaire for COVID-19 Cases

2. Investigation and Analysis Method of COVID-19 Clusters

Appendix 1

Investigation Questionnaire for COVID-19 Cases

Questionnaire number: _____ ID number:_____

I. Basic information

1. Name:_

2. Sex: □Male □ Female

3. Importation from overseas: □Yes □ No (add to Infectious Disease Report Card)

If yes, please fill in the following:

Country(ies) and region(s) of residence or travel before entry (multiple answers possible): _____(add to Infectious Disease Report Card)

Country(ies) or region(s) where transfer(s) were made before entry: _____

Nationality: _____Passport Number: _____

Point of entry: _____of_____Province (airport, train station, and wharf, etc.)

Date of entry: (dd)/(mm)/(yyyy)

Means of transportation (number of flight, train, and ship, etc.): _____

II. Onset and care seeking

4. Identification route: □voluntary care seeking □via close contact management □ border screening □active population screening □regular surveillance of flu and SARI, etc. □others_____

5. Date of admission: (dd)/(mm)/(yyyy)

6. Symptoms and signs at admission:

□ Fever: maximum temperature_____ ℃

□ chills □ dry cough □ sputum □ nasal congestion □ sore throat

□ headache □ fatigue □ muscle soreness □ arthralgia

□ shortness of breath □ breathing difficulty □ chest tightness □ chest pain □ conjunctival hyperemia □ nausea □ vomiting □ diarrhea □ abdominal pain □ others_____

7. Are there any complications? □ Yes □ No

If yes, please select (multiple choices): □ meningitis□ encephalitis □bacteremia/sepsis

□myocarditis □ acute lung injury /ARDS □ acute kidney injury □ epilepsy

□secondary bacterial pneumonia □ others_____

8. Chest x-ray/CT test taken showing pneumonia imaging features: □Not taken □ No □ Yes

9. Date of discharge: (dd)/(mm)/(yyyy)

III. Risk factors and exposure history

10. Does the patient come from a specific professional group: □ no □ medical staff □ pathogenic microorganism detection staff □ personnel with wildlife contact □ poultry and livestock farming workers□ others_____ □ not from a specific professional group

If yes for medical staff, please select: □ doctor □ nurse □ field staff for disease control and prevention □ laboratory staff □ others_____

11. Whether the patient is pregnant: □ Yes, pregnant for ____weeks □ No

12. Past medical history (multiple choices): □none □ hypertension □ diabetes □ cardiovascular and cerebrovascular diseases □ asthma □ chronic pulmonary (□ chronic obstructive pulmonary disease, □ others_____) □ tumor (□ lung cancer □ others_____) □ chronic kidney disease □ chronic liver disease □ immunodeficiency diseases □ postpartum (within 6 weeks) □ others_____

Have you had the following exposure history or contact history within 14 days before the onset of illness or being tested positive:

13. Has the patient visited or lived in Wuhan and surrounding areas, or other domestic communities with reported cases:

□travel history □ residence history □ No

If yes, please fill in: _____county/district _____ prefecture _____ province

14. Has the patient visited or lived in overseas country(ies) or region(s) with severe outbreaks: □travel history □ residence history □ No

If yes, please specify country(ies) or region(s): _____

15. Has the patient come in contact with a person who has fever or respiratory symptoms from Wuhan and surrounding areas, or from a domestic community with a reported case/cased: □ Yes □ No □ Unclear

16. Has the patient come in contact with a person who has fever or respiratory symptoms from overseas country(ies) or region(s) with severe outbreaks: □ Yes □ No □ Unclear

17. Has the patient come in contact with a confirmed case or an asymptomatic infected person: □ Yes □ No □ Unclear

18. Does the patient have a cluster outbreak in the same family, office, school, kindergarten or nursery, or workshop? □Yes □ No □ Unclear

IV. Laboratory testing

Specimen collection and COVID-19 testing of patients on **initial sampling and every sampling until the last time during isolation after discharge** (positive/negative results included for each specimen)

Specimen type	Sampling time (dd/mm/yyyy)	Test results (+/- /to be tested)
Throat swab		
Nasal swab		
Nasopharyngeal swab		
Sputum		
Tracheal aspirate		
Alveolar lavage fluid		
Urine		
Stool/anal swab		
Blood specimen (nucleic acid testing)		
Blood specimen (IgM)		
Blood specimen (IgG)		
Blood specimen (IgM+IgG)		
*Blood specimen with IgG increase of 4 times and above (convalescence sampling)		
Others (fill in specimen name)		
Not collected (do not fill in the sampling time or results)		

*: If IgG in convalescence blood increases by 4 times or more, testing results should be positive.

Investigation organization:_____ Investigator signature:_____

Investigation date: (dd)/(mm)/(yyyy)

Appendix 2

Investigation and Analysis Method of COVID-19 Clusters

I. Definition of clusters

Clusters of cases refer to the detection of 2 or more confirmed cases or asymptomatic infected persons in a small area (such as a family, an office, a school class, and a workshop, etc.) within 14 days, and there is the possibility of interpersonal transmission, or the possibility of infection caused by common exposure.

II. Detection of cluster outbreak

1. Through case investigation, find the confirmed cases, suspect cases or asymptomatic infected persons in close contact with the case or having common exposure.

2. In China's disease prevention and control information system, search for confirmed cases, suspect cases or asymptomatic infected persons working for the same employer or having the same address whose onset is within 1 or 2 incubation periods.

3. Consolidate and review the case epidemiological investigation reports, and search for confirmed cases, suspect cases or asymptomatic infected persons from different regions with the same exposure history such as taking the same flight and train, or participating in the same travel group or meeting within 14 days before onset.

III. Investigation content

1. Investigation of patients and close contacts

The investigation of cluster-related cases should focus on: ①Whether the cases and close contacts have history of travel to or residence in Wuhan and its surrounding areas, or other domestic communities with reported cases, or overseas countries or regions with severe outbreaks; ②Whether they have been in contact with patients with fever or respiratory symptoms from Wuhan and its surrounding areas, or other domestic communities with reported cases or overseas countries or regions with severe outbreaks; ③Contact type, contact distance, frequency and personal protective measures taken; ④Case-related activity track; ⑤Verify and register the name, ID number and contact details of cases.

For the initial investigation, the time range of cluster-related cases may not be limited to 14 days, and the relevant suspect cases and asymptomatic infected persons also need to be included in the investigation. When the investigation is closed, a final judgment should be made on whether

it is a case of a cluster based on the epidemiological and laboratory findings.

The investigation of close contacts should focus on: ①The onset, specimen collection and testing of close contacts; ②The types of close contacts, such as meals together, living in the same household, sharing transportation, etc.; ③The outcome of close contacts.

2. Investigation of place of exposure

(1) Family exposure: investigate the number of family members living together, contacts and personal protection; household environment, including number of rooms, floor area, ventilation and air conditioning use, and hand washing facilities; elevator use and disinfection of the building, etc.

(2) Meal exposure: investigate the time, place, people and seating, dining environment, ventilation and air conditioning use, hand washing facilities, and behaviors that may lead to increased risk of transmission.

(3) Business exposure: investigate the number of workers, the distribution of work stations, the distribution of workshops, the type of working contact and the protection of workers in the workplace, the environmental health of the workplace, canteen, dormitory, toilet and other relevant places, use of central air conditioning, use of fresh air system and ventilation, hand washing facilities, elevator use and disinfection.

(4) Means of transportation: investigate the means of transportation, seat distribution, ventilation and use of air conditioning and the disinfection thereof, hand washing facilities, number of passengers, health conditions and personal protection.

(5) Public places: the length of stay in shopping malls, supermarkets, public baths, hotels, nursing homes, hospitals, wedding / funeral sites and other public places where the patients have been exposed, number and density of or people, personal protection, layout and floor area of public places, use of ventilation and air conditioning, use and disinfection of elevators, hand washing facilities, etc.

3. Sampling and testing

Specimen collection and testing should be done for all cases in accordance with relevant requirements. For special circumstances such as the index case of a cluster, people suspected to be asymptomatically infected or transmission within the incubation period, it is recommended to increase the frequency of sampling and testing in the case of two negative nucleic acid tests, and to collect two serum specimens within 7 days and between 3-4 weeks after onset for future reference.

IV. Information analysis

1．Analysis of transmission chains of cases

Draw epidemic curves according to the onset time of cases. Then draw the onset time sequence diagram or case relationship diagram (see Appendix 1) with information including the relationship with the index case, the exposure history of 14 days before onset and the activity track after onset, and analyze the transmission chain.

2．Generational analysis of cases

According to the epidemic curve, time sequence diagram or case relationship diagram, information of incubation period and exposure history, determine the generation of each case The following principles can be referred to in determining the generation of each cluster:

The first generation is usually the case with the earliest onset, i.e. the index case of the cluster. If it is suspected that there is asymptomatic infection or transmission during incubation, comprehensive analysis and determination should be based on epidemiological investigation and laboratory testing results.

In principle, the following three criteria should be met in determining the second generation of cases: ①There has only been a contact history with the index case within 14 days before onset; ②The case has never visited or lived in Wuhan and surrounding areas, or in other domestic communities with reported cases, or in oversees countries or regions with severe outbreaks; ③ No other suspected exposure history such as hospital visit, or no obvious community transmission in the relevant area.

The three criteria for determining the second generation of case can be used for determining the third generation of cases. If the case has been in contact with the previous two generations within 14 days before onset, the generation cannot be determined.

3．Analysis of the incubation period

The following three criteria should be met in accurately calculating the incubation period for a single case: ①The second generation case has a clear contact history with the index case; ② The second generation case has a short contact time with the index case; ③The second generation case has no other exposure history or contact history before onset than that with the index case.

In a cluster outbreak, if the incubation period of a single case is found to have exceeded the minimal and maximal value observed in the existing studies, it is necessary to verify whether the above criteria are met, and confirm the accuracy of the onset time of the case and the contact time with the index case.

4．Analysis of infectivity during incubation

In a cluster outbreak, if the index case is determined to have infectivity during incubation period, the following three criteria should be met: ①The index case and the second-generation case do not have any clinical symptoms or signs, and there is no contact history between these two cases after their onsets; ②The onset of the second-generation case happens within 14 days after the last contact with the index case; ③The second-generation case has no other exposure history or contact history than that with the index case.

It is recommended that the sampling be done as early as possible for the index case during investigation. If the sampling of the positive specimen of the index case is earlier than the onset of the second-generation case, the evidence is stronger. In addition, it is also recommended to collect two serum specimens within 7 days and between 3-4 weeks after onset of the index case for future reference.

5. Analysis of infectivity of asymptomatic infected persons

In a cluster outbreak, if an asymptomatic infected person is determined to be the source of infection, the following three conditions should be met: ①The asymptomatic infected person and the second-generation case have a clear contact history, and the second-generation case, after his/her onset, has no contact history with the asymptomatically infected; ②The second-generation case has his/her onset within 14 days after the last contact with the asymptomatic infected person; ③The second-generation case has no other relevant exposure history or contact history than with the index case.

It is recommended that the sampling be done as early as possible during investigation. If the sampling of the positive specimen of the asymptomatic infected person is earlier than the onset of the second-generation case, the evidence is stronger. In addition, it is also recommended to collect serum specimens on the day of investigation and again 3-4 weeks later for future reference.

6. Analysis of transmission routes.

During field investigation, make sure the following information is collected: type of contact, contact distance and time, personal protection during contact, hand hygiene and other relevant conditions. Investigate also the floor area of the exposure site, density of people, ventilation and air conditioning use to comprehensively analyze possible routes of transmission.

For a cluster related to a closed space such as an airplane, a carriage in the high-speed train, an Internet bar, or a karaoke bar, analyze the correlation between the onset of cases and the index case in terms of seat distance, duration of short-distance conversation, toilet exposure, hand hygiene and personal protection. If the time and space distribution of cases cannot be explained by droplet transmission and contact transmission, and the possibility of aerosol transmission is suspected, it is recommended to collect air samples and environmental smear and swabs from

the cabin, high-speed train carriage, toilet and other relevant places as much as possible to test the virus content and activity.

V. Outline for drafting the investigation report

1. Background

Describe the process of event detection and reporting, and the general situation of the local outbreak, including the number of cases, deaths and case fatality rate.

2. Epidemiological investigation

(1) Describe the total number and classification of cases (including confirmed cases, suspect cases and asymptomatic infected persons), severe cases and deaths.

(2) Describe each case by onset date including the basic information (name, age, gender, occupation, residential address at the time of onset, ID number), process of onset and diagnosis and treatment, clinical manifestations, specimen collection and testing, progress and outcome of the disease, exposure history, close contacts, activity track after onset, and personal protective measures, etc.

(3) According to case investigation results, draw the epidemic curve, time sequence diagram and case relationship diagram, sort out and summarize the key information of the cluster investigation, and fill in Appendix 2.

3. Investigation of place of exposure

Describe the environment of the exposure place, the number of people with common exposure, personnel contact and protection. If necessary, draw a plan of the exposed area.

4. Investigation of close contacts

Describe the relationship between the case and his/her close contacts, type and frequency of contact and the first and last contact time, and determine the total number of close contacts, the outcome and the number of people.

5. Measures taken

Describe the type, time and implementation of the prevention and control measures against the specific cluster.

6. Investigation findings

Determine the generations of cases in the cluster, chains of transmission, and the source and route of transmission.

7. Recommendations

On the basis of the investigation findings and the problems identified for the cluster, propose targeted prevention and control recommendations.

Appendix:

1. Sample diagrams of clustered cases

2. Registration form of key information of clustered cases

Appendix 1

Sample diagrams of a cluster outbreak

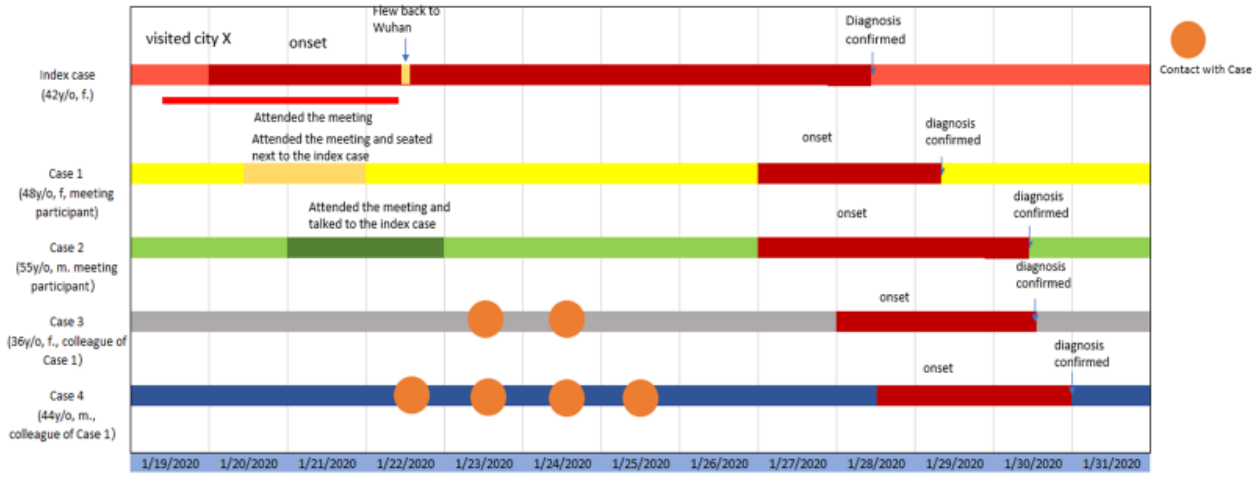

Fig. 1 Time sequence of meeting/business clusters

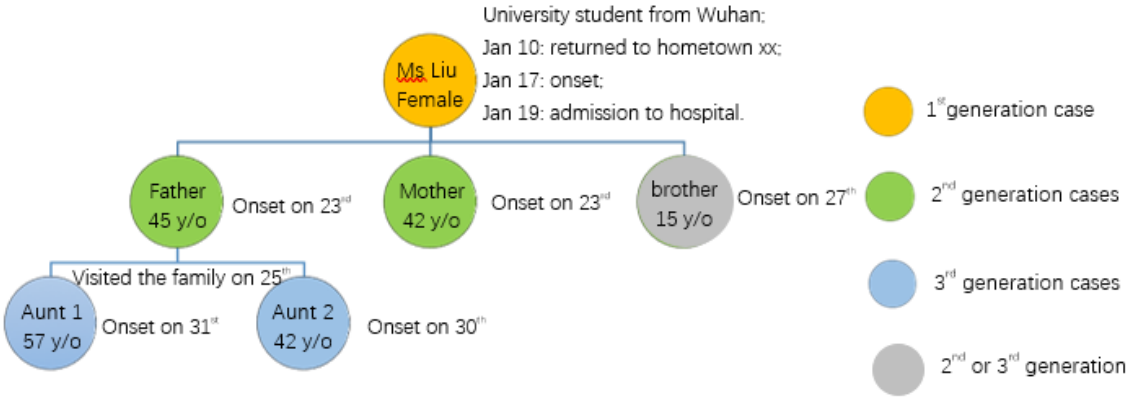

Fig. 2 Relations of a family cluster

Appendix 2 **Registration form of key information of cluster cases**

Cluster outbreak	Family cluster			Meal transmission			Other transmission type (please specify)			Transmission during incubation (1 yes 2 no)	Transmission by asymptomatic infection (1 yes 2 no)
	Number of susceptible people at exposure	Number of people having onset	Attack rate (%)	Number of susceptible people at exposure	Number of people having onset	Attack rate (%)	Number of susceptible people at exposure	Number of people having onset	Attack rate (%)		

Case number	Generation number ①	Name	Age (years)	gender	ID number	Date of onset	Date of admission	Date of centralized isolation	Date of sampling of the first positive specimen	Contact history with the previous generation②					Travel history ⑤	Other contact history ⑥
										Generation number of the case in contact	Date of first contact	Date of last contact	Place of contact③	Type of contact ④		

Notes: ①generational number: fill in 1 for the first generation, 2 for the second generation, and so on; if there are 2 or more cases in the second generation, specify according to the order of onset, such as 2-1, 2-2, etc., and so on; fill in "unknown" for cases whose generations cannot be determined; ②contact history with the previous generation: fill in the contact situation with the previous generation. The space can be left blank for the index case and cases with undetermined generations; ③contact place: please use the numbers, 1-residence, 2-restaurant, 3-means of transportation, 4-business, 5-public places (such as shopping malls, supermarkets, hotels, etc.), 6-hospital, 7-others (please specify); ④contact type: please use the numbers, 1-

family, 2-neighbors, 3-colleagues, 4-friends, 5-others (please specify). ⑤travel history: it refers to the travel history to Wuhan and its surrounding areas within 14 days before onset, or other domestic communities with reported cases, or overseas countries or regions with severe outbreaks. Please use the numbers, 1-yes, 2-no. ⑥contact history with other cases: it refers to contact except with the previous generation. Please use the numbers, 1-yes, 2-no.

Annex 2

Guidelines for Investigation and Management of Close Contacts of COVID-19 Cases

These Guidelines are based on the most recent researches on the epidemiology of COVID-19 from home and abroad and are intended to further improve investigation and management of close contacts of COVID-19 cases to control spread of the virus.

I. Purpose

1. Identify and manage close contacts in a timely manner to prevent further spread of the disease.
2. Develop a clearer understanding of risk of infection and risk factors during various types of human contact.

II. Principles of Investigation and Identification

"Contacts" include anyone who may have had contact with a case through a range of circumstances or activities including being family members, relatives, friends, colleagues, classmates, health care workers, and services personnel. Contacts can be classified as close contacts and general contacts based on the level of contact.

1. Close Contacts

Close contacts are individuals who have had contact, without effective protection, with one or more suspected or confirmed COVID-19 cases any time starting 2 days before onset of the suspected or confirmed cases' symptoms or 2 days before sampling for laboratory testing of asymptomatic infected persons. Specific types of close contacts are:

(1) Family members living together;
(2) Direct caregivers or providers of medical treatment and care services;
(3) Healthcare workers who perform diagnostic and treatment activities that emit aerosols;
(4) Persons who have had close contact in an office, factory, workshop, elevator, canteen or cafeteria, classroom, or other similar location;
(5) Persons sharing meals, entertaining, and providing catering and entertainment services in a closed environment;
(6) Healthcare workers and family members visiting someone with COVID-19 or other people in close contact with COVID-19 cases;
(7) Persons riding in a vehicle and within 1 meter of a COVID-19 case or an asymptomatic infected person including care-taking and nursing personnel, companions (e.g., family members, colleagues, and friends), and other passengers and vehicle crew who might have contact through investigation and assessment. See Appendix 1 for criteria for identifying close contacts on different types of transportation and vehicles;
(8) Other persons assessed by onsite investigators meeting criteria for close contact.

2. General Contacts

General contacts include anyone who has had contact with suspected cases, confirmed cases, and asymptomatic infected persons, but who do not meet the criteria for being a close contact while taking the same transportation vehicle (airplane, train, ship), or living, studying, or working together, or having less than close contact during diagnostic and treatment procedures.

III. Contact Management

1. Management Approach

(1) Centralized management with medical observation should be applied for close contacts management; however, carefully-managed household isolation may be used when conditions do not permit centralized management (See Appendix 2 for site selection and facility requirements for centralized management with medical observation).

Special consideration should be given to the following types of close contacts:

1) For children 14 years and younger who have parents or family members that are close contacts, centralized management with medical observation is the preferred management method. With good personal protection and interpersonal distancing, children can live in the same room with their parents or family members. If a child is a close contact, household management with medical observation can be used under the guidance of community health workers and family members can be with the child using personal protection and maintaining interpersonal distance. People with underlying medical conditions and elderly individuals cannot be with children who are close contacts.

2) For closes contacts who may not have the ability to perform self-care activities, centralized management with medical observation should be used and personal care should be provided by designated person. If centralized management with medical observation is not possible, under the guidance of community health workers, household management with medical observation can be used. Persons with underlying conditions and elderly persons cannot serve as companions.

(2) General contacts should be registered and informed of their health risk as a general contact; they should be told that if they develop respiratory symptoms such as fever or dry cough or gastrointestinal symptoms such as diarrhea, they should immediately seek medical advice and provide history of their recent activities to the doctor or other healthcare professional.

2. Management Actions

(1) Notification. During medical observation, close contacts should be informed in writing or verbally about the reason for the observation; the timeline, legal basis, and precautions to reduce risk; and COVID-19 information related to medical observation. Individuals under medical observation should be told which medical institution is responsible for their observation and the name and contact information of an institution official for communicating with the medical institution.

(2) Health monitoring. Staff of the medical observation institution should monitor the temperature of close contacts every morning and evening, ask about health status, and provide necessary support and guidance.

(3) Observation period. The medical observation period should last until 14 days after the last contact without effective protection with a confirmed case or an asymptomatic infected person. If the close contact tested negative for 2019-nCoV virus during the medical observation period, they must still be isolated until the end of the 14-day observation period.

(4) Management of symptoms. During medical observation, if a close contact has any symptoms (e.g., fever, dry cough, or other respiratory symptoms or gastrointestinal symptoms such as diarrhea), they must immediately be reported to the local health department and transported to the designated medical institution for diagnosis, treatment, and specimen collection for laboratory testing and investigation. If they are found to be a suspected or confirmed case, their close contacts should be investigated and medically observed.

(5) Release from isolation and medical observation. When the required medical observation period ends, if the close contact has had no abnormal findings or symptoms, he or she should be released from medical observation in a timely manner. If a suspected case is determined to not be a COVID-19 case or asymptomatically-infected, his or her close contacts should be released from medical observation.

3. Observation Management Rules

1. Persons under centralized or household medical observation should live apart from others and, as much as possible, minimize contact with his or her co-habitants. Medical observation sites are to be thoroughly cleaned and disinfected daily.
2. Close contacts are generally not allowed to go outside during the observation period. However, if they must go outside, they should do so only with approval of the medical observation management staff; they must wear surgical masks and avoid going to crowded places while outside.
3. Staff performing medical observation or having close contact with individuals under medical observation should always use effective personal protection practices for respiratory droplets and contact transmission.

IV. Information Reporting Requirements

1. Information to be reported

(1) The "Health Status Monitoring Case Form for Close Contacts" (see Table 1), which records basic information, contact information, and health monitoring information of close contacts, must be completed. Specific requirements are:

1) Basic information and contact information. When registering close contacts, record their personal information (e.g., name, ID number, sex, age, underlying diseases) and information about the last contacted case (e.g., case's name, case type, times of first and last contact, contact type).

2) Health monitoring information of close contacts. After medical observation of close contacts is concluded, information on the starting date of isolation, whether the close contact developed clinical

symptoms during medical observation, the date of first symptoms, the initial clinical manifestations, final laboratory test results, collection dates for positive specimens, the worst clinical status, and their hospital discharge/isolation release date should be filled based on the health status monitoring form for close contacts.

3) Information consistency. If close contacts become confirmed cases or asymptomatically-infected persons, the recording of "the worst clinical outcome of the case" must be consistent with the information reported in the Infectious Disease Information Reporting and Management System.

(2) For daily health monitoring of close contacts during medical observation, one must complete the "Registration Form for Medical Observation of Close Contacts" (see Table 2).

(3) When local areas summarize medical observation of close contacts, one can refer to the "Daily Report Form for Medical Observation of Close Contacts" (Table 3) and the "Daily Summary Form for Medical Observation of Close Contacts" (Table 4).

2. Reporting Requirements and Methods

(1) After a close contact is released from medical observation, the county (or district) level disease control and prevention agency should summarize and update the health status of the close contact during medical observation based on the Health Status Monitoring Case Form for Close Contacts.

(2) Local authorities are encouraged to report relevant information about close contacts through the online reporting module so that CDCs at all levels can conduct timely analyses. Local authorities must conduct quality reviews of the information reported for each close contact. Online module: https://10.249.6.18:8880/portal.

(3) Provinces with functional contact tracing information system continue to use the system with reference to the parameters recommended in the national protocol for close contact tracing.

(4) Retrospective reporting to the online module is not needed for contacts who have completed their quarantine.

V. Data Analysis and Use

The following analyses should be performed on data from medical observations of close contacts:

1. Determine the secondary attack rate of COVID-19 infection among close contacts, especially for close contacts in key places such as homes and hospitals and places varying by their characteristics;
2. Describe the clinical severity of COVID-19 cases associated with close contacts;
3. Estimate the 2019-nCoV incubation period based on the first and last contact time of the close contact with the case, and the onset of close contacts' illnesses.

Appendix 1

Guidance for Identification of Close Contacts on Transportation Vehicles

1 Airplanes

Close contacts are defined as individuals seated in the same row or within three rows in front or three rows behind the case as well as crew members servicing these areas in the aircraft. Other passengers are considered general contacts.

2 Trains

For closed and air-conditioned trains, close contacts are all passengers and crew members who were in the same carriage, hard seat carriage, hard sleeper carriage, or soft sleeper compartment as the case.

For regular trains (not closed or air-conditioned trains), passengers in the same soft sleeper compartment as the case, the same segment and adjacent segments of a hard seat or hard sleeper carriage as the case, and crew members assigned to these areas are considered close contacts.

3 Coaches

For closed and air-conditioned coaches, all passengers in the same coach as the case are considered close contacts.

For regular coaches with ventilation, passengers in the three rows in front of and three rows in back of the case and coach drivers are considered close contacts.

4 Ferries

All passengers in the same cabin as the case and crew members assigned to the area are considered close contacts.

During contact periods, if the patient already has symptoms like fever, sneezing, dry cough, or vomiting, other passengers with contact should be classified as a close contact regardless of the duration of contact.

Appendix 2

Selection of Centralized Management with Medical Observation Sites and Facility Requirements

Selection of centralized management with medical observation sites and their facility requirements are:

1. If possible, centralized management with medical observation sites should be relatively independent, far from densely populated areas, and should not be in medical institutions.
2. Interiors of centralized management with medical observation sites should be divided into sanitary areas, supply areas, and medical observation areas. Accommodations should ensure relatively normal life for those under centralized management. Sites should be ventilated and disinfected daily.
3. Centralized management with medical observation sites should be equipped with medical equipment such as thermometers and stethoscopes, personal protective equipment such as masks, and disinfection products.
4. A single occupancy room and a private toilet should be provided for each close contact.
5. It is best to have independent septic tanks. Sewage should be disinfected before being discharged to the municipal drainage system. After disinfection, sewage should meet the requirements under "Discharge standard of water pollutants for medical organization" (GB18466-2005). If there is no independent septic tank, special containers can be used to collect sewage, which should be disinfected before discharge. For disinfection methods, please refer to the fecal and sewage disinfection methods under the technical protocols for disinfection.

Table 1

Health Status Monitoring Case Form for Close Contacts

_____County (District), _____City (Prefecture), _____ Province (Autonomous Region/Municipality)

Name	ID number	Sex	Age	Contact information	Underlying medical conditions	Last contaced case's					Isolation start date	Presence or absence of clinical symptoms	Onset date of first symptoms	Initial clinical manifestation	2019-nCov test results	Date of positive specimen collection	Worst clinical status of the close contact	Date of hospital discharge or isolation release
						Patient's name	Type of case	Date of first contact	Date of last contact	Contact ways								

Note: Types of underlying diseases (multiple choices): ① hypertension ② diabetes ③ cerebrovascular disease ④ coronary heart disease ⑤ asthma ⑥ emphysema ⑦ chronic bronchitis ⑧ lung cancer ⑨ chronic liver disease ⑩ liver cancer ⑪ chronic kidney disease ⑫ immunodeficiency ⑬ AIDS ⑭ tuberculosis ⑮ pregnancy ⑯ others (please specify in the form)

1. Type of the case for the last contact: ① confirmed case ② suspected case ③ clinically diagnosed case ④ asymptomatic infected person
2. Contact ways (can select more than 1): ① living together ② medical care ③ dinner ④ daily conversation ⑤ share the same transportation ⑥ contact limited to staying in the same closed space without direct contact and communication ⑦ other (please specify in the form)
3. Whether clinical symptoms had manifested: ① Yes ② No
4. First symptom (can select more than 1): ① fever ② chill ③ sputum ④ cough ⑤ nasal congestion ⑥ runny nose ⑦ sore throat ⑧ headache ⑨ fatigue ⑩ muscle soreness and aches ⑪ joint aches ⑫ shortness of breath ⑬ dyspnea ⑭ chest tightness ⑮ conjunctival congestion ⑯ nausea ⑰ vomiting ⑱ diarrhea ⑲ abdominal pain ⑳ others (please specify in the form)
5. 2019-nCov lab test results: ① Positive ② Negative ③ Specimen not collected
6. The worst clinical status of the close contact (referring to confirmed cases among the close contacts): ① asymptomatic infection ② mild ③ normal ④ severe ⑤ critical ⑥ death

Table 2

Registration Form for Medical Observation of Close Contacts

□suspect □clinical □confirmed □asymptomatic Name of the Patient：___ Phone number：___ Onset date of the disease：

Serial no.	Close contact's name	Sex	Age	Current address	Start date of observation	Clinical manifestation																															
						Body temperature（℃）														Presence of symptoms																			
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2	3	4	5	6	7	8	9	10	11	12	13	14						

Note:

1. This table is intended for use by the healthcare workers performing medical observation on the close contacts of COVID-19 cases and asymptomatic infected person

2. Under "clinical manifestation," fill in the actual temperature in Celsius for "Body temperature." Please tick √ if any of the following symptoms appear, otherwise tick "×": chills, sputum, stuffy nose, runny nose, sore throat, headache, fatigue, muscle soreness and aches, joint soreness and aches, shortness of breath, dyspnea, chest tightness, conjunctival congestion, nausea, vomiting, diarrhea, abdominal pain, and other symptoms.

Entered by (organization)：_____ Entered by (individual)：_____ Date of entry：mm dd yy

Table 3

Daily Report Form for Medical Observations of Close Contacts

Sub-district/community or household	Observation start date for the first close contact	Total number of persons observed	Persons who are under medical observation				Number of persons who have clinical manifestations		Number of persons who become infected with COVID-19 or have asymptomatic infections			Date the last close contact is expected to be released from observation
			Number of persons observed for the day		Number of persons released							
			Number of persons	New additions	Of the day	Total	New additions of the day	Total	COVID-19 cases	Asymptomatic infected person	Total	
Total												

Note:

1. This table is intended for aggregate submission by healthcare workers performing medical observation on close contacts of COVID-19 cases and asymptomatic infected person

2. Clinical manifestations include: chills, sputum, stuffy nose, runny nose, sore throat, headache, fatigue, muscle soreness and aches, joint soreness and aches, shortness of breath, dyspnea, chest tightness, conjunctival congestion, nausea, vomiting, diarrhea, abdominal pain, and other symptoms.

3. All "total" entries in the table refer to aggregate numbers since the start of medical observation of the close contacts

Entered by (medical institution)：_____ Entered by (individual)：_____ Date of entry：mm dd yy

Table 4

Daily Summary Form for Medical Observations of Close Contacts

Jurisdiction	Observation start date for the first close contact	Total number of persons observed	Persons who are under medical observation				Number of persons who have clinical manifestations		Number of persons who become infected with COVID-19 or have asymptomatic infections			Date the last close contact is expected to be released from observation
			Number of persons observed for the day		Number of persons released							
			Number of persons	New additions	Of the day	Total	New additions of the day	Total	COVID-19 cases	Asympt-omatic cases	Total	
Total												

Note:

1.The table is intended for statistical aggregation by the city and district level CDCs.

2. Clinical manifestations include: chills, sputum, stuffy nose, runny nose, sore throat, headache, fatigue, muscle soreness and aches, joint soreness and aches, shortness of breath, dyspnea, chest tightness, conjunctival congestion, nausea, vomiting, diarrhea, abdominal pain, and other symptoms.

3. All “total” entries in the table refer to aggregate figures since the start of medical observation on the close contacts.

Entered by：_____ CDC Entered by (individual)：_____ Date of entry：mm dd yy

Annex 3

Technical Guidelines for COVID-19 Laboratory Testing

These Technical Guidelines are formulated to guide disease control agencies and relevant institutions at all levels to carry out laboratory testing for 2019 novel coronavirus (2019-nCoV).

I. Specimen Collection

1. Collection Targets

Collection targets include the following: suspected cases, clustered cases, and other cases requiring diagnosis or differential diagnosis for 2019-nCoV; or other environmental or biological substances that require further screening and testing.

2. Collection Requirements

1. The 2019-nCoV testing specimens shall be collected by qualified technicians who have received biosafety training (who have passed the training) and are equipped with the corresponding laboratory skills. Personal protective equipment (PPE) requirements for sampling personnel are: N95 masks or masks with higher filtration efficiency, goggles, protective clothing, double-layer latex gloves and waterproof boot covers; if exposed to patients' blood, body fluids, secretions or excretions, the outer layer of the latex gloves should be changed in time.
2. Specimens of inpatient cases shall be collected by medical staff of the hospital where they are being treated.
3. Specimens of close contacts shall be collected by the designated local CDCs and medical institutions.
4. Multiple specimens may be collected in the course of the disease, depending on the need for laboratory testing.

3. Categories of Specimens Collected

Respiratory tract specimens in the acute phase (including upper or lower respiratory tract specimens) must be collected from each case; lower respiratory tract specimens shall be preferred for the collection from severe cases. Stool samples, whole blood samples, serum samples urine specimens can be collected according to clinical needs.

Categories of specimen:

(1) Upper respiratory tract specimens: including nasopharyngeal swabs, pharyngeal swabs, etc.

(2) Lower respiratory tract specimens: including deep-cough sputum, alveolar lavage fluids, bronchial lavage fluid, and respiratory tract extracts.

(3) Fecal specimens/anal swabs: Fecal samples are about 10 g (peanut size). If it is not convenient to collect fecal samples, an anal swab can be collected.

(4) Blood specimens: One should, as much as possible, collect anticoagulated blood in the acute phase within 7 days after the onset of the disease. A 5 mL quantity of blood is required for each collection. Vacuum tubes containing EDTA anticoagulant are recommended in blood collection.

(5) Serum specimens: Both acute-phase and convalescent serum specimens should be collected as often as possible. The first serum specimen should be collected as soon as possible (preferably within 7 days after the onset of illness), and the second specimen should be collected during 3 or 4 weeks after the onset of illness. A 5 mL quantity of blood is required for each specimen and vacuum tubes without anticoagulant are recommended. Serum specimens are mainly used for measuring antibodies, rather than nucleic acid testing.
(6) Urine specimens: Collect 2–3 mL mid-stream of morning urine sample.

4. Methods of Specimen Collection and Processing

(1) Nasopharyngeal swab: The sampler gently holds the person's head with one hand, the swab in another, insert the swab via nostril to enter, slowly get deep along the bottom of the lower nasal canal. Because the nasal canal is curved, do not force too hard to avoid traumatic bleeding. When the tip of the swab reaches the posterior wall of the nasopharyngeal cavity, rotate gently once (pause for a moment in case of reflex cough), then slowly remove the swab and dip the swab tip into a tube containing 2–3 mL virus preservation solution (or isotonic saline solution, tissue culture solution, or phosphate buffer), discard the tail, and tighten the cap.
(2) Pharyngeal swab: the sampled person first gargles with normal saline, the sampler then immerses the swabs in sterile saline (virus preservation solution is not allowed to avoid antibiotic allergies), holds the head of the sampled person up slightly with his or her mouth wide open making an “ah” sound to expose the lateral pharyngeal tonsils, insert the swabs, stick across the tongue roots, wipe both sides of the pharyngeal tonsils with pressure at least 3 times, then wipe on the upper and lower walls of the pharynx for at least 3 times, dip the swabs in a tube containing 2–3 mL storage solution (or isotonic saline solution, tissue culture solution, or phosphate buffer solution), discard the tail, and tighten the cap. The pharyngeal swabs can also be placed in the same tube together with the nasopharyngeal swab.
(3) Nasopharyngeal or respiratory tract extract: Extract mucus from the nasopharynx or extract respiratory secretions from the trachea with a collector connected to a negative-pressure pump; insert the head of the collector into the nasal cavity or trachea, turn on the negative pressure, rotate and slowly withdraw the head of the collector, collect the extracted mucus, and rinse the collector once with 3 mL of the sampling solution (a pediatric catheter connected to a 50 mL syringe may be used as an alternative to the collector).
(4) Deep cough sputum: Ask the sampled person to cough deeply and collect the sputum coughed up in a screw-capped plastic tube containing 3 mL of the sampling solution. If the sputum is not collected in the sampling solution, 2–3 mL of the sampling solution can be added into the tube before testing, or sputum digestion reagents (Table 1) of equal volume to the sputum can be added.

Table 1. Formula of storage fluid for sputum digestion reagents.

Ingredients	Mass/volume
Dithiothreitol	0. 1 g
Sodium chloride	0.78 g
Phosphorus chloride	0.02 g
Disodium hydrogen phosphate	0.112 g
Potassium dihydrogen phosphate	0.02 g
Water	7.5 mL
pH 7.4±0.2 (25 °C)	

Dilute the storage solution to 50 mL with deionized water before use. Sputum can also be liquefied with a phosphate buffer containing 1 g/L of protease K in an equal volume of sputum.

(5) Bronchial lavage fluid: Insert the head of the collector into the trachea (about 30 cm deep) from the nostril or the tracheal insertion part, inject 5 mL of physiological saline, turn on the negative pressure, rotate the head of the collector and slowly withdraw it. Collect the extracted mucus and rinse the collector once with the sampling solution (a pediatric catheter connected to a 50 mL syringe may be used as an alternative to the collector). The sampling method depends on the hospital.

(6) Alveolar lavage fluid: After local anesthesia, insert a bronchoscope through the mouth or nose, pass through the pharynx into the branch of the right middle lobe or the lingular segment of the left lung, and insert the tip into the bronchial branch opening; slowly add sterilized physiological saline through the biopsy hole of the bronchoscope, with 30–50 mL of saline each time, 100–250 mL in total, 300 mL at most. The sampling method depends on the hospital.

(7) Fecal specimen: Take 1ml of the sample processing solution (Table 2), pick up a little sample about the size of a soybean and add it into the tube, gently blow for 3–5 times, set aside at room temperature for 10 minutes, centrifuge at 8,000 rpm for 5 minutes, and absorb the supernatant for detection. Fecal sample processing solution can be prepared in-house by the laboratory.

Table 2. Formula of fecal sample processing solution.

Ingredients	Mass/volume
Tris	1.211 g
Sodium chloride	8.5 g
calcium chloride anhydrous or calcium chloride containing crystalline water	1.1 g or 1.47 g
Deionized Water	800 mL
Adjusted pH to 7.5 with concentrated hydrochloric acid and replenishing with deionized water to 1,000 mL.	

Stool suspensions can also be prepared using HANK's solution or other isotonic saline solution, tissue culture solution, or phosphate buffer solution. If the patient has symptoms of diarrhea, collect 3–5 mL of stool specimen, gently blow and mix, centrifuge it at 8,000 rpm for 5 minutes, and absorb the supernatant to reserve for use.

(8) Anal swab: Gently insert the disinfectant cotton swab into the anus for 3–5 cm in depth, then gently rotate and pull out, immediately put the swab into a screw-capped sampling tube containing 3–5 mL virus preservation solution, discard the tail, and tighten the tube cover.

(9) Blood samples: It is recommended to use vacuum blood vessels containing EDTA anticoagulant to collect 5 mL of blood samples. Nucleic acid extraction should be performed on whole blood or plasma according to the type of nucleic acid extraction reagent selected. For plasma separation, the whole blood should be centrifuged at 1,500 to 2,000 rpm for 10 minutes, and the supernatant should be collected in a sterile plastic tube with a screw cap.

(10) Serum specimen: Collect a 5 mL blood specimen with a vacuum negative-pressure blood collection tube. Keep the specimen at room temperature for 30 minutes, centrifuge it at 1,500–2,000 rpm for 10 minutes, and collect the serum in a sterile plastic tube with a screw cap.

(11) Other materials: To be collected in a standardized manner in accordance with design requirements.

5. Specimen Packaging

Collected specimens shall be packaged separately in a biosafety cabinet of a BSL-2 laboratory.

1. All specimens should be placed in an airtight freeze-tolerant sample collection tube of appropriate size with a screw cap and a gasket inside. The sample number, category, name, and sampling date should be indicated on the outside of the container.
2. Specimens kept in an airtight container should be sealed in a plastic bag of appropriate size, with each bag containing one specimen. The specimen packaging requirements must meet the corresponding standards of the *Technical Regulations for the Safe Transport of Dangerous Goods by Air*.
3. Prior to transportation, external specimens shall undergo the three-layer packaging applicable to Category A and Category B infectious substances based on the categories of the specimens.

6. Specimen Preservation

Specimens for virus isolation and nucleic acid detection purposes should be tested as soon as possible. Specimens to be tested within 24 hours can be stored at 4 °C; those that cannot be tested within 24 hours should be stored at –70 °C or below (specimens may be temporarily stored in –20 °C refrigerators in the absence of –70 °C storage condition). Serum can be stored at 4 °C for 3 days and below –20 °C for a longer period. A special depot or cabinet is required to store specimens separately. Repeated freeze-thaw cycles during specimen transportation should be avoided.

7. Specimen Submission and Examination

Collected specimens should be sent to laboratories as soon as possible. Dry ice and other refrigeration methods are recommended for the preservation of specimens to be transported over long distances.

(1) Submission of specimens

Specimens of cluster cases in each province (autonomous region, municipality directly under the central government) shall be submitted to the National Institute for Viral Disease Control and Prevention (NIVDC) of China CDC for testing and review with the specimen submission form attached (see Appendix).

(2) Pathogen and specimen transportation

1) Domestic transport

Strains of 2019-nCoV or other potentially infectious biological substances are subject to packaging instructions for Category A substances assigned to UN2814, and the PI 602 of the Technical Instructions For The Safe Transport of Dangerous Goods by Air (Doc 9284) issued by ICAO; environmental samples, assigned to UN3373, shall be transported in Category B packaging in accordance with the PI 650, Doc 9284; one may refer to the aforementioned standards for specimens to be transported in other modes of transportation.

A *Permit of Transport* is required for the transportation of the 2019-nCoV strains or other potentially infectious substances according to the *Transport Regulations on the Highly Pathogenic Microorganism* (*Virus*) *Strains and Specimens that are Pathogenic to Humans* (*Order No. 45, former Ministry of Health*).

2) International transport

Standard packaging shall be applied to 2019-nCoV strains or samples to be transported internationally, with relevant procedures handled in accordance with the *Provisions on the Administration of the Health Quarantine of Entry/Exit Special Articles* as well as relevant national and international requirements.

3) Management of strains and samples

2019-nCoV strains and samples should be managed by designated personnel with accurate records of the source, category, quantity, and registration number of the strains and samples. Effective measures should be adopted to ensure the security of the strains and samples. Efforts should be made to prevent the misuse, malicious use, theft, robbery, loss, and leakage of the strains and samples.

II. Laboratory Testing of the 2019-nCoV

1. Real-Time Fluorescence-based Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) assay of the 2019-nCoV Nucleic Acid

(1) 2019-nCoV nucleic acid assay

The nucleic acid detection method introduced in this guideline mainly targets at open reading frame 1ab (ORF lab) and nucleocapsid protein (N) genes in the 2019-nCoV genome.

Target 1 (ORF 1ab):

Forward primer (F): CCCTGTGGGTTTTACACT TAA

Reverse primer (R): ACGATTGTGCATCAGCTGA

Fluorescent probe (P): 5′-FAM-CCGTCTGCGGT ATGTGGAAAGGTTATGG-BHQ1-3′

Target 2 (N):

Forward primer (F): GGGGAACTTCTCCTGCTA GAAT
Reverse primer (R): CAGACATTTTGCTCTCAA GCTG
Fluorescent probe (P): 5′-FAM-TTGCTGCTGCTT GACAGATT-TAMRA-3′
For nucleic acid extraction and real-time fluorescence-based RT-PCR reaction system and reaction conditions, refer to kit instructions of the manufacturers concerned.

(2) Judgment of results
Negative: no Ct value or Ct value is 40.
Positive: Ct value <37.
Gray zone: Repeated experiments are recommended if Ct values range between 37 and 40. If the Ct value reads <40 and the amplification curve has an obvious peak, the sample should be considered to be positive, otherwise it should be considered as negative.
Note: If a commercial kit is used, the instructions provided by the manufacturer will take priority.

(3) Confirmation of cases
Laboratory confirmation of positive cases requires one of the following two conditions:
1) The real-time fluorescence-based RT-PCR assay of 2019-nCoV in the same specimen shows that the two targets, ORF1ab and Protein N, are both positive. In case of the result showing positive for one target, then samples shall be re-collected for another test. If it is still positive for a single target, the result should be deemed positive.
2) The real-time fluorescence-based RT-PCR assay of two types of specimens show one single target as positive at the same time, or one target as positive in two samples of the same type, the result should be deemed positive.

Negative nucleic acid results cannot rule out 2019-nCoV infections. Factors leading to false negatives shall be precluded including: poor quality of samples, for instance the respiratory tract samples of the oropharynx and other parts; samples collected too early or too late; samples that are improperly stored, transported, or processed; technical reasons such as virus mutations, PCR inhibition, etc.

2. Serum Antibody Tests

Serum antibody tests (colloidal gold, magnetic particle chemiluminescence, ELISA) are used as supplementary tests for cases of negative 2019-nCoV nucleic acid tests, used in conjunction with nucleic acid tests in the diagnosis of suspected cases, or used in serological surveys and past exposure surveys of concerned population groups. Laboratory confirmed positive cases need to meet one of the following two conditions:
(1) Serum IgM antibodies and/or IgG antibodies to 2019-nCov are positive;
(2) Serum IgG antibodies to 2019-nCov turn from negative to positive or the IgG antibody titers of recovery period are 4 times or more higher than that of acute phase.

Using serum in the acute phase within 7 days after the onset of disease detects IgM and IgG, if the test result is negative, repeat collection for testing within 10 days after the onset of disease is recommended. Convalescent serum specimens within 3–4 weeks after the onset of illness should be used for detecting IgG. Instructions from the manufacturer's manual should be followed for commercial testing kits.

III. Biosafety requirements for pathogen experiments

According to the biological features, epidemiological characteristics, clinical data, and other available information concerning the 2019-nCoV, the pathogen shall be temporally managed as a Category B pathogen and microorganism based on its hazards. Specific requirements are listed as follows:

1. Viral Culture

Viral culture refers to operations such as virus isolation, culture, titration, neutralization test, purification of live virus and its protein, lyophilization of virus, and recombination test to produce live virus. The above operations should be performed in a biosafety cabinet in a BSL-3 laboratory. When viral medium is used to extract nucleic acid, the addition of lysing agent or inactivating agent must be performed under the same level of laboratory and protective conditions as viral culture. Laboratories shall report to the National Health Commission for approval and obtain relevant qualifications before carrying out the corresponding activities.

2. Animal Infection Experiments

Animal infection experiments refer to operations such as infecting animals with live viruses, sampling of infected animals, processing and testing of infectious samples, special test for infected animals, disposal of infected animal excrement, etc., which should be performed in a biosafety cabinet in a BSL-3 laboratory. Laboratories shall report to the National Health Commission for approval and obtain relevant qualifications before carrying out the corresponding activities.

3. Operations of Uncultured Infectious Substances

Operations of uncultured infectious substances refer to viral antigen detection, serological testing, nucleic acid extraction, biochemical analysis, inactivation of clinical samples, and other operations performed on uncultured infectious substances before inactivation through a reliable method. The operation should be performed in a BSL-2 laboratory with personal protective equipment subject to BSL-3 laboratory protection requirements.

4. Operations of Inactivated Substances

After reliable inactivation of infectious substances or live viruses, operations such as nucleic acid testing, antigen testing, serological testing, and biochemical analysis should be performed in a BSL-2 laboratory. Molecular cloning and other operations not involving live pathogenic viruses may be carried out in a BSL-1 laboratory.

Supplementary table: 2019-nCoV Testing Specimen Submission Form

Specimen submission unit (seal): _____ Submission date:_____year_____month____day Submitted by:

No.	Specimen type	Name	Sex	Age	Date of onset	Date of clinical visit	Sampling date	From a clustered outbreak or not	Testing date	Real-time fluorescent RT-PCR		Gene sequence homology*		Notes
										Reagent manufacturer	Target gene	First generation	Deep sequencing	

* Gene sequence homology is not a required option; it indicates completion of the specific target gene sequence / whole genome sequence and its homology with 2019-nCoV. For the column of “from a clustered break or not”, fill in “yes” or “no”.

Annex 4

Technical Guidelines for Site-specific Disinfection

I. The principle of disinfection

1) Determination of scope and object

According to the results of epidemiological investigation, one should determine the scope, object and time limit of on-site disinfection. Places where patients and asymptomatic infected persons have stayed, such as homes, medical institutions, isolation wards, transfer vehicles, etc. should be disinfected at any time, and receive terminal disinfection after discharge or death of patients, and after asymptomatic infections' nucleic acid test results turn negative.

2) Method selection

Medical institutions should try to choose disposable diagnostic supplies. For non-disposable diagnostic supplies, pressure steam sterilization is preferred; non-heat-resistant items can be disinfected or sterilized with chemical disinfectants or low-temperature sterilization equipment.

The surface of surrounding objects can be disinfected through wiping, spraying or soaking with chlorinated disinfectants, chlorine dioxide, or other disinfectants.

It is recommended to choose an effective disinfectant such as Povidone-iodine and hydrogen peroxide, or other quick-drying hand disinfectant for hand and skin disinfection.

For indoor air disinfection, one can choose spray disinfection with disinfectants such as peracetic acid, chlorine dioxide, and hydrogen peroxide.

All disinfection products used should comply with the management requirements of national health departments.

II. Disinfection measures

1) Disinfection at any time

Disinfection at any time refers to the timely disinfection of items and places contaminated by patients and asymptomatic infected persons. Places where patients have stayed, such as homes, isolation wards of medical institutions, medical observation sites, and transfer vehicles etc, as well as the contaminated items and pollutants from patients should be disinfected at any time. For disinfection methods, please refer to the section on terminal disinfection. When there are people in the room, it is recommended not to choose spray disinfection. Ventilate indoor air (including natural ventilation and mechanical ventilation) in places where patients are isolated to maintain indoor air circulation. Ventilate 2~ 3 times a day for 30 minutes each time.

If conditions allow, patients should be placed in negative pressure isolation wards in the healthcare facility; suspected cases should be isolated in single rooms; confirmed cases can be placed in the same

room. Non-negative pressure isolation wards should be well ventilated and can be ventilated either through natural ventilation and mechanical ventilation, or through air disinfection with circulating air sterilizers. Ultraviolet rays can be used to sterilize the air under unmanned conditions. When sterilized with ultraviolet rays, the exposure time can be appropriately extended to more than 1 hour. Medical staff and companions should wash and disinfect their hands after diagnosis, treatment or nursing.

2) Terminal disinfection

Terminal disinfection refers to the thorough disinfection after the source of infection has left relevant sites, and it should be ensured that the places and the items going through terminal disinfection should no longer have pathogens. Terminal disinfection targets include patients and asymptomatic infected persons' pollutants (blood, secretions, vomitus, feces, etc.) and their potentially contaminated items and places. It is not necessary to sterilize the outdoor environment (including the air) on a large scale. Terminal disinfection is not needed for places where asymptomatic infected persons have temporarily stayed and without obvious pollutants.

a. Patient's home

After the patient is hospitalized or dies, or asymptomatic infected persons' nucleic acid test results turn negative, terminal disinfection should be performed, targeting: the floor, walls, surface of tables, chairs and other furniture, door handles, patients' tableware and drinkware, clothes, bedding and other daily necessities, toys, and bathrooms (including toilets) etc.

b. Transportation vehicles

Terminal disinfection should be performed when patients and asymptomatic infected persons take off from transportation vehicles, including: surface of cabins, seats, sleepers, tableware and drinkware, textiles such as bedding, excreta, vomitus, items and places contaminated by excreta and vomitus, toilets within trains and aircraft etc.

c. Medical institutions

Terminal disinfection should be performed for the following situations: at the end of each working day at fever outpatient clinic and infectious disease outpatient clinic of medical institutions; isolation wards; after discharge or death of patients; and after the nucleic acid testing results of asymptomatic infected persons turn negative. Terminal disinfection should cover: the floor, walls, surface of tables, chairs, bedside tables, bedsteads etc., patients' clothes and bedding, other daily necessities and medical supplies, indoor air etc.

d. Terminal disinfection procedures

The terminal disinfection procedure is performed in accordance with Appendix A of the *General Principles of Disinfection of Epidemic Focus (GB19193-2015)*. On-site disinfection personnel should take personal protection when preparing and using chemical disinfectants.

III. Disinfection methods of common polluted objects

1) Indoor air

For the terminal disinfection of indoor air in venues such as households and isolation wards of medical

institutions, one can refer to the "*Management Specifications of Air Cleaning Technique in Hospitals*" (WS/T 368-2012). Peracetic acid, chlorine dioxide, hydrogen peroxide and other disinfectants can be selected and sprayed in ultra low volume for disinfection when no one stays indoors.

2) Contaminants (patients' blood, secretions and vomitus)

A small amount of pollutants can be carefully removed by using disposable absorbent materials (such as gauze, wipes, etc.) dipped with 5,000mg/L-10,000mg/L chlorine-containing disinfectant (or disinfecting wet wipes/dry wipes that can achieve high-level disinfection).

A large amount of pollutants should be completely covered with disinfectant powder or bleach powder containing water-absorbing ingredients, or fully covered with disposable water-absorbing materials before a sufficient amount of 5,000mg /L -10000mg/L chlorine-containing disinfectant (or sterilized dry towels that can achieve high-level disinfection) is poured on the water-absorbing materials for 30 minutes of disinfection, followed by careful removal of the pollutant. One should avoid contact with pollutants during the removal. The cleaned-up pollutants should be centrally disposed of as medical waste.

Patients' secretions, vomitus should be collected in a specialized container and should be soaked for two hours with 20,000 mg/L chlorine-containing disinfectant, according to the ratio of 1:2 for contaminants to disinfectant.

After removal of the pollutants, the surface of the polluted environmental objects should be disinfected. The container containing the pollutants can be soaked with a disinfectant solution containing 5,000mg/L effective chlorine for 30 minutes, and then be cleaned.

3) Faeces and sewage

When there is an independent septic tank, it should be disinfected before entering the municipal drainage pipe network, and chlorine-containing disinfectant should be added regularly, and chlorine-containing disinfectant should be added into the tank (for the first time, effective chlorine reaches 40mg/L or above), and the total residual chlorine should reach 10mg/L after 1.5 hours of disinfection. The disinfected sewage should meet the discharge standard of water pollutants from medical institutions (GB18466-2005).

In the absence of a separate septic tank, special containers are used to collect faeces, disinfect them and dispose of them. Use chlorine-containing disinfectant with effective chlorine of 20000mg/L and soak for 2 hours according to the feces to medicine ratio of 1:2; If there is a large amount of diluted excrement, the bleaching powder with 70%-80% effective chlorine should be applied to dry it, and the mixture should be thoroughly mixed according to the excrement to medicine ratio of 20:1, and then disinfect it for 2 hours.

4) Floor and wall

When there are visible pollutants, the pollutants should be completely removed before disinfection. When there are no visible pollutants, one can use 1,000mg/L chlorine containing disinfectant or 500mg/L

chlorine dioxide to wipe or spray for disinfection. For the floor disinfection, the floor should be sprayed with disinfectant once from outside to inside, in a volume of 100mL/m^2 ~ 300mL/m^2. Then, after the indoor disinfection, the floor should be sprayed again from inside out. The disinfection should be not less than 30 minutes.

5) Surface of the object

When there are visible pollutants on the surface of the diagnosis and treatment equipment as well as bed fences, bedside tables, furniture, door handles, and household items, the pollutants should be completely removed before disinfection. When there are no visible pollutants, 1,000mg/L chlorine-containing disinfectant or 500mg/L chlorine dioxide can be used for spraying, wiping or soaking. The surface can then be wiped clean with water after 30 minutes of disinfection.

6) Textiles such as clothes and bedding

Aerosols should be avoided during collection, and it is recommended that textiles be centrally incinerated as medical waste. When there are no visible pollutants, if the textiles need to be reused, they can be sterilized by circulating steam or boiling for 30minutes; or500mg/L chlorine-containing disinfectant can be used to first soak the polluted textiles for 30 minutes, before they are washed as usual; or they can be put in a washing machine directly in a water-soluble packaging bag, washed and disinfected for 30 minutes, with an effective chlorine content maintained at 500mg / L; valuable clothing can be sterilized by ethylene oxide.

7) Hand hygiene

All personnel participating in the field work should strengthen their hand hygiene measures. An effective alcohol-based hand-drying disinfectant can be selected, or directly wipe with 75% ethanol disinfection. Those who are allergic to alcohol, can choose the effective non-alcohol hand disinfectant such as quaternary ammonium disinfectant; Under special conditions, 3% hydrogen peroxide disinfectant, 0.5% iodov or 0.05% chlorine-containing disinfectant can be used to wipe or soak hands, and appropriately prolong the disinfection time. One should wash hands with liquid soap and running water before disinfection when there are visible pollutants.

8) Skin and mucous membranes

When the skin is contaminated by pollutants, the pollutants should be removed immediately, and then the skin should be wiped for more than 3 minutes with a disposable absorbent material dipped with 0.5% Povidone-iodine or hydrogen peroxide, and washed with water; the mucous membrane should be washed with a large amount of physiological saline or be rinse and disinfected with 0.05% Povidone-iodine.

9) Tableware (drinkware)

After the tableware or drinkware is cleared of food residues, it should be boiled and sterilized for 30 minutes, or a chlorine-containing disinfectant with an effective chlorine of 500m /L can be used to soak the tableware/drinkware for 30 minutes, before it is washed clean with water.

10) Transportation and transfer vehicles

The pollution situation should be evaluated first. When there are visible pollutants in trains, cars, and ships, one should first use disposable absorbent materials dipped with 5000mg/L -10000mg/L chlorine-containing disinfectant (or disinfectant wipes/dry towel able to achieve high level disinfection) to completely remove the pollutants, and then spray or wipe the area with 1000mg/L chlorine-containing disinfectant or 500mg /L chlorine dioxide, and wipe with clean water after 30 minutes of disinfection. When disinfecting aircraft cabins, disinfectant types and dosages should be selected in accordance with the relevant regulations of the Civil Aviation Administration of China. Fabrics, cushions, pillows and sheets are recommended to be collected and centrally treated as medical waste.

11) Daily waste of patients

The domestic waste of patients should treated as medical waste.

12) Medical waste

The disposal of medical waste should follow the requirements of the *Medical Waste Management Regulations* and the *Medical Waste Management Measures of Medical Institutions.* The waste should be collected, packed and sealed through standard use of double-layered yellow medical waste collection bags and follow the normal disposal procedures for disposal.

13) Dead body disposal

After the death of the patient, one should minimize the movement and handling of the corpse and leave it to be promptly handled by trained staff under strict protection. Cotton balls or gauzes with 3,000mg/L-5,000mg/L chlorine-containing disinfectant or 0.5% peracetic acid should used to fill the patient's mouth, nose, ears, anus, trachea opening and other open channels or wounds; the body should be wrapped with a double-layer cloth soaked with disinfectant, placed in a double-layer body bag, and sent directly by a special vehicle from the civil affairs department to the designated place for cremation as soon as possible.

14) Precautions

The on-site disinfection work should be conducted in time by relevant organizations under the guidance of the local disease prevention and control agency, or the local disease prevention and control agency should be responsible for the disinfection. The medical institution's disinfection at any time and their terminal disinfection should be arranged by the medical institution, with technical guidance from the disease control agency. Non-professionals should receive professional training from local disease prevention and control agency before starting disinfection, so that they can adopt correct disinfection methods and have thorough personal protection.

IV. Evaluation of the disinfection effect

When necessary, the disinfection effect of the object surface, air, and hands should be evaluated in a timely manner by relevant laboratory personnel eligible for such testing.

1) Object surface

The surface of the object before and after disinfection should be sampled according to GB15982-2012 "*Hygienic Standard for Disinfection in Hospitals"*, with the sampling solution after disinfection being the corresponding neutralizer.

The evaluation of disinfection effect is generally based on natural bacteria. If necessary, indicator bacteria can also be used to evaluate the disinfection effect according to the actual situation. The resistance of the indicator bacteria should be equal to or greater than the existing pathogens. When using natural bacteria as an indicator, the killing rate of natural bacteria on the disinfected object after disinfection should be ≥90%, to render the disinfection qualified; when using the indicator bacteria as an indicator, the killing rate of the indicator bacteria after disinfection should be ≥99.9%, before the disinfection can be considered as qualified.

2) Indoor air

Air before and after disinfection should be sampled according to GB5982-2012 "*Hygienic Standard for Disinfection in Hospitals*", the sampling plate for the air after disinfection should contain the corresponding neutralizing agent. The killing rate of natural bacteria in the air after disinfection should ≥90%, so as to render the disinfection qualified.

3) Staff hands

Pre and post disinfected hands should be sampled according to the Appendix A under GB15982-2012 "*Hygienic Standard for Disinfection in Hospitals*" with the sampling solution for post disinfected hands being the corresponding neutralizer. The killing rate of natural bacteria on the hand after the disinfection should be ≥90%, to render the disinfection qualified.

4) Disinfection effect of hospital sewage

Evaluate should be made according to the relevant provisions in GB18466 "*Water Pollutant Discharge Standards for Medical Institutions*".

Annex 5

Guidelines for Personal Protection of Specific Groups

These Guidelines are used for the prevention and control of the new coronavirus pneumonia among professionals who carry out epidemiological investigations, work in isolation wards and medical observation sites, are involve in transporting of cases, infected persons and dead bodies, as well as environmental cleaning and disinfection, specimen collection and laboratory work etc.

I. Personal protection equipment and its usage

All persons who come into contact with, or may come into contact with new coronavirus pneumonia patients and asymptomatic infected persons, their pollutants (blood, body fluids, secretions, vomitus and excreta, etc.) and contaminated items or object surfaces, should use personal protective equipment, including:

1) Gloves

When entering a contaminated area or performing diagnosis and treatment, one should wear disposable rubber or nitrile gloves according to the work content; disinfect, replace gloves and perform hand hygiene in time when contacting different patients or when the gloves are broken.

2) Medical protective masks

When entering a contaminated area or performing diagnosis and treatment, one should wear a medical protective mask or a powered air filter respirator. Before each wear, an air tightness check should be performed. When wearing multiple protective equipment, one should ensure that the medical protective mask is removed as the final step.

3) Protective face shields or goggles

When one is entering a contaminated area or performing diagnosis and treatment, and when one's eyes, eye conjunctiva, and face are at risk of being contaminated by blood, body fluids, secretions, excreta, and aerosols, one should wear a protective face shield or goggles. After taking off reusable goggles, one should sterilize and dry it in time for the next use.

4) Protective suit

When entering a contaminated area or performing diagnostic and treatment, one should change his or her personal clothing and wear work clothes (surgical scrubs or disposable clothing, etc.), plus protective clothing.

II. Hand hygiene

All personnel participating in the field work should strengthen their hand hygiene measures. An effective alcohol-based hand-drying disinfectant can be selected, or directly wipe with 75% ethanol disinfection;

Those who are allergic to alcohol, can choose the effective non-alcohol hand disinfectant such as quaternary ammonium disinfectant; Under special conditions, you can also use 3% hydrogen peroxide disinfectant, 0.5% IodoPhor or 0.05% chlorine-containing disinfectant to wipe or soak your hands, and appropriately prolong the disinfection time. Hands should be washed with liquid soap and running water before disinfection when there are visible pollutants.

Hand hygiene measures should be strictly taken in daily work, especially before wearing gloves and personal protective equipment, before performing aseptic operations on patients, after possibly touching the patient's blood, body fluids and contaminated items or surrounding surface, and when removing personal protective equipment.

III. Personal protection for special groups

1) Epidemiological investigators

When investigating close contacts, the investigators should wear disposable work caps, medical surgical masks, work clothes, and disposable gloves, keeping a distance of more than 1 meter from the target of investigation.

When investigating suspect cases, confirmed cases and asymptomatic infected persons, it is recommended to wear work clothes, disposable work caps, disposable gloves, protective clothing, KN95 / N95 or above particulate protective masks or medical protective masks, protective face shields or goggles, work shoes or rubber boots, waterproof boot covers, etc.

2) Staff in isolation wards and medical observation sites

It is recommended to wear work clothes, disposable work caps, disposable gloves, protective clothing, medical protective masks or powered air filter respirators, protective face shields or goggles, work shoes or rubber boots, waterproof boot covers, etc.

3) Personnel transporting cases and asymptomatic infected persons

It is recommended to wear work clothes, disposable work caps, disposable gloves, protective clothing, medical protective masks or powered air filter respirators, protective face shields or goggles, work shoes or rubber boots, waterproof boot covers, etc.

4) Corpse handling personnel

It is recommended to wear work clothes, disposable work caps, disposable gloves and long-sleeved thick rubber gloves, protective clothing, KN95 / N95 or above particulate protective masks or medical protective masks or powered air filter respirators, Protective face shields, work shoes or rubber boots, waterproof boot covers, waterproof aprons or waterproof isolation gowns, etc.

5) Cleaning and disinfection personnel

It is recommended to wear work clothes, disposable work caps, disposable gloves and long-sleeved thick rubber gloves, protective clothing, KN95 / N95 or above particulate protective masks or medical

protective masks or powered air filter respirators, Protective face shields, work shoes or rubber boots, waterproof boot covers, waterproof aprons, or waterproof isolation gowns. When using powered air-supply filter respirators, one should select a dust-and-toxicant filter box or canister according to the type of disinfectants, and properly protect themselves from disinfectants and other chemicals.

6) Specimen collection staff

It is recommended to wear work clothes, disposable work caps, double gloves, protective clothing, KN95/N95 or above particulate protective masks or medical protective masks or powered air filter respirators, protective face shields, work shoes or rubber boots, and waterproof boot covers. If necessary, one should wear a waterproof apron or waterproof isolation gown.

7) Laboratory staff

It is recommended to wear at least work clothes, disposable work caps, double gloves, protective clothing, KN95 / N95 or above particulate protective masks or medical protective masks or powered air filter respirators, protective face shields or goggles, work shoes or rubber boots, waterproof boot covers. If necessary, one should wear a waterproof apron or waterproof isolation gown.

IV. Precautions for removal of personal protective equipment

1) Minimize contact with the contaminated surface when removing.

2) Non-disposable items such as protective goggles and rubber boots that have been removed should be directly dipped in a container with a disinfectant solution; the remaining disposable items should be placed in a yellow medical waste collection bag as medical waste for centralized disposal.

3) Hand disinfection should be performed at each step of removing protective equipment. After all protective equipment is removed, one should wash hands and disinfect hands again.