



COVID-19 epidemic prevention and control strategy for dental facilities in Jiangsu Province

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Abstract: Coronavirus disease 2019 (COVID-19) is an infectious disease caused by the novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19, which in severe cases can lead to pneumonia, is mainly transmitted through respiratory tract droplets. Dental healthcare personnel are at high risk of the novel coronavirus infections due to the close contact with patients required during their work. Biological factors, physical factors, dust, and chemical agents all may cause potential occupational exposure to COVID-19 for oral medical staff. To reduce the risk of contracting and transmitting COVID-19 infection, prevention and control measures to effectively control the source of infection and cut off the transmission routes should be taken before, during, and after dental practice. Jiangsu Provincial Center for Disease Control and Prevention has formulated technical guidelines for the prevention and control of COVID-19 in dental facilities in Jiangsu based on local healthcare standard criteria. These guidelines are effective for the prevention and control of COVID-19. This article introduces the main occupational hazards of dental medical institutions and the detailed content of the guidelines, which is aiming to guide the dental medical institutions to standardize the prevention and control measures of the COVID-19 epidemic. With strong operability and practicality, these guidelines could also be used as a reference during epidemics of other infectious diseases.

Keywords: Coronavirus disease 2019 (COVID-19); dentistry; dental practice

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Introduction

A novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in December 2019. SARS-CoV-2 belongs to the coronavirus family, which includes severe acute respiratory syndrome coronavirus (SARS-CoV) and the Middle East respiratory syndrome coronavirus (MERS-CoV). The disease caused by the novel coronavirus was termed coronavirus disease

2019 (COVID-19) by the World Health Organization. COVID-19 has been classified as a statutory Class B infectious disease by China's National Health Commission, although Class A infectious disease measures have been taken to effectively control its spread. Dental healthcare personnel are at high risk of nosocomial infections due to the close contact with patients required during their work. Patients may be asymptomatic carriers or in the incubation period, thereby leading to a risk of nosocomial

cross-infection. The risk of infection can only be reduced by effectively controlling potential sources of infection and cutting off the routes of transmission. In response to the need for measures to prevent and control the transmission of COVID-19 in dental facilities, Jiangsu Provincial Center for Disease Control and Prevention has compiled a set of local healthcare standard criteria as a guideline.

Occupational exposure during dental practice

Potential occupational exposure and process of occurrence

Biological factors

Dental healthcare personnel come into close contact with patients and are frequently exposed to body fluids, such as blood and saliva, during their work. These body fluids can contain pathogenic microorganisms, including *Mycobacterium tuberculosis*, mumps virus, human immunodeficiency virus, hepatitis B virus, hepatitis C virus, and aspergillus. During the COVID-19 pandemic, there is the additional risk of exposure to SARS-CoV-2. Dentistry involves the use of dental instruments, such as high- and low-speed handheld tools, as well as ultrasonic scalers, which can generate aerosols that facilitate the further spread of infectious diseases.

Physical factors

The first physical factor in dental practice is noise. Instruments such as high-speed handheld instruments, ultrasonic scalers, saliva ejectors, and bench grinders can emit noise, and long-term exposure to noise at a certain intensity can cause varying degrees of damage to the auditory, cardiovascular, endocrine, and immune systems. The second physical factor is radiation, comprising both non-ionizing radiation from dental curing lights, cold-light bleaching, and laser beams, as well as ionizing radiation based on radiation examinations and treatments.

Dust

Dust is another factor in dental practice. Equipment such as dental sandblasters and grinders can generate dust, which can cause chronic inflammation of the respiratory tract. Long-term dust inhalation can even lead to lung diseases.

Chemical agents

Chemical agents are the fourth factor in dental practice. Volatile substances such as glutaraldehyde and peracetic acid that are used in dental practice can cause severe irritation of

the eyes, nose, respiratory tract mucosa, and skin. Moreover, amalgam fillings can be damaging to the human body.

Prevention and control measures

Basic requirements

Organization and management

The dental medical institutions should strictly implement the primary responsibilities for epidemic prevention and control. And a committee for emergency response to the COVID-19 pandemic, led by the principal person in charge of the medical institution, should be established. A leading group for epidemic prevention and control should be established, with specific responsibilities designated to specialized departments and personnel.

Protocol development

Medical institutions should establish a precautionary system and develop emergency plans and work protocols based on the etiological characteristics of COVID-19 as well as factors relating to the sources of infection, transmission routes, susceptible populations, and diagnosis and treatment of the disease.

Material support

Funds and supplies that are necessary for the prevention and control of COVID-19 should be stockpiled, while efforts to acquire supplies, including protective equipment, disinfectants and disinfectant equipment, medical devices, and drugs, should be strengthened in response to the epidemic.

Staff training

Dental personnel should be given job- or task-specific training. Staff members from high-risk departments, including the fever clinic, internal medicine clinic, pediatric clinic, emergency department, imaging department, intensive care unit (ICU), and respiratory ward, should be specially trained to improve their comprehension of the knowledge, measures, and skills needed for the effective prevention and control of infection. Training for dental personnel should have the multipronged aim of early detection, early reporting, early isolation, early diagnosis, early treatment, and early control.

Personnel protection

Dental medical institutions should standardize the

procedures of disinfection, isolation, and protection. Sufficient supplies for the protection of medical personnel, such as disinfectant products and personal protective equipment (PPE), including surgical masks, medical protective masks, gowns, and goggles of an acceptable quality, should be stocked. Standard measures for the prevention and control of contact spread, as well as droplet and airborne transmission, should be strictly implemented. Hand hygiene and the correct selection and wearing of masks are especially important.

Health management

Medical institutions should allocate human resources rationally, with appropriate work shift arrangements to prevent medical personnel from being overworked, and should also provide a nutritious diet to enhance the immunity of staff. Health monitoring, including for fever and respiratory symptoms, should be actively and regularly conducted according to occupational characteristics and the results of risk assessment. Measures should be taken to protect the health of medical personnel who provide health services to patients.

Risk assessment before dental treatment

Pretreatment examination and screening of patients

Reception areas should be set up. When checking health codes, recording temperatures, and obtaining initial information about patients' conditions, receptionists should ensure first-level protective measures are strictly followed. Patients whose body temperature is ≥ 37.3 °C should be given a disposable surgical mask immediately, and then guided to the fever clinic for further evaluation.

Patient risk classification

The following categories should be used to classify patients according to risk:

- ❖ Category A: patients with suspected or confirmed COVID-19 and asymptomatic patients with positive results on nucleic acid tests.
- ❖ Category B: patients who are basically excluded from a diagnosis of COVID-19 according to the Diagnosis and Treatment Plan for COVID-19 (Trial Version 7) (1) but have characteristics consistent with one of the following conditions: (I) An epidemiological history pertinent to COVID-19, including: return from a medium- or high-risk area, or home or centralized observation, in the past

14 days; a visit to a place with a cluster outbreak of COVID-19; or contact with a confirmed case in the past 14 days. (II) Patients with fever (≥ 37.3 °C) and/or respiratory symptoms. (III) Patients with other clinical characteristics. Further, Category B is divided into two subcategories. Category B1 includes patients with acute infections and trauma to the teeth, jaws, or face who need urgent treatment or those whose condition is life-threatening and who need treatment under high-level protection. Category B2 includes patients who do not need require treatment, such as those with non-life-threatening conditions. Patients in category B2 should visit the fever clinic at a general hospital or self-isolate at home. After meeting the exclusion criteria of COVID-19, they could undergo routine diagnosis and treatment in accordance with the guidelines specified for Category C patients should be.

- ❖ Category C: patients who have passed the COVID-19 pretreatment examination and screening protocol of the institution.

Classification of contamination risk during dental procedures

The risk of contamination during dental procedures can be classified as follows:

- ❖ High risk: procedures using high-speed powered instruments, such as ultrasonic scalers and high-speed handheld instruments, which require a large amount of liquid for cooling during pulp opening, crown preparation, ultrasonic scaling, or sandblasting.
- ❖ Medium risk: procedures using low-speed powered instruments and with a relatively short duration, such as simple occlusal adjustment or denture repair.
- ❖ Low risk: procedures that do not require any powered devices, such as dental examination, hand scaling, simple tooth extraction, or dressing change.

Clinic selection

Category A patients should be referred to a designated hospital for diagnosis and treatment according to the corresponding management requirements.

Category B1 patients should be treated in a separate patient clinic, and a ratio of one patient per room should be ensured. For clinics with independent ventilation systems, the return air vents should be turned off and only supply air

vents should be operated to ensure favorable air circulation. For medical institutions with good infrastructural facilities, high-efficiency exhaust systems can be installed to ensure the swift removal of polluted air from indoors with outlets that are situated far away from populated areas.

Category C patients undergoing high-risk procedures should be treated either in a separate patient clinic (i.e., one patient per room) or in a dental operatory unit with partitions (at least 1.5 m in height, with the length covering the entire extension of the dental chair) and air disinfection machines. When undergoing medium-risk procedures, Category C patients should be treated either with a single patient per room or in a dental operatory unit with partitions (at least 1.5 m in height, with the length covering the extension of the dental chair). For low-risk procedures, dental treatment can be given in a dental operatory unit with partitions.

Infection prevention and control during dental practice

Environmental control

Air purification and disinfection

Clinics with natural ventilation should be ventilated for at least 30 minutes before the initiation of dental practice, at noon, and after dental practice. Under favorable weather conditions, windows should be kept open during treatment to improve air circulation. When ventilation is not possible, an air cleaning and disinfection machine should be used to purify and disinfect the air. When a central air conditioning system with return-air ducts is used, the return-air vents should be turned off to ensure only fresh air is circulated. Medical institutions should decide the type of ventilation system, the source of fresh air, and the scope of air supply before the centralized air conditioning system is turned on.

Environmental cleaning and disinfection of clinics

The number of items kept within the clinic and on the countertops should be reduced, or the items should be covered to prevent contamination. During dental practice, high-evacuation suction apparatus should be used for high-risk procedures. Firstly, the medical contact surfaces in the dental operatory unit can be classified into two types. (I) Medical contact surfaces that are subject to contamination but difficult to clean, such as lamp handles, operation buttons of dental chairs, air/water syringe handles, and saliva ejector handles, should be covered with single-use disposable isolation films (sheaths) that should be replaced after each use and wiped and disinfected after exposure to potential contaminants. (II) Other medical contact

surfaces, including dental chair headrests, dental lamps, armrests, gargle basins, and countertops of workstations, should be cleaned and disinfected after each procedure with disinfectant wipes, 75% alcohol, or disposable paper (cloth) towels containing chlorine preparations with an effective concentration of 500 mg/L. Reusable cloth towels should not be used. Secondly, non-medical contact surfaces in the dental operatory unit, such as cabinets, drawers, and computer keyboards, should be cleaned and disinfected after the completion of daily dental practice (i.e., terminal disinfection) with appropriate disinfectant wipes, 75% alcohol, or disposable paper (cloth) towels containing chlorine preparations with an effective concentration of 500 mg/L. Thirdly, the floor of the dental operatory unit should be kept clean and dry, be cleaned and disinfected using chlorine-containing preparations with an effective concentration of 500 mg/L every 4 hours, and decontaminated, cleaned, and disinfected whenever obviously polluted.

Environmental cleaning and disinfection of waiting areas

According to the requirements of WS/T512 (2), surfaces that are frequently touched, such as elevator buttons and doors, door handles, and other contact surfaces in public areas, should be cleaned and disinfected every 2 hours. Floors should be kept clean and dry, and should be cleaned and disinfected with chlorine-containing preparations with an effective concentration of 500 mg/L every 4 hours.

Personnel management and protection

In order to reduce the movement of people, medical personnel should not enter the clinic unnecessarily during dental practice. Medical personnel should select appropriate PPE according to the risk classification of the procedures. When treating Category A patients, all operating staff are at a high risk of occupational exposure. Strict hand hygiene should be practiced, and operating caps, medical protective masks, gloves, goggles or full-face shields, shoe covers, and work clothing, gowns, or isolation clothing should be worn during the procedure. When treating Category B1 patients, all operating staff are at high risk of occupational exposure. Strict hand hygiene should be practiced, and operating caps, medical protective masks, work clothing, gowns, gloves, goggles or full-face shields, and shoe covers should be worn during the procedures. For Category C patients, strict hand hygiene should be practiced and, depending on the level of exposure, the following protective measures for high, medium-, and low-risk procedures should be adhered to: (I) high-risk procedures: staff should wear operating caps,

surgical masks (medical protective masks when necessary), work clothing, gowns, gloves, goggles or full-face shields, and shoe covers. (II) Medium-risk procedures: staff should wear operating caps, surgical masks (medical protective masks when necessary), work clothing, gowns, gloves, goggles or full-face shields, and shoe covers. (III) Low-risk procedures: staff should wear operating caps, surgical masks, work clothing, gloves, goggles, and shoe covers. Isolation clothing, gowns, goggles, and full-face shields must not be worn outside the clinic. Contaminated gowns should be replaced immediately. Disposable gowns and protective clothing should be properly disposed of after use. Medical personnel should implement the hand hygiene principle of “two before and three after” in accordance with the requirements of WS/T 313 (3). Wearing gloves is not a substitute for hand hygiene. Non-medical contact areas, such as cabinets, drawers, keyboards, medical charts, and radiographs, should not be touched with contaminated gloves.

Infection prevention and control after dental practice

Environmental cleaning and disinfection

After the completion of high-risk procedures for Category B1 and C patients, terminal disinfection should be carried out. The next patient must only be seen after object surfaces, the floor, and the air have been completely cleaned and disinfected.

Instruments management

Reusable medical instruments should be reclaimed, cleaned, disinfected, and sterilized according to the requirements stated in WS 310.2 (4) and WS 506 (5). The instruments used for Category B1 patients should be sealed and transported, then disinfected and sterilized according to the institutional requirements for special infected instruments. The instruments used for Category C patients should be managed in a similar way to routine surgical instruments. After each dental procedure, reusable goggles and face shields should be cleaned and disinfected with 75% alcohol or disinfectant wipes, dried, and then stored in a clean area for subsequent use. Stethoscopes, sphygmomanometers, and other healthcare items should be wiped and disinfected with 75% alcohol or chlorine-containing preparations with an effective concentration of 500 mg/L after each use. Contact thermometers should be soaked in 75% alcohol for 30 minutes and dried before use. The use of disposable instruments is advised for Category B1 patients. After treatment, reusable fabrics should be handled according to

the relevant infection prevention and control measures and be packed in disposable water-resistant packaging bags.

Medical waste disposal

Medical waste generated by Category A patients should be managed according to the requirements for medical waste management, including packaging in double-layer packaging bags for disposal as medical waste. Thereafter, the surface of the packages should be sprayed with a chlorine-containing preparation with an effective concentration of 1,000 mg/L, and the packages should then be placed in a disposable pressure-resistant hard carton and sealed. Specific marks should be made on the carton surface, and the cartons should subsequently be transported by designated personnel in a special car and managed in the centralized disposal unit for medical waste. Medical waste generated by Category B and C patients should be collected and transported in accordance with routine procedures.

Discussion

At present, the COVID-19 epidemic is effectively under control in most areas of China. However, outbreaks have been recorded in Beijing and Northeast China, and the fight to control the COVID-19 pandemic is still ongoing in most other countries. Consequently, China is facing increasing pressure with regard to “foreign import and domestic rebound”. Medical institutions have fully resumed normalized work. For dental healthcare personnel, improving personal protection and controlling the spread of the disease during treatment have become major issues. In accordance with the requirements of the *Technical Guidelines on the Prevention and Control of COVID-19* in Medical Institutions, issued by the National Health Commission (First Edition) (6), the Center for Disease Control and Prevention of Jiangsu Provincial has formulated and released a local standard regulation of DB32/T 3761.24-2020: *Technical Specifications of Prevention and Control of COVID-19 Part 24: Dental Facilities*, as well as work characteristics and procedures for dental treatment. The standard regulations describe the prevention and control measures for COVID-19 in dental facilities, with the aim of cutting off transmission routes for the virus to prevent its cross-infection and spread. Dental healthcare personnel with a risk of exposure to SARS-CoV-2 should master the knowledge and skills necessary for the prevention and control of COVID-19, and demonstrate a high awareness of self-protection, including by implementing self-protection

measures, practicing infection control and hand hygiene, and using protective equipment. This standard regulation, with strong operability and practical significance, is suitable for the prevention and control of COVID-19, and it could be referred to during epidemics of other infectious diseases.

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Footnote

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