

## Scientific Research Report

## Emergency Management in a Dental Clinic During the Coronavirus Disease 2019 (COVID-19) Epidemic in Beijing

Chao Wang<sup>a,\*\*\*</sup>, Li Miao<sup>a,\*\*\*</sup>, Zhigang Wang<sup>b,\*\*\*</sup>, Yanjie Xiong<sup>a</sup>, Yang Jiao<sup>a\*</sup>, Hongchen Liu<sup>C\*\*</sup><sup>a</sup> Department of Stomatology, The Seventh Medical Center of PLA General Hospital, Beijing, China<sup>b</sup> Department of Infection Control, The Seventh Medical Center of PLA General Hospital, Beijing, China<sup>c</sup> Department of Stomatology, The First Medical Center of PLA General Hospital, Beijing, China

## ARTICLE INFO

## Article history:

Available online 7 October 2020

## Key words:

COVID-19

Risk management

Epidemiology

Cross-infection

Health policy

Public policy

Patient education

Indoor air pollution

**Background:** In mid-March 2020, the World Health Organization declared that COVID-19 was to be characterised as a pandemic. The purpose of this article is to recommend emergency management procedures for dental clinics during this public health emergency.

**Materials and Methods:** We have implemented a series of emergency management measures to prevent cross-infection in our dental clinic during the COVID-19 pandemic, including personnel scheduling, division of the clinic into functional areas, limitation or delay of non-emergency patients, staff protection and infection controls, clinical environmental disinfection, and the use of online consultation services, among others.

**Results:** Due to public health policy and dental emergency management, the number of dental visitors to our clinic dropped sharply, and no COVID-19 suspected cases or high-risk patients received treatment. There have been no reports of infection of dental staff or patients during dental treatment in China to date.

**Conclusion:** These public health policies and dental emergency management measures were effective in controlling cross-infection of COVID-19 in the dental clinic.

**Practical Implications:** We share control measures for COVID-19, and hope that they will be helpful for dental professionals worldwide to continue to provide dental care in a safe and orderly manner.

© 2021 The Authors. Published by Elsevier Inc on behalf of FDI World Dental Federation.

This is an open access article under the CC BY-NC-ND license

[\(http://creativecommons.org/licenses/by-nc-nd/4.0/\)](http://creativecommons.org/licenses/by-nc-nd/4.0/)

## Introduction

At the end of December 2019, an acute respiratory disease caused by a previously unknown beta-coronavirus emerged in the city of Wuhan, Hubei province, and transmitted rapidly throughout China before the Spring Festival<sup>1</sup>. Soon after, the novel virus was isolated from patients' respiratory epithelia, and on 12 January was temporarily named the 2019 novel coronavirus (2019-nCoV) by the World Health Organization (WHO). On 11 February, the International Commission of Virus Classification declared the virus was named severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and,

on the same day, the WHO announced that the disease caused by the infection was named coronavirus disease 2019 (COVID-19)<sup>2–4</sup>.

The most common symptoms presented by those suffering from COVID-19 include fever and cough, with less common symptoms including sputum production, headache, haemoptysis and diarrhoea<sup>1,5,6</sup>. Ground-glass opacity is the typical radiological finding on chest computed tomography<sup>1,5,7,8</sup>. Moreover, the two major oral-related symptoms, dry mouth and amblygeusia, have been present in a relatively high proportion of COVID-19 patients, suggesting that oral symptoms can also be considered as initial symptoms of COVID-19 infection<sup>9</sup>.

Most of the cases reported in January and February had either been in contact with people from Wuhan or had been to Wuhan recently<sup>1,8,10,11</sup>. The incubation period of the virus varies from 0 to 24 days<sup>1,5,6</sup>, and asymptomatic infections have been recorded<sup>12</sup>.

Due to the flu-like symptoms, long period of incubation, various transmission routes and asymptomatic infections,

\* Corresponding author. Yang Jiao, Department of Stomatology, The Seventh Medical Center of PLA General Hospital, Beijing, China.

\*\* Hongchen Liu, Department of Stomatology, The First Medical Center of PLA General Hospital, Beijing, China.

E-mail addresses: [jiaoyang1989731@163.com](mailto:jiaoyang1989731@163.com) (Y. Jiao), [liu-hc@301dent.com](mailto:liu-hc@301dent.com) (H. Liu).

\*\*\* C.W., L.M. and Z.W. contributed equally to this work.

<https://doi.org/10.1111/idj.12609>

0020-6539/© 2021 The Authors. Published by Elsevier Inc on behalf of FDI World Dental Federation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

the COVID-19 epidemic has spread rapidly throughout the world by human-to-human transmission<sup>3,13</sup>.

With the rapid transmission of the epidemic, the WHO announced that COVID-19 formed a Public Health Emergency of International Concern (PHEIC) on 31 January 2020. The WHO made the assessment that COVID-19 can be characterised as a pandemic as of mid-March.

During the COVID-19 pandemic, both dental patients and staff are at high risk of being infected in the oral therapy practice. Dentists and nurses are in direct contact with patients' open mouths, and are exposed to both coughing and breathing. Furthermore, the high-speed gas and running water of dental handpieces generate large amounts of aerosol and droplets mixed with the patient's saliva or blood<sup>14,15</sup>. These fluids pollute the clinical space and the surfaces of various dental devices, increasing the risk of infection for clinic staff and subsequent dental patients<sup>16,17</sup>.

Here, we share experiences of emergency management in our dental clinic during the COVID-19 epidemic from the end of January to mid-March, when the outbreak of the COVID-19 epidemic was growing in Beijing.

## Materials and methods

Based on the guidance of National Health Commission, a series of measures have been taken to reduce the possibility of cross-infection in dental clinics, and meanwhile to provide emergency dental services.

### Advance preparation in the dental clinic

#### Personal scheduling and infection control training

Details about contact history, any symptoms of fever or cough, commuting method, and residential location should be collected as accurately as possible for each staff member. According to gathered personal information and the predicted number of patients, the dental clinic director of our clinic evaluated the risk of COVID-19 infection for each individual and made the dental clinic on-duty arrangements.

Infection control training for dentists and nurses is necessary before they begin to work. Hand hygiene and the dressing and removal of medical protection suits are the most important part of training. These procedures were based on consultations with medical professionals who had experienced and worked through SARS in 2003.

#### Division of the dental clinic into functional areas

The 'three zones and two passageways' layout is the basic requirement of an infectious disease negative pressure isolation room<sup>18,19</sup>. The three zones refer to the clean area, semi-polluted area, and polluted area, and the two passageways refer to separate passageways for patients and medical staff. During the COVID-19 epidemic, this requirement was introduced into dental clinic management. The semi-polluted area is the buffer zone from the clean area to the dental treatment room area, where dentists and nurses wash their hands, disinfect, and change their shoes and clothes before moving from one area to another. Due to the limited equipment and the original layout, our dental clinic failed to

achieve positive air pressure in the clean zone, or negative air pressure in the semi-polluted and patient zones; the air pressure of all three zones was equal. The central air conditioning and ventilation systems were turned off to avoid cross-infection among the zones or even across the whole building.

#### Splash treatment room

The splash treatment room is specially prepared for certain kinds of dental procedures that apply high-speed rotating dental drills or ultrasonic vibrating dental cleaners. The splash treatment room is isolated and should be located in a remote area of the department far away from the other dental treatment areas, with good ventilation, a buffer area and reasonable passageway management. All unrelated items should be removed or stored in a cabinet to keep the surfaces clean and smooth. Together, this makes disinfection of the splash treatment room more effective. Povidone-iodine solution at a concentration of 0.5%–1% is highly recommended as mouthwash before dental treatment, as it may provide a protective oropharyngeal hygiene measure for individuals at high risk of exposure to oral and respiratory pathogens, including SARS-CoV and MERS-CoV<sup>20</sup>. Moreover, we employ rubber dam and suction in the splash treatment room to reduce saliva splashing (Figure 1).

#### Contingency plan: isolated treatment room for patients at high risk of COVID-19

The isolated treatment room is prepared for patients who have been evaluated as at high risk of COVID-19, and who concurrently need an emergency oral treatment. Because of the limited space in our dental clinic, one splash treatment room will be temporarily transformed into the isolated treatment room. Environmental disinfection will be more stringent and no further treatment will be performed in the same room for at least 4 hours.

#### Adjustment of the medical process

##### Preview triage first and then registration

It was a convention that registration came first in the former medical process. However, given the epidemic, we have



**Fig. 1 – Dental professionals with personal protective equipment (PPE) and use of the rubber dam and suction in the isolated treatment room.**

adjusted the procedure so that dental nurses preview and evaluate the patients in advance. The aim of this change is to evaluate the COVID-19 risk in prospective patients to arrange the treatment order and time, reducing the possibility of cross-infection.

#### Patient evaluation

Patient evaluation was determined to be an important part of cross-infection control. Dentists and nurses should be able to identify a suspected case of COVID-19 or an individual at high risk. Based on the Guideline for the Diagnosis and Treatment of Novel Coronavirus Pneumonia (5th edition) by the National Health Commission of the People's Republic of China, we designed a questionnaire to administer for patient evaluation (Table 1).

There are four main categories of the dental patient evaluation. Patients (category A) with no fever, no symptoms listed, and who reply 'no' to all questions about epidemiological history are able to receive dental treatment immediately. Patients (category B) who have a fever of more than 37.3°C, but who answer 'no' to all questions about epidemiological history, will be recommended to visit the Fever Clinic immediately. Patients (category C) who answer at least one 'yes' to the questions about epidemiological history, but who have

no fever and no other symptoms will be recommended to undergo medical isolation for 14 days at home. Patients (category D) who answer at least one 'yes' to the questions about epidemiological history, and who have a fever of more than 37.3°C or any respiratory symptoms will be treated as high-risk patients or suspected COVID-19 infections. The contingency plan of a suspected case in hospital will be enabled, and the patient will be isolated before undergoing chest computed tomography and laboratory detections.

#### Limitation or delay of non-emergency patients

On 30 January 2020, the Beijing Municipal Health Commission released a notice about how to carry out dental work during the epidemic. According to the notice, conventional dental service was to be interrupted, except for dental emergencies such as acute toothache, tooth trauma, maxillofacial trauma or infection.

#### Supply protocol of personal protective equipment

Providing personal protective equipment (PPE) to healthcare personnel plays an essential role in avoiding occupational

**Table 1 – Patient questionnaire before dental treatment.**

<p><b>In order to assist COVID-19 epidemic prevention, please answer the following questions before you visit a doctor. If you answer "Yes," fill the blank with "√"; If you answer "No," fill the blank with "×." Fill the "____" with the relevant answers. Thanks for your cooperation!</b></p>
<p><b>Essential information</b></p> <p>★ Patient Name: _____ Tel: _____ ID number: _____ Residential address in Beijing: _____</p> <p>★ Accompanying person Name: _____ Tel: _____ ID number: _____ Residential address in Beijing: _____</p>
<p><b>Symptoms</b></p> <p><input type="checkbox"/>Fever: Body temperature: _____ °C Maximum body temperature: _____ °C <input type="checkbox"/>Cough <input type="checkbox"/>Nasal obstruction <input type="checkbox"/>Running nose <input type="checkbox"/>Difficult breathing <input type="checkbox"/>Pharyngalgia <input type="checkbox"/>Muscular soreness <input type="checkbox"/>Diarrhea</p>
<p><b>Epidemiological history</b></p> <p><input type="checkbox"/> 1. Have you ever been to Wuhan or its surrounding areas, or a COVID-19 reported community in the past 14 days? <input type="checkbox"/> 2. Have you ever been in contact with a patient with respiratory symptoms or fever who come from Wuhan or its surrounding areas, or a COVID-19 reported community in the past 14 days? <input type="checkbox"/> 3. Have you ever been in contact with a confirmed case of COVID-19 in the past 14 days? <input type="checkbox"/> 4. Is there any clustering disease in your family or people you regularly contact?</p>
<p><b>Informed consent</b></p> <p>You have to promise:</p> <ol style="list-style-type: none"> <li>1. The information I provided is objective;</li> <li>2. I have been informed that providing false information or withholding information will delay the treatment, or may constitute a crime and undertake the civil compensation responsibility;</li> <li>3. I will wear a mask unless medical staff tell me to take it off;</li> <li>4. I have been informed of the infection risk of not wearing a mask and bear the detention or other legal consequences.</li> </ol> <p><b>Patient signature:</b> _____ <b>Date:</b> _____ <b>Accompanying person signature:</b> _____ <b>Date:</b> _____</p>

(The questionnaire was translated from Chinese for patients.)

exposure and infection<sup>21</sup>. However, the hospital has extremely limited PPE inventory, with a supply shortage of N95 respirators and protective suits.

The US Centers for Disease Control and Prevention has recommended gloves, gowns, respiratory protection and eye protection as standardised PPE for the COVID-19 infection control of healthcare personnel<sup>22</sup>. In early February 2020, the National Health Commission of the People's Republic of China issued 'Introduction of medical protection equipment application in the prevention of COVID-19' and other policies (<http://www.nhc.gov.cn/jkj/s7916/202002/485e5bd019924087a5614c4f1db135a2.shtml>).

According to these policies, the hospital management has developed a PPE supply protocol based on the COVID-19 infection risk of different jobs. Herein, we have detailed the supplemental supply protocol for dental clinics (Table 2). Our management strategies, as a temporary emergency plan, have extracted the greatest benefits from extremely limited resources to meet the emergency need. In our opinion and experience, there is neither medical necessity nor economic feasibility to supply all dental staff with N95 respirators and protective suits. We even used swimming goggles as eye protection at the beginning of the epidemic.

### Clinic environmental disinfection

Infection control measures were helpful in the containment of SARS as well as avian influenza in the past<sup>23</sup>. Environmental disinfection plays a much more important part in preventing COVID-19 cross-infection in the dental office, as dental procedures will generate large amounts of droplets and aerosols. Our set environmental disinfection standards for different areas are detailed in Table 3.

### Online dental care and consultation services

Online medical care is increasingly popular in China with the development of communication and use of the smartphone. It is also useful for outpatient education and management. Dental professional staffs in our clinic provide online medical care services for free by instant messaging APP or phone. Online medical consultations are playing an important role during the COVID-19 epidemic<sup>24</sup>.

## Results

### Dental patient evaluation in our clinic

All dental patients visiting our clinic were notified before treatment. In general, patients with COVID-19 who are in the acute febrile phase of the disease are not recommended to visit the dental clinic. From 31 January to 15 March, there were 94 visitors to our clinic in total. The number of patients (category A) was 92, and they received dental treatment. There were two patients in category B, who were recommended to visit the Fever Clinic immediately and ruled out COVID-19. No patients in category C or category D were identified in our clinic.

### The number of visitors and consultations

From 31 January to 15 March, there were 94 visitors to our clinic in total, a sharp decrease from the 3,803 visitors in the same period last year. Two cases of maxillofacial trauma, four cases of fascial space infection, 39 cases of acute toothache (of which 13 cases received treatment), two cases of chronic toothache, and 47 cases of other conditions (mainly asking for a prescription for medication) were seen (Table 4).

As of 15 March, dental professionals have completed approximately 189 free online dental consultations via messaging apps (QQ, Wechat) and telephone. These professionals offer medication guidance or emergency treatment advice at home, and evaluate the necessity of receiving further treatment in the dental clinic (Table 4).

### The number of visitors to our clinic and new confirmed cases of COVID-19 in Beijing each day from 26 January to 15 March

Figure 2 shows the number of visitors to our clinic and new confirmed cases of COVID-19 in Beijing each day from 26 January to 15 March. There were no visitors to our clinic from 26 January to 30 January, due to clinic closure during the spring holidays. Ten patients visited the clinic on 31 January, the first day postholiday. There were 44 visitors in total from 31 January to 6 February, and an average of 24 new COVID-19 cases were confirmed in Beijing during this period, indicating a growth peak. In response, a series of prevention management strategies was issued gradually by the government; people were restricted at their homes to reduce the risk of

**Table 2 – Supplemental supply protocol for dental clinic staff.**

Dental staff	PPE
Triage nurses and disinfection nurses	Surgical cap, eye protection, face shield, surgical mask, latex examination gloves, isolation gowns, plastic shoe covers
Dentists and nurses in the conventional treatment room	Surgical cap, eye protection, face shield, surgical mask, latex examination gloves, isolation gowns, plastic shoe covers
Dentists and nurses in the splash treatment room	Surgical cap, eye protection, face shield, surgical mask (+N95 respiratory protection), latex examination gloves, isolation gowns, plastic shoe covers
Dentists and nurses in the isolated treatment room	Surgical cap, eye protection, face shield, surgical mask (+N95 respiratory protection), double surgical gloves, protective suits, isolation gowns, plastic shoe covers

PPE, personal protective equipment.

**Table 3 – Environmental disinfection standard.**

Area	Location	Disinfection method	Disinfection frequency
Conventional treatment room and splash treatment room	Dental instruments	Autoclave sterilisation	Every case
	Dental chair and side table	Wipe with 75% alcohol-containing disinfectant wipes or 1,000 mg/L chlorine disinfectant solution	Every case
	Air	Aerosol spray with 10% sodium hypochlorite solution; ultraviolet disinfection lamp for 30 minutes; room ventilation through windows	Every single case
Clean and semi-polluted area	Floor	Mop the floor with 1,000 mg/L chlorine disinfectant solution	Twice a day
	Office equipment	Wipe with 75% alcohol-containing disinfectant wipes or 1,000 mg/L chlorine disinfectant solution	Twice a day
	Air	Aerosol spray with 10% sodium hypochlorite solution; ultraviolet disinfection lamp for 2 hours; room ventilation through windows	Twice a day
Waiting and registration area	Floor	Mop the floor with 1,000 mg/L chlorine disinfectant solution	Twice a day
	Infrared thermometer	Wipe with 75% alcohol-containing disinfectant wipes or 1,000 mg/L chlorine disinfectant solution	Every case
	Registration table	Wipe with 75% alcohol-containing disinfectant wipes or 1,000 mg/L chlorine disinfectant solution	Every 2 hours
	Chairs	Wipe with 75% alcohol-containing disinfectant wipes or 1,000 mg/L chlorine disinfectant solution	Twice a day
	Air	Aerosol spray with 10% sodium hypochlorite solution; room ventilation through windows	Twice a day
	Floor	mop the floor with 1,000 mg/L chlorine disinfectant solution	Twice a day

**Table 4 – The number of visitors or consultations (2020.01.31–2020.03.15).**

	Total number	Trauma	Fascial space infection	Acute toothache	Chronic toothache	Other causes
Outpatient	94	2	4	39	2	47
Online consultation	189	2	6	40	47	94

infection, contributing to no visitors to the clinic between 7 February and 19 February. With the COVID-19 epidemic slowly becoming controlled, the average number of new confirmed COVID-19 was 2, and there were less than 5 visitors to our clinic each day from 20 February to 15 March.

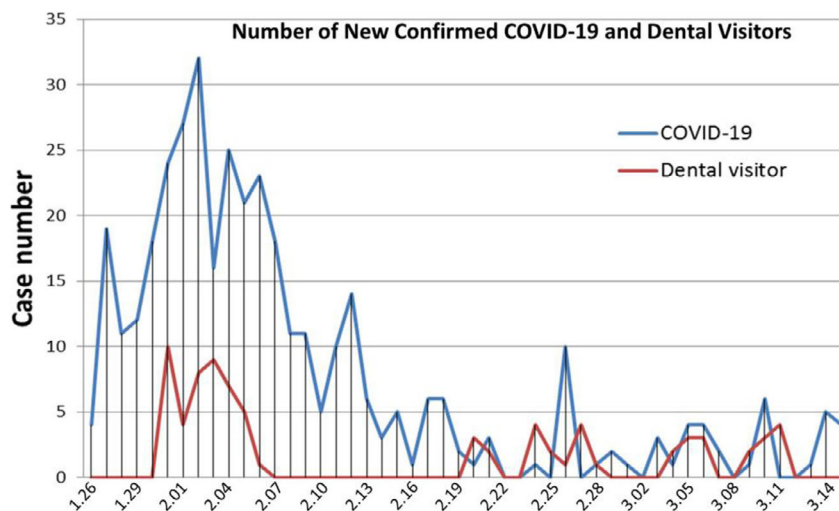
#### No infections because of dental treatment

As of 15 March, we have not provided dental emergency treatment for patients who have been evaluated as at high risk of

COVID-19. Also, no dental institute throughout Beijing, including our clinic, provided dental therapy to a confirmed case of COVID-19. There has been no reports of a dental staff member or patient being infected through dental treatment in China.

#### Discussion

As a novel coronavirus, SARS-CoV-2 is very similar to the virus that caused the SARS outbreak (SARS-CoV) of 2003. Both

**Fig. 2 – Number of dental outpatients in our clinic and new confirmed COVID-19 in Beijing (2020.01.31–2020.03.15).**

coronaviruses belong to a large family of single-stranded RNA viruses, in which MERS-CoV is also included<sup>25,26</sup>. Compared with SARS and MERS, COVID-19 has spread more rapidly, due in part to increased globalisation and the origin of the epidemic. The outbreak originated in Wuhan, one of the most important transportation hubs in China, shortly before the Spring Festival when the maximum passenger flow volume would occur<sup>27</sup>.

### Transmission routes and high-risk dental practice

Dental professionals are most concerned with the transmission routes of SARS-CoV-2<sup>16</sup>. Conventional transmission routes of SARS-CoV and MERS-CoV include respiratory droplets and direct contact<sup>26,28</sup>, but the importance of indirect contact transmission (involving contamination of inanimate surfaces) is uncertain<sup>26</sup>. In contrast, it has been reported that SARS-CoV-2 has been detected not only in respiratory droplets from coughs and sneezes, but also in the gastrointestinal tract, saliva and urine; the transmission routes of 2019-nCoV may therefore consist of fomite transmission alongside the conventional routes of respiratory viruses. There is also increasing evidence that the virus may spread through faecal–oral transmission and through the conjunctiva<sup>29,30</sup>, indicating the importance of hand hygiene in dental practice.

Most dental therapies are invasive and involve contamination through a short range of face-to-face positions; as a result, dental professionals will directly encounter respiratory droplets and contaminates from an open mouth. Dental pulp, gingiva, oral mucous and alveolar bone are all involved in the process of oral treatment, which can lead to the outflow and exudation of respiratory secretions, saliva, blood and tissue fluid. At the same time, stimulation and limited swallowing movements during treatment lead to the increase and retention of saliva and nasopharyngeal secretions in the oral cavity.

Dental procedures involving sandblasting devices, high-speed rotating dental drills and ultrasonic vibrating dental cleaners promote the vaporisation of saliva, blood and tissue fluid in the oral cavity, and generate large amounts of droplets and aerosols, which can remain suspended in the air for an extended period of time<sup>31</sup>. Droplets and aerosols floating in the clinic air contain many bacteria, fungi, viruses, tooth fragments and dental filling materials, which are an important source of air pathogen transmission in dental clinics that may contribute to the explosive COVID-19 epidemic.

Furthermore, a variety of instruments, assistant equipment and the surrounding environment would all be contaminated by bodily fluids of the patients. Once contaminated by the environment, hands can self-inoculate the mucous membranes of the nose, eyes and mouth. Poor hand hygiene will also increase the risk infection of COVID-19<sup>32</sup>.

As a result, routine dental procedures will probably accelerate the spreading of SARS-CoV-2. Certain management procedures should be performed to control the transmission routes and prevent COVID-19 infection in the dental clinic.

### Post-epidemic management

The ‘emergency only’ policy of the dental clinic is appropriate to implement during the epidemic threshold period to reduce

**Table 5 – Dental disease classification based on degree of emergency.**

Degree of emergency classification or dental diseases	Dental diseases, symptoms, dental service demand	Dental clinic visitation advice
Emergency	1 Acute toothache 2 Tooth trauma 3 Maxillofacial trauma or fascial space infection 4 TMJ dislocation 5 Persistent bleeding 6 Etc.	Immediate clinic visit
Secondary emergency	1 Interrupted orthodontic treatment 2 Chronic toothache 3 Dental filling 4 Root canal therapy 5 Etc.	Appointment registration or online consultation
Optional treatment	1 Orthodontic demand 2 Dental implant demand 3 Dental hygienic treatment 4 Prosthodontic demand 5 Etc.	Post-epidemic appointment registration or online consultation

the cross-infection risk, but is executed at the expense of the dental treatment of numerous patients. Fortunately, the COVID-19 epidemic is stabilising and becoming more controlled in Beijing as of mid-March, and new confirmed cases have only been imported from epidemic areas overseas like Italy and Iran. However, it has been predicted that the epidemic may be in a relatively low period at present, and has the potential to worsen again in the following months. Therefore, we plan to progressively expand the dental services offered in the clinic so that along with dental emergencies (acute toothache, tooth trauma, maxillofacial trauma or infection), secondary dental demands can also be satisfied (Table 5).

Dental professionals determine the priority of dental diseases by classification according to symptoms, diseases, severity degree and the potential of COVID-19 infection risk.

It has been predicted that there will be a rise in dental clinic visitors post-epidemic, along with large numbers of individuals with previously interrupted treatment. Therefore, it is highly recommended that no dental professional is absent from the workforce during the 2 months post-epidemic. Moreover, the supply of some imported medicines and instruments should be reserved in advance, as imported goods may be interrupted due to the spreading of COVID-19 overseas.

### Conclusions

Early public preventive measures were key to limiting the spread of the epidemic. There were 25 provinces that began the first-level response to this major public health emergency at 21:00 hours on 25 January, covering a total of 1.2 billion people. The number of new confirmed COVID-19 cases nationwide varied from 18 to 29 daily between 9 March and

15 March. We have, therefore, achieved phase achievements in mid-March. Based on guidelines from the National Health Commission and the Chinese Stomatological Association, dental professionals have continued to provide dental treatment during the COVID-19 epidemic. As of 15 March, there has been no report of a dental staff member or patient being infected through dental treatment in China.

By experiencing SARS in Beijing in 2003, and now COVID-19, we are reminded that every emerging infectious disease is a challenge to the whole of mankind. The importance of standard precautions for any patient and disinfection for the healthcare environment cannot be overemphasised in the dental office during the COVID-19 epidemic, due to the virus' rapid human-to-human transmission routes of respiratory, direct and indirect contact. To protect dental staff and promote disinfection, we have offered emergency dental treatment in clinic and consultation services online. Hence, this report relays useful lessons for dental professionals or hospital managers during both the present COVID-19 era and future epidemics.

### Acknowledgements

The authors appreciate Professor Zhao Wenfeng and head nurse Wang Liying for sharing their experiences and providing guidance after their own contributions to the SARS epidemic in 2003.

### Funding

None.

### Conflicts of interest

The authors declare no conflicts of interest.

### Author contributions

Research concept and design: Chao Wang, Li Miao, Hongchen Liu. Collection and assembly of data: Yanjie Xiong, Chao Wang. Data analysis and interpretation: Chao Wang, Li Miao, Zhigang Wang. Writing the article: Chao Wang, Yang Jiao. Critical revision of the article: Hongchen Liu, Zhigang Wang, Yang Jiao. Final approval of the article: Hongchen Liu, Chao Wang.

### REFERENCES

- Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395:497–506.
- Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;727–33.
- Wang C, Horby PW, Hayden FG, et al. A novel coronavirus outbreak of global health concern. *Lancet* 2020;395:470–3.
- Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* 2020;579:270–3.
- Zhang J-J, Dong X, Cao Y-Y, et al. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. *Allergy* 2020;75:1730–41.
- Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020;395:507–13.
- Xia W, Shao J, Guo Y, et al. Clinical and CT features in pediatric patients with COVID-19 infection: different points from adults. *Pediatr Pulmonol* 2020;55:1169–74.
- Sun P, Qie S, Liu Z, et al. Clinical characteristics of 50 466 hospitalized patients with 2019-nCoV infection. *J Med Virol* 2020;92:612–7.
- Chen L, Zhao J, Peng J et al. Detection of 2019-nCoV in Saliva and Characterization of Oral Symptoms in COVID-19 Patients (3/14/2020). Available at SSRN: <https://ssrn.com/abstract=3556665> or <http://dx.doi.org/10.2139/ssrn.3556665>
- Wang H, Wang Z, Dong Y, et al. Phase-adjusted estimation of the number of coronavirus disease 2019 cases in Wuhan, China. *Cell Discov* 2020;6:10.
- Shen Z, Xiao Y, Kang L, et al. Genomic diversity of SARS-CoV-2 in coronavirus disease 2019 patients. *Clin Infect Dis* 2020;71:713–20.
- Hu Z, Song C, Xu C, et al. Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. *Sci China Life Sci* 2020;63:706–11.
- Kucharski AJ, Russell TW, Diamond C, et al. Early dynamics of transmission and control of COVID-19: a mathematical modelling study. *Lancet Infect Dis* 2020;20:553–8.
- Chen C, Zhao B, Cui W, et al. The effectiveness of an air cleaner in controlling droplet/aerosol particle dispersion emitted from a patient's mouth in the indoor environment of dental clinics. *J R Soc Interface* 2010;7:1105–18.
- An N, Yue L, Zhao B. Droplets and aerosols in dental clinics and prevention and control measures of infection. *Zhonghua Kou Qiang Yi Xue Za Zhi* 2020;55:E004.
- Peng X, Xu X, Li Y, et al. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020;12:9.
- Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. *J Dent Res* 2020;99:481–7.
- Takeda Y, Nomura T. Future direction of medical care system for patients with infectious disease and the new infectious diseases control law in Japan—centering around a category 1 hospital. *Kansenshogaku Zasshi* 2000;74:687–93.
- Tsai YH, Wan GH, Wu YK, et al. Airborne severe acute respiratory syndrome coronavirus concentrations in a negative-pressure isolation room. *Infect Control Hosp Epidemiol* 2006;27:523–5.
- Eggers M, Koburger-Janssen T, Eickmann M, et al. In vitro bactericidal and virucidal efficacy of povidone-iodine gargle/mouthwash against respiratory and oral tract pathogens. *Infect Dis Ther* 2018;7:249–59.
- Cao Y, Li Q, Chen J, et al. Hospital emergency management plan during the COVID-19 epidemic. *Acad Emerg Med* 2020;27:309–11.
- Smith N, Fraser M. Straining the system: novel coronavirus (COVID-19) and preparedness for concomitant disasters. *Am J Public Health* 2020;110:648–9.
- Chen YC, Chang SC, Tsai KS, et al. Certainties and uncertainties facing emerging respiratory infectious diseases: lessons from SARS. *J Formos Med Assoc* 2008;107:432–42.
- Zhang L, Liu Y. Potential interventions for novel coronavirus in China: a systematic review. *J Med Virol* 2020;92:479–90.

25. Chowell G, Abdirizak F, Lee S, et al. Transmission characteristics of MERS and SARS in the healthcare setting: a comparative study. *BMC Med* 2015;13:210.
26. Otter JA, Donskey C, Yezli S, et al. Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination. *J Hosp Infect* 2016;92:235–50.
27. Peeri NC, Shrestha N, Rahman MS, et al. The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned? *Int J Epidemiol* 2020;49:717–26.
28. Lei H, Li Y, Xiao S, et al. Routes of transmission of influenza A H1N1, SARS CoV, and norovirus in air cabin: comparative analyses. *Indoor Air* 2018;28:394–403.
29. Gu J, Han B, Wang J. COVID-19: gastrointestinal manifestations and potential fecal–oral transmission. *Gastroenterology* 2020;158:1518–9.
30. Peng Y, Zhou YH. Is novel coronavirus disease (COVID-19) transmitted through conjunctiva. *J Med Virol* 2020;92:1408–9.
31. Hubar JS, Pelon W. Low-cost screening for microbial contaminants in aerosols generated in a dental office. *Gen Dent* 2005;53:270–2.
32. Wang C, Pan R, Wan X, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health* 2020;17:1729–53.