

COMMENTARY

Management plan of a paediatric outpatient department during the SARS-CoV-2 epidemic

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Email: 981342321@qq.com**Keywords**

2019 novel corona virus, pediatric outpatient department, prevention and control of infection

Funding information

Natural Science Foundation of Chongqing, Grant/Award Number: 2019ZDXM017

1 | INTRODUCTION

Since December 2019, a novel corona virus infection, which broke out in Wuhan, Hubei Province, has spread to various parts of China. By the beginning of March 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infected patients had been diagnosed in more than 70 countries around the world, especially South Korea, Iran, and Italy. The World Health Organization has officially named the disease coronavirus disease 2019 (COVID-19). This epidemic was classified as an international public health emergency on 30 January 2020. SARS-CoV-2 has been declared a national class B infectious disease by the China International CDC, and Class-A prevention and control measures for infectious diseases are being utilized.¹⁻³ As of 15 July 2020, more than 13 000 000 people around the world have been diagnosed with SARS-CoV-2 infection.

Children are susceptible to acute infectious diseases. Thus far, more than 2000 children have become infected in China; the youngest child was a 36-hour-old newborn. Moreover, children show milder cases and a better prognosis than adults.⁴ Although detailed analysis from the epicentre of the Italian COVID-19 outbreak describes increase in cases of rare Kawasaki-like disease in young children, but this syndrome is rare and experts stress that children remain minimally affected by SARS-CoV-2 infection overall.⁵ The paediatric clinic, as the first defence against children's SARS-CoV-2 infection, plays an extremely important role. As the only Tertiary

class A maternal and child care center integrating clinical medicine in the city, our hospital undertakes the work of maternal and child health care in 40 districts and counties of the city, as well as the major responsibility and mission of fighting against SARS-CoV-2 infection. Under the leadership of our hospital, we have formulated the prevention and control management plan for the paediatric outpatient department during the SARS-CoV-2 epidemic. From 26 January 2020 to 12 May 2020, a total of 23 58 children and 68 759 accompanying parents were screened in our paediatric clinic. Among them, there were 2346 fever cases, 12 suspected children cases and 39 suspected adults cases. All the suspected patients were safely sent to the designated hospital for further diagnosis and treatment, and none of the staff in the paediatric outpatient department was infected. The current review summarizes the management plan of paediatric outpatient department in our hospital. The purpose of this paper is to discuss how to prevent and control SARS-CoV-2 infection in paediatric outpatient services from the aspects of protection, diagnosis, psychological adjustment, etc. At the same time, we also hope that this article can act as a reference in the fight against SARS-CoV-2 infection.

1. Establish a management team, implement pre-inspection and triage procedures, allocate a fever outpatient area, and prepare personnel properly through training and other preliminary work.

Abbreviation: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

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- (1) Set up an expert consulting group, emergency group and infection control group with clear divisions and responsibilities for each group. The responsibility of the expert consulting group is to train medical staff about new SARS-CoV-2 infection diagnosis and treatment plan, protective measures, and to answer other medical staff related issues. The members of the emergency team are mainly responsible for rescuing critically ill children infected with the SARS-CoV-2. The responsibility of infection control group includes: (a) formulate, update and communicate relevant information on the prevention and control of SARS-CoV-2 infection; (b) intensive training and assessment of medical staff through online (video and courseware teaching) or on-site demonstration training methods; (c) reasonably arrange the use of protective equipment; d) responsible for the formulation and supervision of outpatient disinfection and isolation measures.
 - (2) Additionally, set up in advance a well-prepared rescue plan for critical patients in the fever clinic. (a) Material preparation: the first-aid area is equipped with equipment such as central oxygen supply, central sputum suction, first-aid vehicle, cardiopulmonary resuscitation, and first-aid medicine; the first-aid process is put on the wall; first-aid equipment is in functional state; (b) When patients with suspected or confirmed SARS-CoV-2 infection have life-threatening changes (such as dyspnea, fainting, etc.), we will immediately notify the new coronary pneumonia emergency team to participate in the rescue; members of the rescue team shall carry out rescue according to the division of responsibilities and the first-aid process; (c) In addition, we will implement a single room isolation observation for the family members of the children.
 - (3) Close parts of the hospital's entrances and exits while setting up a pre-inspection triage area at the in-use entrances and exits with clearly marked signs, good ventilation, and a 24-hour on duty system.
 - (4) The fever clinic (with eye-catching signs) should be set up far away from the general consulting room. Pre-examination triage personnel should follow a fixed routine (Figure 1) in guiding patients to the fever clinic. Pre-examination triage nurse protective equipment: disposable surgical masks, work caps, gloves, waterproof gowns, work clothes, goggles/protective screens. The fever clinic should include an independent area for medical staff and prepare two separate pathways for both doctors and patients. There should be a specialized observation area and toilets. The independent area should be able to function and complete the whole registration, test, inspection and dispensing process.
 - (5) The arrangement of proper personnel and the formulation of various rules, regulations and processes should be completed. To avoid personnel gatherings, all paediatric medical personnel should be trained in advance to master the relevant proficiencies, carry out reception and first-aid drills, and focus on network and video training.
2. Strengthen the management of medical treatment and create a well-prepared plan for prevention.

SARS-CoV-2 is a novel corona virus with a beta genus. It has a capsule and is highly homologous with bat SARS virus. The virus is sensitive to UV and heat. It can be inactivated at 56°C for 30 minutes, and 75% ethanol-, ether-, and chlorine-containing disinfectants can also effectively inactivate the virus. The main infection source of the virus is patients who have been previously infected with SARS-CoV-2. The virus is highly contagious between humans, and it can easily be transmitted by air and contact, whereas the alimentary or aerosol transmission route is not yet clear.^{6,7} The primary task of cross-infection prevention is properly educating medical staff, as the majority of diseases in paediatric outpatient clinics are contagious. Simultaneously, the proper instruction of patients and their families who are in close contact is also important.

The specific implementation steps are as follows:

 - (1) Strengthen the self-management of medical staff, monitor body temperature and physical condition every day. Medical staff who have a history of staying in an epidemic-endemic area, a family member with a suspected case or a history of contact with a suspected case, are required to isolate themselves for 14 days. Generally, individuals can continue working unless they are confirmed as being infected.
 - (2) Enhance screening and management in the pre-examination and triage process:
 - (a) An epidemiological assessment and temperature monitoring are carried out for children and their companions;
 - (b) Control visitor flow and limit one companion for each patient;
 - (c) Limit the number of outpatients for each time slot and strictly adhere to this rule;
 - (d) Ensure the hygiene of the consulting room and waiting area, disinfect this space with chlorine-containing preparations every day, and turn off the central air conditioning to ensure a reduction in air circulation;
 - (e) The parents or other family members who come to our paediatric clinic inevitably experience panic, tension and anxiety. The generation of these emotions can adversely affect the normal organization of the outpatient clinic and can lead many children not to receive an accurate diagnosis or proper treatment. This situation is not conducive to the control of the epidemic or the children's physical and mental health. Reassure family members and seek to mollify any irritability that might interfere with the normal processes of diagnosis and treatment and work urgently to calm and control disruptive behaviors;
 - (f) Multiple sizes of children's masks should be available and placed in the pre-examination triage area.
 3. Obtain an accurate and clear diagnosis (for the children with a positive epidemiological history, we recommend nucleic acid testing whether or not they are symptomatic).

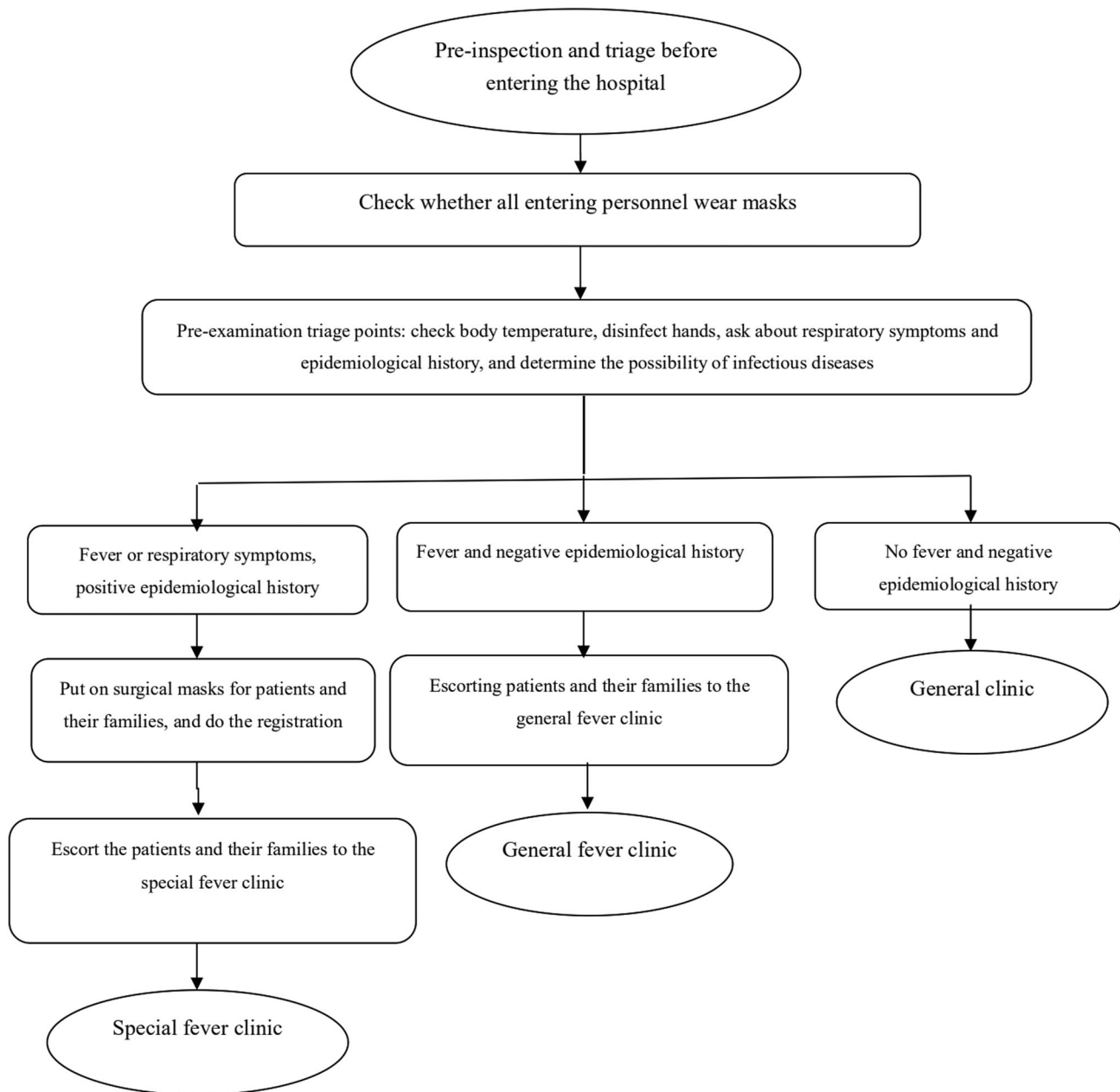


FIGURE 1 Pre-examination triage fixed routine

The incubation period of SARS-CoV-2 is 1 to 14 days, and in most people, symptoms occur in 3 to 7 days. Fever, dry cough and fatigue are the main clinical manifestations of the disease. Children who are severely affected have symptoms such as dyspnoea and hypoxemia. In very severe cases, symptoms may rapidly progress to acute respiratory distress syndrome, septic shock, coagulation dysfunction, metabolic acidosis. Among the known cases the most severe include elders with chronic diseases, while the symptoms of children have been generally mild.⁸⁻¹⁰

In the early stage of SARS-CoV-2 infection, the main peripheral blood indices are as follows: the total number of white blood cells is

normal or decreased and the number of lymphocytes decreased. In some cases, lactate dehydrogenase, myoglobin, liver enzymes and muscle enzymes increase, and troponin is elevated in critically ill patients. The virus can be detected in nasopharynx swabs, sputum, blood and faeces. There are only small patches and interstitial changes at the early stage of chest imaging, but they could further develop into ground glass-like changes in both lungs or even pulmonary consolidation in severe cases.^{6,11}

Epidemiological history (we tested 1345 children with positive epidemiological history. Five of them were nucleic acid positive, and these children only had symptoms of acute upper respiratory tract infection.):

- (1) A history of a sojourn in Wuhan and surrounding areas or in epidemic areas in the world within 14 days of morbidity;
- (2) Children's parents or families reporting contact with patients in Wuhan and surrounding areas or epidemic areas within 14 days of morbidity and who had fever or other related symptoms;
- (3) Children within family-clustering disease cases or who had close contact with patients with SARS-CoV-2 infection;
- (4) A history of contact with a new coronavirus infection patient (positive nucleic acid test) within 14 days of morbidity;
- (5) Diagnosis of SARS-CoV-2 infection in the mother of a newborn.

Clinical manifestations:

- (1) Fever, dry cough, and fatigue; a small number of newborns show low fever or normal body temperature;
- (2) Imaging examination is consistent with the expected characteristics;
- (3) In the early stage of the disease, the total number of white blood cells is normal or decreases or the number of lymphocytes decreases.
- (4) Inability to explain the current clinical manifestations with regard to other diseases.¹¹

Suspected case (with one of the following):

- (1) Positive in history of epidemiology, and consistent with any two clinical manifestations;
- (2) Consistent with any three clinical manifestations without clear history of epidemiology.

Confirmed cases (with one of the following):

- (1) A positive nasopharyngeal swab or blood nucleic acid test;
- (2) A virus gene sequence from respiratory secretion or blood samples that is highly homologous with SARS-CoV-2.
- (3) Serum-specific antibody immunoglobulin G level changed from negative to positive or in the recovery period was four times or more greater than in the acute period.

Clinical grade:

- (1) Recessive infection. The nucleic acid test is positive but there are no clinical and imaging manifestations;
- (2) Acute upper respiratory infection. Only fever, cough, pharyngeal pain, fatigue, runny nose and other upper respiratory manifestations; chest imaging examination is negative;
- (3) Mild pneumonia. With or without fever and cough; chest imaging conforms to the characteristics of SARS-CoV-2 pneumonia but has not reached the diagnostic standard of severe pneumonia;
- (4) Severe pneumonia (in accordance with any of the following).

- (a) In the quiet state with a normal temperature, the respiratory rate is ≥ 60 times/min (< 2 months old) or ≥ 50

times/min (2-12 months old) or ≥ 40 times/min (1-5 years old) or ≥ 30 times/min (> 5 year old);

- (b) Oxygen saturation is $\leq 92\%$;
 - (c) There is hypoxia, moaning, nasal wing agitation, three concave chest signs or apnoea or cyanosis;
 - (d) There is loss of consciousness, convulsion, drowsiness, coma, or altered awareness;
 - (e) There are refusals to feed, feeding difficulties, dehydration.
- (5) Critical illness (meeting any of the following criteria requires admission to the intensive care unit for treatment).
 - (a) Respiratory failure requiring mechanical ventilation;
 - (b) Shock;
 - (c) Multiple organ failure.⁷⁻¹²

4. Strengthen humanistic care and focus attention on the mental health of the medical staff in the paediatric outpatient department.

The paediatric outpatient department, as the first defence in protecting children's health, has a great responsibility. Medical staff fighting the epidemic suffer from a high-pressure, fast-paced, high-risk environment and have great responsibility. In addition to their daily work, such as diagnosis, treatment and screening, medical staffs also experience psychological pressure from children's parents and from the epidemic, which indicates that they must not only overcome physical fatigue but also the negative effects of psychological pressure. Thus, it is very important to pay attention to their mental status.¹³

Therefore, in the fight against the epidemic, relevant strategies for the mental health of medical personnel should also be prepared¹⁴:

- (1) Strengthen humanistic care and establish a special mental health team to conduct psychological counselling; The members of the special mental health team are mainly composed of psychiatrists in our hospital. A simple psychological self-assessment form is filled in daily by the medical staff of pediatric outpatient department. If the medical personnel with psychological problems are found, the mental health team members shall provide one-on-one psychological guidance.
- (2) In cooperation with the psychology department of the hospital, invite professional psychologists to provide relevant lectures; Psychological lectures are held once a week, mainly including how to conduct self psychological counseling, how to deal with the panic caused by the epidemic, how to pacify the family members of children with emotional tension, etc.
- (3) Share positive news to prevent staff from becoming frightened;
- (4) Investigate the medical staffs' family status in case they have any difficulties and try helping them address their concerns.

2 | CONCLUSION

The epidemic developed extremely quickly and is very serious. Cases of infection in children are also increasing, and most cases are

asymptomatic. A reasonable and effective prevention and control strategy is very important for disease prevention. We formulated this strategy based on previous experience and the existing diagnosis and treatment guidelines to respond to the epidemic. As the first line of defence for children with SARS-CoV-2 infection, the pediatric clinic can effectively prevent and avoid infection to allow children to grow up healthily by actively doing the important work of protection, diagnosis, transportation and psychological adjustment. For the children with positive epidemiological history, we recommend nucleic acid test whether they have symptoms or not. In addition, there will be further modifications with the increase in clinical experience and with changes in the disease.

ACKNOWLEDGMENT

This study was supported by Natural Science Foundation of Chongqing (no. 2019ZDXM017).

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

XW wrote the manuscript. XL reviewed the manuscript.

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How to cite this article: Wu X, Li X. Management plan of a paediatric outpatient department during the SARS-CoV-2 epidemic. *Pediatric Pulmonology*. 2020;55:2587-2591. <https://doi.org/10.1002/ppul.25000>