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Telemedicine usage via WeChat for children with congenital heart disease preoperatively during COVID-19 pandemic: a retrospective analysis

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Abstract

Objective: During the COVID-19 pandemic, parents of infants having medical problem face challenges of insufficient medical resources at home. The purpose of this study was to investigate the effect of WeChat-based telehealth services on the preoperative follow-up of infants with congenital heart disease (CHD) during the COVID-19 pandemic.

Methods: This study retrospectively analyzed the medical records of 190 infants with CHD who underwent remote follow-up via WeChat from December 2019 to May 2020 in Fujian Maternity and Child Health Hospital, Affiliated Hospital of Fujian Medical University. In addition, the psychological benefits of WeChat on the parents of these infants were analyzed.

Results: In total, 190 infants were involved in this study, including 72 cases of ventricular septal defects, 42 cases of patent ductus arteriosus, 55 cases of atrial septal defects, 3 cases of tetralogy of Fallot, 2 cases of endocardial cushion defects, 12 cases of pulmonary stenosis, 2 cases of total anomalous pulmonary venous connection and 2 cases of aortic arch constriction. During the follow-up period, 48 infants who received surgical indications were hospitalized in time for surgical treatment. It was recommended that 10 infants with respiratory tract infections be treated in local hospitals through the WeChat platform. We provided feeding guidance to 28 infants with dysplasia through the WeChat platform. The psychological evaluation results of parents showed that the median score and range of Self-Rating Depression Scale scores were 42 and 32–58, respectively. Nine parents (4.7%) were clinically depressed, while the majority had mild depression. The median score and range of Self-Rating Anxiety Scale scores were 44 and 31–59, respectively. Twenty parents (10.5%) had clinical anxiety, while the rest had mild anxiety.

Conclusion: During the COVID-19 pandemic, follow-up management and health services for infants with CHD prior to surgery through the WeChat platform were useful in identifying the state of an

infant's condition as well as in identifying and relieving care pressure, anxiety and depression in the parents.

Key words: COVID-19, WeChat, telehealth services, congenital heart disease (CHD)

Introduction

COVID-19 is a highly contagious virus that has spread widely among people all over the world since its first appearance in Wuhan, China, in December 2019 [1–4]. On 30 January 2020, it was declared a global public health emergency of international concern [5]. Cases of COVID-19 have been confirmed in 196 countries and regions. As of 22 April 2020, Mainland China has reported 182 798 confirmed cases and 4632 deaths. Globally, 2 471 136 cases have been confirmed, with 169 006 deaths [6]. The rapidly spreading COVID-19 pandemic has had a major impact on public health and socioeconomic development, which has also put tremendous pressure on medical care [7]. In this context, the general population as well as most health-care workers have become vulnerable to the emotional impact of COVID-19 due to both the pandemic and its consequences worldwide [8].

Congenital heart disease (CHD) is the most common congenital structural malformation, and 2–3% of newborns are diagnosed with CHD each year [9, 10]. Surgery is the main treatment for CHD, and most patients with CHD require surgery. The choice of surgical timing requires close follow-up, and a delay in surgery can have adverse effects on patients [11]. Therefore, infants with CHD need to be followed up closely by the department of cardiac surgery after birth. Previously, infants with CHD were followed up mainly through outpatient services. However, travel has become inconvenient during the COVID-19 outbreak. In this situation, medical support for infants with CHD has become a serious problem. Families worry about not only the risk of COVID-19 infection during their journey for medical treatment and at the hospital but also the delay of treatment and home care problems if they are not followed up, which places a heavy burden on parents. As a result, it is very important to monitor and provide medical services for infants with CHD during the COVID-19 outbreak.

Telehealth or telemedicine, with the use of telecommunication techniques, can provide health-care advice and allow long-distance patient and clinician contact, care, advice, reminders, education, monitoring and remote admission [12]. WeChat, one of the most popular smartphone-based social media applications in China and similar to Facebook, Twitter and WhatsApp, has also emerged as a great medium for delivering health education to patients [13]. WeChat currently has 600 million active users out of the 1.12 billion registered users [14]. Furthermore, WeChat-based health educational programs have been found to be more effective than the conventional method of delivering information, as it is less time consuming and associated with lower economic costs, improved adherence to treatment, fewer complications, increased follow-up rates and improved patient satisfaction in patients with cancer [15], chronic illness [16] and communicable disease [17]. We provided follow-up management and medical services for infants with CHD prior to surgery via WeChat.

Methods

Ethics approval and consent to participate

This study was approved by the ethics committee of our hospital and strictly adhered to the tenets of the Declaration of Helsinki (Code of Ethical approval for scientific research project: no. 2020KY039). In addition, all patients' guardians signed an informed consent form before the study.

Patients

This was a retrospective analysis of medical records. We retrospectively collected the data of infants with CHD who underwent remote follow-up via WeChat from December 2019 to May 2020 in Fujian Maternity and Child Health Hospital, Affiliated Hospital of Fujian Medical University. The Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS) were used to evaluate the psychological states of these infants' parents.

Infants diagnosed with CHD after birth in our hospital are followed up in the cardiac surgery department prior to discharge, at which point we included them in this study. We instructed the parents' infants to join our WeChat group and helped them master use of the WeChat platform (Figure 1).

Inclusion criteria included the following: (i) infants were diagnosed with CHD in our hospital after birth, (ii) parents were primary caregivers and (iii) parents had smartphones and could use WeChat correctly. Exclusion criteria included the following: (i) infants were complicated with other serious diseases, (ii) parents were inconvenienced in using the Internet and (iii) parents refused to participate in this study.

Medical services based on the WeChat platform

A team composed of professional heart surgeons in our hospital conducted follow-up management for infants with CHD and provided telemedicine services to their parents; all the team members were qualified physicians.

The content of telehealth services on WeChat mainly included two parts: the education module and the question-and-answer module. The education module included relevant information on CHD, preoperative care and feeding and the management of related preoperative complications. Parents were able to view and learn these materials at any convenient time. In the question-and-answer module, one medical staff member was online from 8:00 to 18:00 h every day to reply to parents' questions. The questions often asked by parents were as follows: What should I pay attention to in the feeding process? As infants often vomit, what should I do? How can I judge whether an infant is experiencing shortness of breath? Is there anything special that I should pay attention to during home care? The medical staff also guided family members in communicating, discussing and sharing their care experiences and actively encouraging each other in the WeChat group. For parents with severe depression or anxiety, we offered a personal WeChat group to provide special psychological counseling and support. For parents with very severe anxiety or depression, we asked a special psychologist to provide psychological counseling and treatment.

Research tools

Questionnaires were administered through WeChat to understand the psychological status of parents of infants with CHD when they were followed up for 3 months.

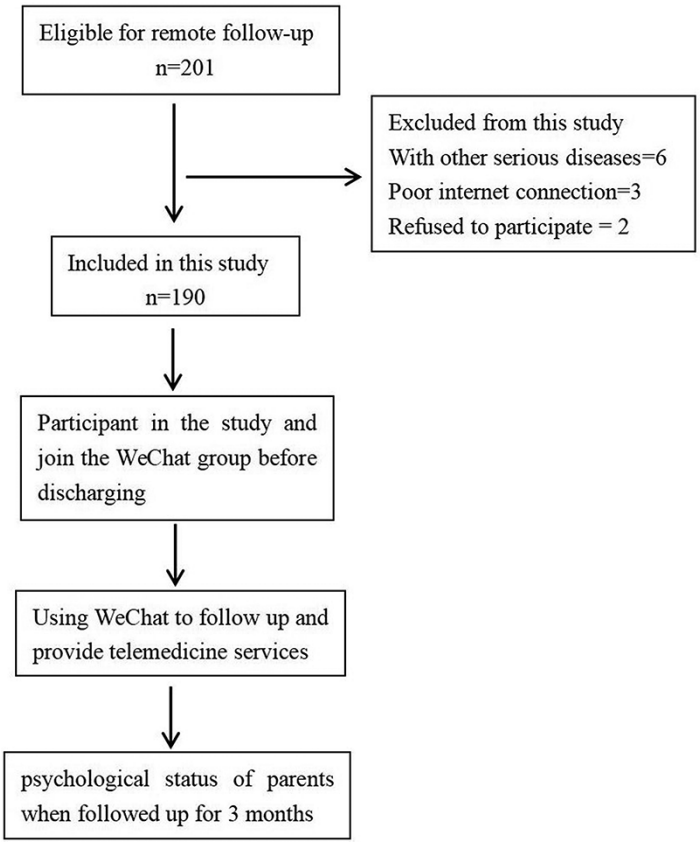

Figure 1 The frame of the study.

1. The Self-Rating Depression Scale (SDS) was used to evaluate the depression [18]. This scale consists of 20 items: 10 negative symptoms and 10 positive symptoms. All items together reflect the mood, body discomfort symptoms, spiritual movement, behavior and psychological symptoms of patients with depression. The score involves 4 grades, which were obtained using the scoring method in ascending order (from 1 to 4) based on the frequency of the occurrence of positive symptoms. The scores were obtained using the reverse-scoring method in descending order (from 4 to 1) based on the frequency of the occurrence of negative symptoms. The standard score was obtained by multiplying the scores by 1.25 and rounding off the result. Normally, the upper limit score was 41, and the standard total score was 53. A higher score indicates a more significant depression tendency. A score of 50–59 indicates mild depression, 60–69 indicates medium depression and $\geq$70 indicates severe depression.

2. The Self-Rating Anxiety Scale (SAS) was used to evaluate the anxiety [19]. This scale mainly evaluates the subjective feeling of anxiety in patients, and it is a self-evaluation tool. The SAS has been extensively applied in clinics and is characterized by high reliability and validity. Fifteen items were worded negatively. The scores on these items were obtained using the scoring method in ascending order (from 1 to 4) based on the frequency of the occurrence of symptoms. Five items were worded positively. The scores on these items were obtained using the reverse-scoring method in descending order (from 4 to 1) based on the frequency of the occurrence of symptoms. The total score was obtained by summing the scores for all items. The standard score was obtained by multiplying the total score by 1.25 and rounding off the result. The mean value of the standard score was 50. A score <50 indicates normal anxiety, 50–59 indicates mild anxiety, 60–69 indicates medium anxiety and $\geq$70 indicates severe anxiety.

Results

Overall, 201 infants were eligible for remote follow-up, and 190 infants were included in this study, including 72 cases of ventricular septal defects, 42 cases of patent ductus arteriosus, 55 cases of atrial septal defects, 3 cases of tetralogy of Fallot, 2 cases of endocardial cushion defects, 12 cases of pulmonary stenosis, 2 cases of total anomalous pulmonary venous connection and 2 cases of aortic arch constriction. In total, 11 eligible infants were excluded from this study, including 6 children with other serious diseases, parents of 3 infants who could not easily use the Internet and parents of 2 infants who refused to participate in this study. At inclusion, the median age was 2 days, the range was 0–15 days, the median weight was 3.3 kg, the weight range was 2.2 g–4.3 kg, the median follow-up time was 5.8 months and the range was 3–8.3 months. A total of 69.5% (132/190) of infants' families lived in rural villages, and 64.8% (123/190) of parents had an education level below junior college (Table 1).

During the preoperative follow-up via WeChat, 48 infants exhibited symptoms, such as feeding difficulties, shortness of breath and no weight gain. Through WeChat, we advised their patients to return to the hospital in a timely manner and further evaluated their condition.

Table 1 Clinical date of patients and general data of their parents

Item	Number
Patients	
Age, median (range)	2 (0–15) days
Weight, median (range)	3.3 (2.2–4.3) kg
Disease	
Ventricular septal defect	72
Patent ductus arteriosus	42
Atrial septal defect	55
Tetralogy of Fallot	3
Endocardial cushion defect	2
Pulmonary stenosis	12
Total anomalous pulmonary venous connection	2
Aortic arch constriction	2
Follow-up time, median (range)	5.8 (3–8.3) months
Parents	
Age, median (range)	30 (23–42) years
Education level	
Under high school	46
High school	77
Junior college	41
Bachelor degree or higher	26
Living condition	
Rural area	132
City	58

Table 2 Complications of the patients during the follow-up and the psychological state of their parents followed up for 3 months

Item	Number
Patients	
Operation	48
Respiratory infections	10
Poor growth and development	28
Death	0
Parents	
SDS score, median (range)	42 (32–58)
Normal (score: <50)	181
Mild depression (score: 50–59)	9
Medium depression (score: 60–69)	0
Severe depression (score: >70)	0
SAS score, median (range)	44 (31–59)
Normal (score: <50)	170
Mild anxiety (score: 50–59)	20
Medium anxiety (score: 60–69)	0
Severe anxiety (score: >70)	0

After the evaluation, surgical indications were determined to be met, and surgical treatment was performed. The median age at surgery was 2.1 months, and the range was 0.9–8 months. Respiratory tract infections occurred in 10 patients during follow-up. We recommended diagnosis and treatment in local hospitals through WeChat. After undergoing an examination in the local hospital system, they were diagnosed with respiratory tract infections, which are common in infants, and treated in local hospitals. For 28 infants with poor growth and development, we provided feeding guidance. There were no cases of loss to follow-up, death or a delayed operation (Table 2).

The psychological evaluation results for parents at the 3-month follow-up showed that the median score and range for SDS scores were 42 and 32–58, respectively. Nine parents (4.7%) were clinically depressed, while the majority had mild depression. The median score and range for SAS scores were 44 and 31–59, respectively. Twenty parents (10.5%) had clinical anxiety, while the rest had mild anxiety (Table 2).

Discussion

Statement of principal findings

Prior to surgery, because of heart malformations, infants with CHD experience worse growth and development than do normal infants and are more prone to illness. As a result, feeding and home care are more difficult for infants with CHD, placing a more serious burden on infants' families. These families need more support and help in the form of medical resources [20]. Preoperative infants with CHD need closer follow-up, and their families need more medical support and help.

China is a developing country, and the basic level of medical care in rural or some areas is relatively low. Professionals' knowledge of pediatric cardiac surgery is very inadequate and thus cannot solve the problems of parents of infants with CHD in rural areas. Moreover, as most infants with CHD live in rural areas, their parents face pressure and difficulty in home care. To effectively control the COVID-19 pandemic, governments have adopted isolation measures to restrict population movement and social contact, which is beneficial for reducing the spread of the virus [21]. During this period, it has become very inconvenient to travel, especially in rural areas, where one must go to a large city for professional medical treatment and face the risk of being infected by the virus. In this period, it has been very inconvenient to monitor infants with CHD and guide their parents in addressing care problems through traditional outpatient services. Therefore, it is very important to develop new follow-up and health education methods to provide medical support for the parents of preoperative patients with CHD during the COVID-19 pandemic.

Telemedicine can provide medical support remotely and solve patients' health problems without them having to leave home [22]. During the COVID-19 pandemic, telemedicine has achieved tremendous developments and good results [23, 24]. WeChat integrates functions, such as graphics, text, audio and video, which collectively provide a popular, convenient method of interactive information exchange [16]. Patients or their families can use appropriate communication methods through WeChat according to their own needs. If a matter is not urgent, then they can leave a message for medical staff via text; if it is urgent, then they can contact medical staff directly by voice or a video call. During the COVID-19 pandemic, we conducted remote follow-up management for preoperative infants with CHD and provided their parents with remote medical services to solve their home care problems in time via WeChat. Anytime and anywhere, parents can obtain information on medical knowledge, home care and attentional factors through WeChat's education module according to their own needs. If there is a problem, then they can consult medical staff through WeChat anytime and anywhere to obtain professional support. In our study, many parents consulted us about attentional factors in the process of home care and the professional knowledge that they did not understand in the education module on WeChat. When infants were sick, parents also asked us for help via WeChat. In this way, parents can obtain medical support from professional doctors and solve home care problems in a

timely manner without leaving home, which can alleviate the inconvenience of traveling for medical treatment during the COVID-19 pandemic.

Studies have shown that infectious disease pandemics not only threaten people's physical health but also affect people's mental health, leading to negative emotions, such as anxiety and depression. For example, severe acute respiratory syndrome increases anxiety, depression and stress levels in a population [25, 26]. People and families with health problems, especially those who need to travel for medical treatment, are more anxious and fearful [27]. Through WeChat, parents can not only obtain relevant information on their own but also easily obtain medical support when they face problems, which can solve their worries in time and greatly alleviate their anxiety and depression. At the same time, we also provide psychological guidance and support to parents with severe stress or anxiety and depression. In our study, most of the infants' parents did not exhibit anxiety or depression, and those who did had only mild symptoms.

Strengths and limitations

This study had several limitations. First, this study was a single-center retrospective study with a small number of cases. Second, this study lacked a control group. Third, this study was conducted during a special period (the epidemic of infectious diseases). Fourth, this was a specific group of patients (newborns with CHD). Fifth, the follow-up period was short.

Interpretation within the context of the wider literature

We must emphasize that WeChat, as a new medical Internet tool, can be a useful assistant in clinical follow-up, but it is not a substitute for clinical follow-up. We can obtain information through the continuous dynamic monitoring of WeChat, which is very valuable for follow-up. However, the information obtained by such remote follow-up is not as rich and accurate as that obtained by outpatient follow-up. In the face of any vague or suspicious information or patients with serious symptoms, we need to carefully inquire about the situation of the patients, and we can use the video function on WeChat to directly communicate with and observe the status of patients. When necessary, patients should be called to our hospital for a clinical or medical examination to avoid a misdiagnosis or missed diagnosis. At the same time, remote follow-up via WeChat requires mobile devices and networks. Some patients in poor or remote areas may not be able to enjoy telemedicine because they do not have smartphones or networks or cannot use WeChat.

Implications for policy, practice and research

The use of WeChat can make health education for parents of patients convenient, economical and continuous. At the same time, providing telemedicine services through WeChat can reduce the travel of patients, which helps to prevent and control COVID-19. This is worthy of clinical application.

Conclusion

During the COVID-19 pandemic, follow-up management and health services for infants with CHD prior to surgery through the WeChat platform were useful in identifying the state of an infant's condition as well as in identifying and relieving care pressure, anxiety and depression among the parents.

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Contributions

Z.Q.L., C.Q. and C.H. designed the study, collected the clinical data, performed the data analysis, drafted the manuscript and revised the article. X.W.P. and L.Y.Q. collected the clinical data and drafted the manuscript. All authors read and approved the final manuscript.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics and other permissions

This study was approved by the ethics committee of our hospital and strictly adhered to the tenets of the Declaration of Helsinki (Code of Ethical approval for scientific research project: no. 2020KY039). In addition, all patients' guardians signed an informed consent form before the study.

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