

Telehealth Education via WeChat Improves the Quality of Life of Parents of Children with Type-1 Diabetes Mellitus

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Abstract

Objective The purpose of this study was to explore the effect of telehealth education and care guidance via WeChat (Tencent Ltd., Shenzhen, China; a popular smartphone-based social media application) on improving the quality of life of parents of children with type-1 diabetes mellitus.

Methods A prospective randomized controlled study was conducted in our hospital from March 2019 to September 2020 to compare the quality of life of parents of children with type-1 diabetes mellitus in the intervention group and the control group.

Results Six months after discharge, the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) scores of parents in the intervention group were significantly lower than those in the control group ($p < 0.05$). Compared with the SAS and SDS scores at discharge time, those scores of parents at 6 months after discharge time in intervention group were significantly lower ($p < 0.05$), while those scores of parents at 6 months after discharge time in control was similar ($p > 0.05$). Six months after discharge, the scores of the physiological field, psychological field, social relationship field, and environmental field in the intervention group were significantly higher than those of the control group according to the result of the World Health Organization Quality of Life Brief Scale (WHOQOL-BREF; $p < 0.05$).

Conclusion Using WeChat to provide telehealth education and home care guidance to the parents of children with type-1 diabetes mellitus can effectively relieve the anxiety and depression of the parents and improve their quality of life.

Keywords

- ▶ telehealth education
- ▶ home care
- ▶ type-1 diabetes mellitus
- ▶ quality of life

Background and Significance

Type-1 diabetes mellitus is a common chronic disease in children with an increasing incidence.^{1–5} Type-1 diabetes mellitus is a life-long disease, and its long-term treatment effect mainly depends on the effect of home care.⁶ Children with poor self-control, irregular diet, difficult insulin injection and poor compliance being prone to complications which brings great difficulties, pressure, and burden to the parents of children.^{7,8} In addition, frequent subcutaneous

injection and blood glucose monitoring, long-term diabetes diet, and regular outpatient review also have a serious physical and mental health and the quality of life of the children and their parents.⁹ Parents' poor psychological reactions not only cause harm to their own health and life but also adversely affect the physical and mental health of children and the treatment of the disease.¹⁰ At present, most of the studies only focus on improving the prognosis, psychological state, and quality of life of children with type-1 diabetes mellitus, while few studies to the psychological

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state and quality of life of their parents. This study conducted a prospective randomized controlled trial to explore the effect of telehealth education and care guidance via WeChat on improving the quality of life of parents of children with type-1 diabetes mellitus.

Methods

The present study was approved by the ethics committee of our hospital and adhered to the tenets of the Declaration of Helsinki. Additionally, all the parents of patients signed the consent form before participating in the study.

Research Design

A prospective randomized controlled study was conducted in our hospital from March 2019 to September 2020. Based on the results of the WHOQOL-BREF scale from the preexperiment and assuming that the α value was set at 0.05 with a power of 0.80, the required number of participants was calculated to be 41 in each group. Assuming a 10% missing rate, the total sample size was set as 92 (46 per group). The parents of all patients filled out the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) at the discharge time, and completed the SAS scale, SDS scale, and World Health Organization Quality of Life Brief Scale (WHOQOL-BREF) again at 6 months of follow-up.

The demographic characteristics of patients and their parents between two groups including age (8.6 ± 3.2 vs. 8.3 ± 3.6 years), boy/girl (25/21 vs. 24/22), age of parents (31.2 ± 5.8 vs. 30.3 ± 6.5 years), parents' education level, living condition, score of SAS (68.6 ± 13.6 vs. 67.1 ± 14.5), and score of SDS (65.7 ± 12.8 vs. 63.6 ± 13.3) were similar.

Inclusion criteria are as follows: (1) parents of children with type-1 diabetes mellitus, (2) parents were the primary caregivers, (3) parents have smart phones and can use WeChat properly, and (4) the internet is easy to use at home. Exclusion criteria include the following: (1) children complicated with other serious diseases, and (2) the parents of children refused to participate in the study.

Randomization

Participants who were eligible were randomized to either the intervention group or the control group by an independent member of our research team using a 1:1 randomization ratio and a randomization list blinded to the researchers. The outcome assessors were blinded to the allocation (→ Fig. 1).

Intervention Methods

The parents in intervention group were provided with health education and home care guidance via WeChat. When the children discharged from hospital, the medical staff instructed the parents to join the WeChat group and skillfully use the WeChat. The health education content in the WeChat group included two parts: the education module and the question and answer module. First, the education module included related knowledge on type-1 diabetes mellitus, home care, feeding, insulin usage, and complication man-

agement. Parents could view the module and learn at any convenient time. Second, question and answers module in which one medical staff member of our team was on duty every day and was online in the WeChat group at 18:00 to 21:00 to explain information and reply to parents' questions, to remind parents about and supervise regular outpatient review. The medical staff also guided the family members in the WeChat group to communicate, discuss, and share the care experience and encourage each other actively.

The parents in control group obtained a card at the discharge. The card contained the same educational information as that in the health education module in the intervention group. They were also told to visit the hospital immediately in the event of an emergency.

Both the control group and the intervention group were asked to make monthly outpatient visits.

Research Tool

The SAS scale consists of 20 items which is widely used in clinic with high reliability and validity. Fifteen items are presented with negative wording. The scores are obtained using the scoring method in ascending order (1–4) based on the occurrence frequency of symptoms. Five items are presented with positive wording. The scores are obtained using the reverse scoring method in descending order (4–1) based on the occurrence frequency of symptoms. The total score is obtained by adding the scores of all items. The standard score is obtained by multiplying the total score by 1.25 and rounding off the result. The mean value of the standard score is 50. With regard to the grade description, 50 to 59 is mild anxiety, 60 to 69 is medium anxiety, and ≥ 70 is severe anxiety.¹¹

The SDS consists of 20 items, including 10 negative symptoms and 10 positive symptoms, which are widely used in clinic with high reliability and validity. All items together reflected the mood, body discomfort symptoms, spiritual movement, behavior, and psychological symptoms of patients with depression. The scores were obtained using the scoring method in ascending order (1–4) based on the occurrence frequency of positive symptoms. The scores were obtained using the reverse scoring method in descending order (4–1) based on the occurrence frequency of negative symptoms. The standard score was obtained by multiplying the scores by 1.25 and rounding off the result. A higher score indicated a more significant depression tendency. Grade description: 50 to 59 means mild depression, 60 to 69 means medium depression, and ≥ 70 means severe depression.¹²

The WHOQOL-BREF scale has 26 items including the physiological field, psychological field, social relations field, and environmental field. It is a widely used scale developed by the World Health Organization to measure the quality of life according to its concept of quality of life with high reliability and validity. Item 1 and item 2 are two independent topics, and their total scores are used as an overall index to evaluate quality of life. Each item in the scale is designed to be graded 1 to 5, corresponding to 1 to 5 points, and items 3, 4, and 26 are reverse scored and graded 1 to 5, corresponding to 5 to 1 points. The higher the score, the higher the quality of life.¹³

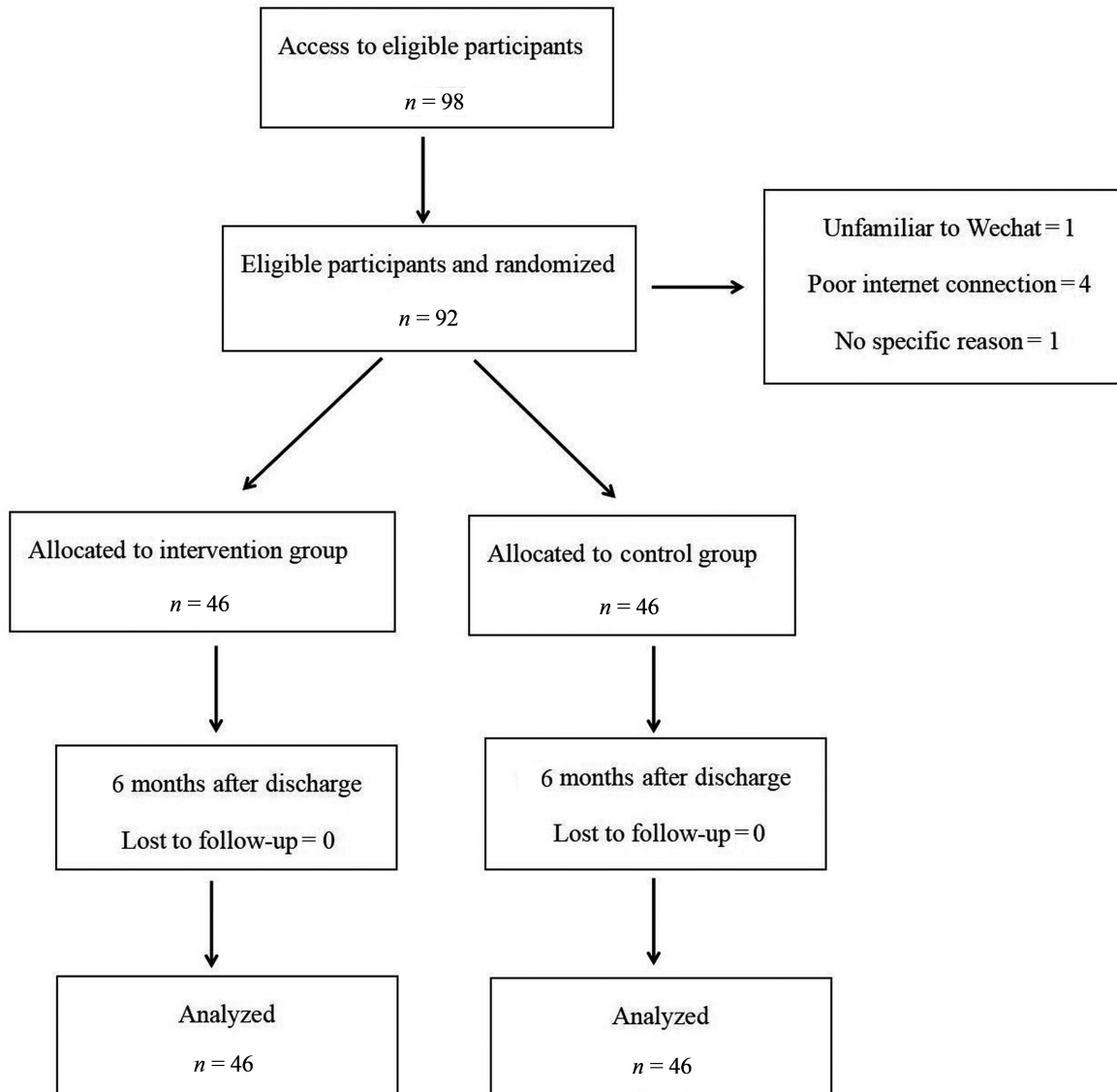


Fig. 1 The frame of the study.

Statistical Analysis

SPSS 25.0 was used for statistical analysis. Continuous data were presented as the mean \pm standard deviation and range. The normal distribution test was performed on all continuous data, and they followed a normal distribution. Continuous data between the two groups were compared with the paired *t*-test. The χ^2 or Fisher's test was used to categorize the variables. A *p*-value of <0.05 was defined as significant.

Results

The demographic characteristics of patients and their parents are shown in **Table 1**, and there was no statistical significance difference between the two groups. **Table 2** showed that the SAS and SDS scores of the parents at the time of discharge between the two groups were similar without

statistical significance difference. These indicate that patients and parents in the two groups were homogenous and comparable.

All patients were followed-up in 6 months after discharge. Six months after discharge, SAS and SDS scores of parents in the intervention group were significantly lower than those in the control group ($p < 0.05$). Compared with the SAS and SDS scores at the time of discharge, those scores of parents at 6 months after discharge time in intervention group were significantly lower ($p < 0.05$), while those scores of parents at 6 months after discharge time in control was similar ($p > 0.05$; **Table 2**).

The results of the WHOQOL-BREF scale show that the scores of the physiological field, psychological field, social relationship field, and environmental field in the intervention group were significantly higher than those of the control group in 6 months after discharge ($p < 0.05$; **Table 3**).

Table 1 Demographic characteristics of patients and their parents in two groups

Demographic characteristics	Intervention group	Control group	p-Value
Age (y)	8.6 ± 3.2	8.3 ± 3.6	0.413
Boy/girl	25/21	24/22	0.834
Age of parents (y)	31.2 ± 5.8	30.3 ± 6.5	0.552
Parents' education level			
Under high school	8	10	0.910
High school	14	13	
Junior college	15	16	
Bachelor degree or higher	9	7	
Living condition			
Rural area	30	32	0.656
City	16	14	

Table 2 Comparison of SAS score and SDS score of parents between the two groups

	Intervention group	Control group	p-Value
At the discharge time			
Score of SAS	68.6 ± 13.6	67.1 ± 14.5	0.582
Score of SDS	65.7 ± 12.8	63.6 ± 13.3	0.621
6 months after discharge			
Score of SAS	51.3 ± 7.3 ^a	63.3 ± 10.2	0.024
Score of SDS	47.6 ± 8.1 ^a	60.1 ± 9.3	0.027

Abbreviations: SAS, self-rating anxiety scale; SDS, self-rating depression scale.

^aShown that compared with the score of each corresponding item at the discharge time $p < 0.05$.

Table 3 Comparison of WHOQOL-BREF scale score of parents between the two groups at 6-month follow-up time

	Intervention group	Control group	p-Value
Physiological fields	15.1 ± 2.9	11.2 ± 3.1	0.029
Psychological fields	15.8 ± 2.6	10.4 ± 2.9	0.020
Social fields	16.1 ± 3.2	10.2 ± 3.0	0.016
Environmental fields	14.9 ± 2.7	9.8 ± 3.3	0.035

Abbreviation: World Health Organization Quality of Life Brief Scale.

Table 4 Comparison of glycemic control of parents between the two groups at 6-month follow-up time

	Intervention group	Control group	p-Value
HbA1c (%)	7.0 ± 1.1	8.1 ± 1.2	0.020
Fasting blood glucose (mmol/L)	6.2 ± 1.5	8.5 ± 1.8	0.018
Hyperglycemia or hypoglycemia	5	13	0.036
Rehospitalizations	2	8	0.044

The comparison of glycemic control of parents between the two groups at 6-month follow-up time that the HbA1c, fasting blood glucose, and the complications of hyperglycemia or hypoglycemia and rehospitalizations in the intervention group were significantly lower than those of the control group ($p < 0.05$; **Table 4**)

Discussion

Type-1 diabetes mellitus is a common chronic metabolic disease of children with complex disease management which involves many aspects of daily life.^{14–16} The complex management of the disease is a challenge for the medical

professional, so that it would be a big challenge for the family without medical knowledge. However, the management of type-1 diabetes mellitus is concentrated in the home. At the current medical model, parents can receive medical support and care guidance in hospital, while once the children is discharged from the hospital, the medical support and care guidance are terminated.¹⁷ Due to the short hospitalization time, the parents were unable to adapt a series of home care problems after discharge, and they urgently hoped that the medical staff could continue to provide medical support and help to them. The pressure and difficulties of the home care for the parents of children with type-1 diabetes mellitus was the lack of knowledge of disease and home care and medical support.¹⁸ Parents of children with type-1 diabetes mellitus need to invest a lot of time and energy in the home care, and they also always worried about the occurrence of poor blood glucose control and complications. They are in a long-term nervous state or even collapse, and the normal life is seriously affected, so that their quality of life is very low.¹⁹ Therefore, it is very important to implement the new health education method to guide the home care of parents, to provide them with continuous medical support, to reduce the pressure of home care, and to improve their quality of life.

Recently, telemedicine has been rapidly developed and widely used as a tool for disease management and health education with many advantages, such as shortening time consumption, improving patients' condition and improving the quality of life of patients and families.^{20–25} WeChat is the most widely used mobile application in China with 1.12 billion users.²⁶ In this study, WeChat was used as a telehealth education platform to perform health education and home care guidance for parents of children with type-1 diabetes mellitus after discharge. The results showed that anxiety and depression in the intervention group were significantly lower than those in the control group. Parents in the intervention group can learn from the WeChat educational module anytime and anywhere according to their needs. When they had problems, they can consult the medical staff through WeChat anytime and anywhere, and they can get timely and effective answers, and get professional knowledge support. The hospital high quality professional level of medical services can be extended to the family and the relationship between doctors and parents can be better strengthen via WeChat, which is benefit for medical staffs to understand the home care of patients timely, to give parents sufficient medical support and help. These were conducive to the glycemic control and reduce complications and rehospitalization rate during the follow-up which can reduce the pressure, anxiety, and depression of parents on the home care. At the same time through WeChat chat, we can also timely understand the psychological state of the parents, and the through giving care, counseling, and support can alleviate their negative psychology and eliminate worries. In addition, it was free to apply for WeChat public accounts and establish WeChat groups, and we did not charge any fees for answering parents' questions in WeChat groups. Therefore, WeChat medical services would not increase the economic burden of parents.

With the improvement of people's living standard, people have higher and higher requirements for the quality of life and pay more and more attention to the enjoyment of life. Now, the quality of life has been regarded as an important index to evaluate the health and living standard. Studies have shown that social support is positively correlated with caregivers' quality of life on the whole, and strengthening social support intervention can improve the caring ability and quality of life of patients' families.²⁷ In this study, the scores of WHOQOL-BREF scale in the intervention group were significantly higher than those in the control group in the field of physiology, psychology, social relations, and environment. Health education and home care guidance via WeChat can effectively provide professional medical support and help to parents of children with type-1 diabetes mellitus which can effectively solve the problems and improve their caring ability at home, relieve their pressure of home care, and improve their quality of life.

Limitations

This paper still has some limitations. First, some patients cannot be recruited due to poor internet support, especially in rural areas of China. Second, this was a single-center study. Third, the follow-up time was short. Fourth, this study lacked the data on ethnicity/race, as well as public versus private insurance.

Conclusion

Performing telehealth education and home care guidance to the parents of children with type-1 diabetes mellitus via WeChat can effectively extend the high-quality medical services of the hospital to the family which can effectively relieve the anxiety and depression of the parents, and improve their quality of life.

Clinical Relevance Statement

Telehealth education and care guidance via WeChat is a new and effective way of health education which is very convenient and can be continuous. Telehealth education via WeChat can make the health education more effective and through timely interaction, family members can better grasp these knowledge.

Multiple Choice Questions

1. What are the great difficulties, pressure, and burden to the parents of children with type-1 diabetes mellitus?
 - a. Poor self-control
 - b. Irregular diet
 - c. Difficult insulin injection
 - d. All of the above

Correct Answer: The correct answer is option d, all of the above. Children with poor self-control, irregular diet, difficult insulin injection, and poor compliance are prone

to complications which bring great difficulties, pressure, and burden to the parents of children

2. Advantages of telemedicine
 - a. Shortening time consumption
 - b. Improving patients' condition
 - c. Improving the quality of life
 - d. All of the above

Correct Answer: The correct answer is option d, all of the above. Telemedicine has been rapidly developed and widely used as a tool for disease management and health education with many advantages, such as shortening time consumption, improving patients' condition and improving the quality of life of patients and families.

Protection of Human and Animal Subjects

The project was deemed not human subjects research and received exempt approval by the ethics committee of our hospital.

Authors' Contributions

M.-X.H and B.-Y.W. designed the study, collected the clinical data, performed the statistical analysis, drafted the manuscript, and revised the article. M.-C.W. participated in the statistical analysis and drafted the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

The present study was approved by the ethics committee of our hospital and adhered to the tenets of the Declaration of Helsinki. Additionally, all the parents of patients signed the consent form before participating in the study.

Data Availability

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

Funding

None.

Conflict of Interest

None declared.

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Reference

- 1 Pettitt DJ, Talton J, Dabelea D, et al; SEARCH for Diabetes in Youth Study Group. Prevalence of diabetes in U.S. youth in 2009: the SEARCH for diabetes in youth study. *Diabetes Care* 2014;37(02):402–408
- 2 Rowley WR, Bezold C, Arikan Y, Byrne E, Krohe S. Diabetes 2030: insights from yesterday, today, and future trends. *Popul Health Manag* 2017;20(01):6–12
- 3 Dabelea D, Mayer-Davis EJ, Saydah S, et al; SEARCH for Diabetes in Youth Study. Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. *JAMA* 2014;311(17):1778–1786
- 4 Maahs DM, West NA, Lawrence JM, Mayer-Davis EJ. Epidemiology of type 1 diabetes. *Endocrinol Metab Clin North Am* 2010;39(03):481–497
- 5 Groat D, Kwon HJ, Grando MA, Cook CB, Thompson B. Comparing real-time self-tracking and device-recorded exercise data in subjects with type 1 diabetes. *Appl Clin Inform* 2018;9(04):919–926
- 6 Caccavale LJ, Weaver P, Chen R, Streisand R, Holmes CS. Family density and SES related to diabetes management and glycemic control in adolescents with type 1 diabetes. *J Pediatr Psychol* 2015;40(05):500–508
- 7 Delamater AM, de Wit M, McDarby V, et al. ISPAD Clinical Practice Consensus Guidelines 2018: psychological care of children and adolescents with type 1 diabetes. *Pediatr Diabetes* 2018;19(Suppl 27):237–249
- 8 Joensen LE, Almdal TP, Willaing I. Associations between patient characteristics, social relations, diabetes management, quality of life, glycaemic control and emotional burden in type 1 diabetes. *Prim Care Diabetes* 2016;10(01):41–50
- 9 Chow SK, Wong FK, Chan TM, Chung LY, Chang KK, Lee RP. Community nursing services for postdischarge chronically ill patients. *J Clin Nurs* 2008;17(7B):260–271
- 10 Lawoko S. Factors influencing satisfaction and well-being among parents of congenital heart disease children: development of a conceptual model based on the literature review. *Scand J Caring Sci* 2007;21(01):106–117
- 11 Zung WW. A rating instrument for anxiety disorders. *Psychosomatics* 1971;12(06):371–379
- 12 Zung WW. A self-rating depression scale. *Arch Gen Psychiatry* 1965;12(01):63–70
- 13 Sijtsma K, Emons WH, Bouwmeester S, Nyklíček I, Roorda LD. Nonparametric IRT analysis of Quality-of-Life Scales and its application to the World Health Organization Quality-of-Life Scale (WHOQOL-Bref). *Qual Life Res* 2008;17(02):275–290
- 14 Malik JA, Koot HM. Explaining the adjustment of adolescents with type 1 diabetes: role of diabetes-specific and psychosocial factors. *Diabetes Care* 2009;32(05):774–779
- 15 Colton PA, Olmsted MP, Daneman D, Rodin GM. Depression, disturbed eating behavior, and metabolic control in teenage girls with type 1 diabetes. *Pediatr Diabetes* 2013;14(05):372–376
- 16 Katz ML, Laffel LM, Perrin JM, Kuhlthau K. Impact of type 1 diabetes mellitus on the family is reduced with the medical home, care coordination, and family-centered care. *J Pediatr* 2012;160(05):861–867
- 17 Carroll A, Dowling M. Discharge planning: communication, education and patient participation. *Br J Nurs* 2007;16(14):882–886
- 18 Deek H, Hamilton S, Brown N, et al; FAMILY Project Investigators. Family-centred approaches to healthcare interventions in chronic diseases in adults: a quantitative systematic review. *J Adv Nurs* 2016;72(05):968–979
- 19 Carter JD, Mulder RT, Darlow BA. Parental stress in the NICU: The influence of personality, psychological, pregnancy and family factors. *Pers Ment Health* 2007;1:40–50
- 20 Malasanos TH, Burlingame JB, Youngblade L, Patel BD, Muir AB. Improved access to subspecialist diabetes care by telemedicine: cost savings and care measures in the first two years of the FITE diabetes project. *J Telemed Telecare* 2005;11(Suppl 1):74–76
- 21 Wood CL, Clements SA, McFann K, Slover R, Thomas JF, Wadwa RP. Use of telemedicine to improve adherence to american diabetes association standards in pediatric type 1 diabetes. *Diabetes Technol Ther* 2016;18(01):7–14
- 22 Hamine S, Gerth-Guyette E, Faulx D, Green BB, Ginsburg AS. Impact of mHealth chronic disease management on treatment

- adherence and patient outcomes: a systematic review. *J Med Internet Res* 2015;17(02):e52
- 23 Debon R, Coleone JD, Bellei EA, De Marchi ACB. Mobile health applications for chronic diseases: a systematic review of features for lifestyle improvement. *Diabetes Metab Syndr* 2019;13(04):2507–2512
- 24 Zhang QL, Liu JF, Xie WP, Cao H, Chen Q. The effect of WeChat on parental care burden, anxiety, and depression in children after CHD surgery during COVID-19 pandemic. *Appl Clin Inform* 2021;12(04):768–773
- 25 Groat D, Soni H, Grando MA, Thompson B, Kaufman D, Cook CB. Design and testing of a smartphone application for real-time self-tracking diabetes self-management behaviors. *Appl Clin Inform* 2018;9(02):440–449
- 26 Shao F, He Z, Zhu Z, et al. Internet influence of assisted reproduction technology centers in china: qualitative study based on WeChat official accounts. *J Med Internet Res* 2020;22(06):e17997
- 27 Leow MQ, Chan MF, Chan SW. Predictors of change in quality of life of family caregivers of patients near the end of life with advanced cancer. *Cancer Nurs* 2014;37(05):391–400