Am J Transl Res 2024;16(12):7817-7829
www.ajtr.org /ISSN:1943-8141/AJTR0159664

Original Article

Internet-enhanced continuity of care reduces postoperative complications and improves outcomes in pediatric strabismus surgery

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Received August 7, 2024; Accepted December 2, 2024; Epub December 15, 2024; Published December 30, 2024

Abstract: Objective: To explore the application value of Internet Family Engagement Continuum of Care in strabismus ambulatory surgery and evaluate its impact on postoperative complications, children's quality of life, and parental satisfaction. Methods: A retrospective analysis was conducted on the clinical data of 257 children who underwent strabismus ambulatory surgery in our hospital from February 2022 to December 2023. The children were divided into a control group (n=149), which received routine nursing services and telephone follow-up, and an observation group (n=108), which received Internet Family Engagement Continuum of Care through a mobile medical platform. Evaluations were conducted using the Chinese versions of the Empowerment of Parents in The Intensive Care (EMPATIC-30), Visual Analogue Scale (VAS), Pediatric Quality of Life Inventory 4.0 (PedsQLTM 4.0), Children's Depression Inventory (CDI), and Multidimensional Anxiety Scale for Children (MASC). Results: The observation group showed significantly better outcomes in postoperative VAS scores, PedsQLTM scores, CDI scores, and MASC scores compared to the control group (all P<0.001). The readmission rate in the observation group (10.19%) was significantly lower than in the control group (22.82%) (P=0.009). Parents with children in the observation group scored significantly higher on all dimensions of the EMPATIC-30 compared to those in the control group (all P<0.0001). The incidence of complications was significantly lower in the observation group (6.48%) compared to the control group (18.79%) (P=0.005). Multivariate logistic regression analysis indicated that the intervention program and surgical time were independent risk factors affecting postoperative complications. Conclusion: Internet Family Engagement Continuum of Care significantly reduces the incidence of postoperative complications in children undergoing strabismus ambulatory surgery, improves the quality of life and mental health of the children, and enhances parental satisfaction and engagement.

Keywords: Strabismus, ambulatory surgery, continuity of care, internet, family engagement, quality of life, parental satisfaction

Introduction

Strabismus, characterized by the misalignment of one or both eyes when focusing on a target, is one of the most common organic diseases in pediatric ophthalmology [1]. The etiology of strabismus is complex, involving anomalies in binocular single vision, abnormalities in the nerves or extraocular muscles controlling eye movements, mechanical factors, and trauma [2]. Due to its multifaceted causes and manifestations, strabismus is considered a multidisciplinary disease intersecting neurology, optometry, pediatric ophthalmology, genetics, and imaging [3]. The prevalence of strabismus in children varies globally, ranging from approximately 0.13% to 4.70% [4]. Strabismus not only affects the visual function of children but also has significant impacts on appearance and mental health, thus being widely recognized as a public health issue.

Strabismus severely impairs the development of visual function in children, leading to the loss of binocular single vision or the absence of stereoscopic vision [5]. These visual defects affect daily life and may result in learning difficulties and coordination problems [6]. Furthermore,

https://doi.org/10.62347/HWWE7193

strabismus has profound impacts on children's mental health. Studies have shown that children with strabismus are more prone to psychological issues such as anxiety, depression, and low self-esteem compared to their peers [7]. The abnormal appearance caused by strabismus often leads to ridicule and social exclusion, exacerbating psychological problems. Surveys indicate that the use of alcohol, depression, and anxiety disorders are prevalent among Chinese children aged 10 to 17 with strabismus, highlighting the close connection between mental health issues and strabismus. If left unaddressed, the psychological impact of strabismus can lead to more severe mental health problems [8].

Ambulatory surgery is an effective treatment for strabismus, where children are admitted, undergo surgery, and are discharged on the same day, typically within hours post-operation [9]. Ambulatory surgery offers several advantages, including shorter hospital stays, reduced medical costs, and lower risks of hospital-acquired infections [10]. Post-surgery, children are observed in a recovery room, and they can soon be discharged without significant discomfort or complications [11]. Detailed postoperative care instructions are provided by doctors, covering medication guidance, rest and activity restrictions, and follow-up arrangements. However, due to the lack of hospitalization, postoperative communication with doctors may decrease, potentially leading to reduced attention to postoperative care instructions and a higher risk of complications [12]. To address this issue, continuity of care has emerged as a crucial supplementary approach.

Continuity of care is a healthcare model designed to address the care needs of children transitioning from hospital to home and community [13]. It aims to reduce readmission rates, lower medical costs, and improve patient outcomes and satisfaction. Delivered by a multidisciplinary team, often led by extended care nurses, continuity of care involves a coordinated process of assessment, planning, implementation, and evaluation to ensure comprehensive health care for children [14]. With advancement in internet and mobile technology, continuity of care has integrated internet platforms (such as WeChat public accounts, dedicated apps, enterprise WeChat), facilitating real-time and convenient communication and information sharing between patients and their care team [15]. By using these platforms, the care team can remotely monitor postoperative recovery, offer personalized care advice, and promptly address patient concerns, thus enhancing the coverage and effectiveness of nursing services.

While previous studies have explored various aspects of postoperative care in strabismus surgery, many have focused primarily on short-term outcomes or specific surgical techniques, with limited attention to long-term postoperative care and complication prevention. Additionally, few studies have fully integrated internet-based platforms into the continuum of care, particularly in the context of ambulatory surgery [16]. These studies often suffer from limitations such as short follow-up periods, small sample sizes, or inadequate utilization of technology for continuous patient monitoring and support. Our study seeks to address these gaps by implementing a comprehensive, internet-enhanced continuity of care model that provides long-term follow-up, personalized care, and real-time interaction between patients and care teams. This approach aims not only to reduce postoperative complications but also to improve the overall quality of life for children undergoing strabismus surgery, thereby offering a novel contribution to the field.

Methods and materials

Clinical data

A retrospective analysis was conducted on the clinical data of 257 pediatric patients who underwent ambulatory surgery for strabismus at Xi'an People's Hospital (Xi'an Fourth Hospital) from February 2022 to December 2023. The patients were divided into two groups based on postoperative care methods: the control group (n=149) received routine nursing services and telephone follow-ups, while the observation group (n=108) received Internet Family Engagement Continuum of Care combined with mobile medical platforms.

Inclusion criteria: All patients underwent horizontal muscle strengthening and weakening surgery combined with inferior oblique muscle weakening surgery [17]. The children, aged between 6 and 12 years old, were first-time

patients without previous professional treatment, and were diagnosed by doctors as meeting the criteria for ambulatory surgery. Their comprehensive clinical data and follow-up records were available.

Exclusion criteria: Patients were excluded if they had ocular or systemic infections, coagulation function or immune system disorders, facial deformities, ocular abnormalities caused by other diseases, intellectual disabilities, sinus arrhythmia, congenital heart disease, major organ dysfunction (including heart, liver, brain, or kidney), or acute or chronic infections. This study was approved by the Ethics Committee of Xi'an People's Hospital (Xi'an Fourth Hospital) (KJLL-Z-H-2024012).

Nursing plans

Control group: Follow-up nurses conducted telephone follow-ups on the 3rd day, 1st week, 1st month, and 3rd month after discharge, with an outpatient review required at the 6th month to assess the recovery of the children's eyes, outpatient visits, and psychological status. The nursing staff provided medication guidance, rehabilitation guidance, and conducted satisfaction surveys. Subsequent follow-up visits were scheduled based on the patient's condition and doctor's recommendations. Additionally, responsible nurses provided education on treatment plans and disease-related knowledge at the time of admission. At discharge, they provided oral instructions on family care and lifestyle adjustments, along with distributing health brochures for the guardians to reference.

Observation group: In addition to the routine care provided to the control group, the observation group incorporated "Internet Family Engagement Continuum of Care". A WeChat group, namely "City Eye Hospital Ambulatory Surgery Nurse-Patient Communication Group" was set up. WeChat is a mobile application designed for enterprise services, providing a real-time communication platform for the families of pediatric patients. Creating a WeChat group is cost-free, by downloading the WeChat app on a mobile phone. To ensure information security, the personal information of children and nurses within this group was protected. A dedicated extended care service team, established by a nurse, managed the WeChat group. A follow-up information platform, constructed by our hospital's nursing experts and information engineers based on the hospital information system, allows nurses to directly access patient information, contact guardians via one-click dialing, and conduct follow-ups efficiently. Electronic health education materials were distributed in stages by the on-duty nurse. At admission, information about the ambulatory surgery process and precautions was shared. During hospitalization, surgical cooperation precautions and disease-related knowledge were shared. After surgery, postoperative precautions, discharge procedures, and follow-up plans were provided, requiring guardians to familiarize themselves with the relevant content. Real-time problem-solving: After the child returned home, guardians could ask questions in the WeChat group, and the on-duty nurse would promptly respond and provide guidance. In cases where the child exhibited symptoms like eye swelling, pain, nausea, vomiting, or worsening symptoms, the nurse guided the family to visit the emergency department, which operates 24 hours a day. Follow-up tracking: Follow-up nurses used the follow-up information platform to track patients post-discharge according to the plan and recorded the follow-up results in the system.

Functional scores

The Chinese version of the Empowerment of Parents in The Intensive Care (EMPATIC-30) [18] is a 30-item scale designed to assess the parental satisfaction and participation in nursing services. Each item is scored from 1 to 6, with higher scores indicating greater parental satisfaction.

The Visual Analogue Scale (VAS) [19] was used to measure the subjective sensations of children, such as pain intensity, with a score range from 0 to 10, where 0 represents no symptoms and 10 represents the most severe symptoms.

The Pediatric Quality of Life Inventory 4.0 (PedsQLTM 4.0) [20] was used to assess the quality of life of children across four dimensions with 23 items. Scores range from 0 to 100, with higher scores indicating better quality of life.

The Children's Depression Inventory (CDI) [21] is a scale designed to assess depressive symp-

Table 1. Comparison of baseline data between the two groups

Index	Control Group (n=149)	Observation Group (n=108)	Z/χ^2 Value	*P* Value
Gender (male/female)	85/64	58/50	0.284	0.594
Age (years)	9.00 [7.00, 11.00]	9.00 [7.00, 11.00]	0.731	0.46
Disease duration (years)	3.00 [1.00, 4.00]	3.00 [1.00, 4.00]	0.663	0.502
BMI (kg/m^2)	16.60 [15.40, 17.90]	16.70 [15.45, 18.00]	0.41	0.683
Disease type (exotropia/endotropia/paralytic strabismus)	31/58/60	31/40/37	2.277	0.32
Ethnicity (Han Chinese/Minority)	127/22	95/13	0.396	0.529
Place of residence (urban/rural)	97/52	66/42	0.43	0.512
Only child (Yes/No)	52/97	42/66	0.43	0.512
Monthly family income (RMB)	6000.00 [4000.00, 9000.00]	6000.00 [4000.00, 8250.00]	-0.929	0.349
Surgical time (min)	28.00 [27.00, 30.00]	28.00 [25.00, 30.00]	-1.365	0.17
Intraoperative bleeding (mL)	12.00 [10.00, 14.00]	12.00 [10.00, 14.00]	-0.132	0.895
Wound recovery time (d)	6.00 [5.00, 7.00]	6.00 [5.00, 7.00]	-0.076	0.937

Note: BMI, Body mass index.

toms in children and adolescents, containing 27 items scored based on frequency, with a total score of 54. Higher scores indicate more severe depressive symptoms.

The Multidimensional Anxiety Scale for Children (MASC) [22] was used to assess anxiety symptoms in children, covering multiple anxiety dimensions with 39 items, and total scores range from 39 to 195. Higher scores indicate more severe anxiety symptoms.

Observation indicators

Primary indicators: The incidence of complications after nursing interventions was compared between the two groups, and logistic regression was used to analyze the risk factors influencing the occurrence of complications.

Secondary indicators: The baseline data were compared between the two groups. Changes in PedsQLTM scores, CDI scores, and MASC scores before and 6 months after the intervention, as well as changes in VAS scores before and 1 month after the intervention were compared between the two groups. The readmission rate of children and parental satisfaction with treatment were also compared between the two groups.

Statistical analysis

SPSS 26.0 was used for statistical analyses. Count data were expressed as rates (%) and analyzed using the chi-square test. For measurement data, the distribution was assessed using the Kolmogorov-Smirnov test. Data conforming to a normal distribution were expressed as mean ± standard deviation (Mean ± SD) and analyzed using the independent samples t-test, while non-normally distributed data were expressed as quartiles P50 (P25, P75). Logistic regression was employed to identify the risk factors affecting postoperative complications in children. Spearman's correlation test was used to examine the relationship between complications and changes in functional scores. Additionally, Restrictive Cubic Spline analysis was applied to explore the non-linear relationship between surgical time and the predicted probability of adverse reactions. Statistical significance was set at $P<0.05$.

Results

Comparison of baseline characteristics between the control and observation groups

Comparison of the baseline data between the two groups revealed no statistically significant differences in gender (P=0.594), age (P=0.46), disease duration (P=0.502), body mass index (BMI) (P=0.683), disease type (P=0.32), ethnicity (P=0.529), place of residence (P=0.512), only child status (P=0.512), monthly family income (P=0.349), surgical time (P=0.17), intraoperative bleeding (P=0.895), and wound recovery time (P=0.937) (all P>0.05). These results indicate that the two groups were comparable in their preoperative baseline characteristics (**Table 1**).

Changes in pain and quality of life scores before and after intervention

There was no significant difference in the VAS scores between the two groups before the

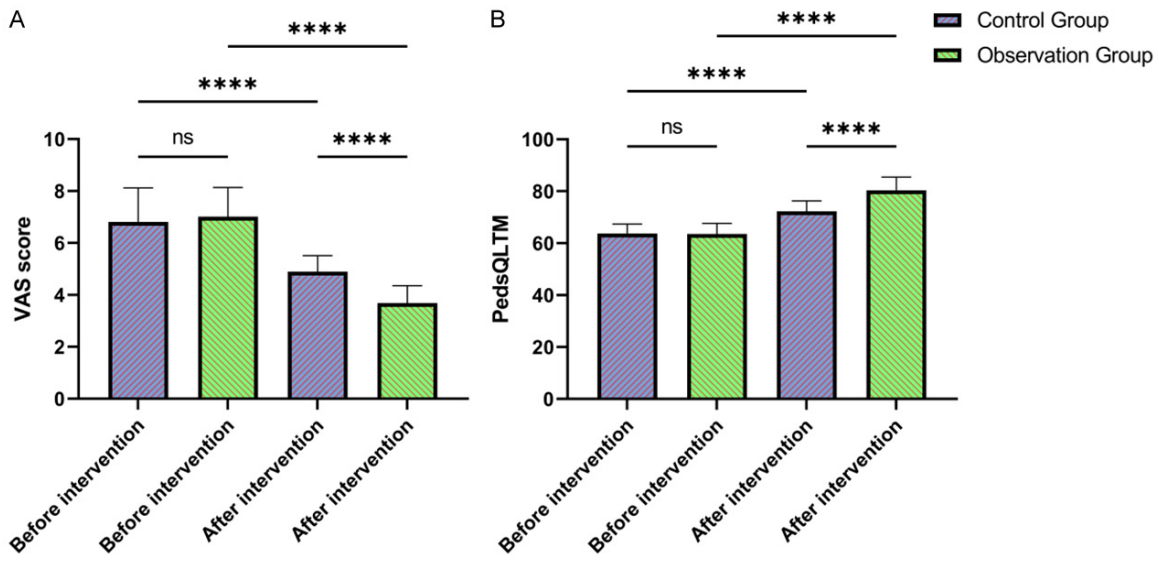

Figure 1. Changes in pain intensity and quality of life scores before and after intervention. A. Comparison of VAS scores before and after the intervention. B. Comparison of PedsQLTM scores before and after the intervention. Note: VAS, Visual Analogue Scale; PedsQLTM 4.0, Pediatric Quality of Life Inventory 4.0; ns P>0.05, ****P<0.0001.

intervention (P>0.05). After the intervention, the VAS scores decreased in both groups compared to those before the intervention (P<0.0001). Specifically, the VAS scores in the observation group were significantly lower than those in the control group after the intervention (P<0.001), indicating better pain management in the observation group (**Figure 1A**).

There was no significant difference in PedsQLTM scores between the two groups before the intervention (P>0.05). After the intervention, the PedsQLTM scores increased in both groups compared to those before the intervention (P<0.0001). Specifically, the PedsQLTM scores in the observation group were significantly higher than those in the control group after the intervention (P<0.001), indicating a more significant improvement in quality of life in the observation group (**Figure 1B**).

Changes in anxiety and depression scores before and after intervention

There was no significant difference in CDI scores between the two groups before the intervention (P>0.05). After the intervention, both groups showed significantly lower CDI scores compared to baseline (P<0.0001). Specifically, the CDI scores in the observation group were significantly lower than those in the control group after the intervention (P<0.001), indicating better management of depression in the observation group (**Figure 2A**).

Similarly, there was no significant difference in MASC scores between the two groups before the intervention (P>0.05). After the intervention, the MASC scores were significantly lower in both groups than the baseline scores (P<0.0001). Specifically, the MASC scores in the observation group were significantly lower than those in the control group after the intervention (P<0.001), indicating better management of anxiety in the observation group (**Figure 2B**).

Comparison of readmission rates within 6 months between the control and observation groups

Statistics on non-review readmission within 6 months were collected. The results showed that the non-review readmission rate was significantly higher in the control group (22.82%) compared to the observation group (10.19%) (P=0.009, **Table 2**).

Comparison of parental satisfaction between the control and observation groups

When comparing the EMPATIC-30 scores between the two groups, parents with children in the observation group scored significantly high-

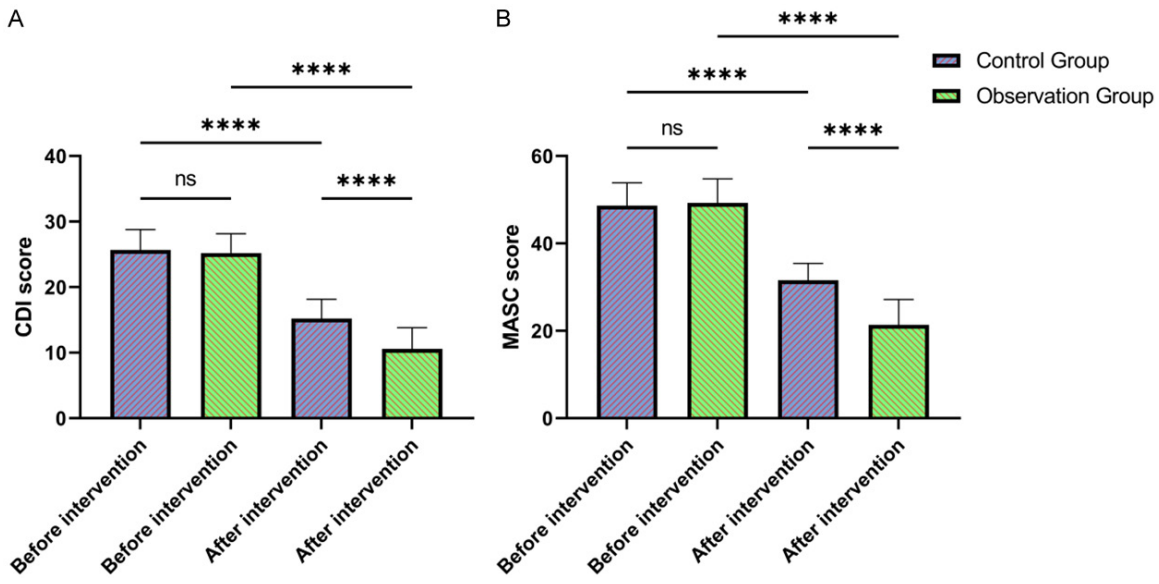

Figure 2. Changes in anxiety and depression scores before and after intervention. A. Comparison of CDI scores before and after the intervention. B. Comparison of MASC scores before and after the intervention. Note: CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children; ns P>0.05, ****P<0.0001.

Table 2. Comparison of readmission rate within 6 months between the two groups

Group	1 Month	3 Months	6 Months	Total Readmission Rate
Control Group (n=149)	21	8	5	34 (22.82%)
Observation Group (n=108)	5	4	2	11 (10.19%)
χ^2 Value				6.919
P Value				0.009

er in all dimensions (**Figure 3A-D**): information acquisition (P<0.0001), parental participation (P<0.0001), professional attitude (P<0.0001), and treatment care (P<0.0001) compared to those in the control group.

Comparison of incidence of complications between the control and observation groups

Statistics on the incidence of complications within 6 months were collected. The results showed that the incidence of complications within 6 months was significantly higher in the control group (18.79%) compared to the observation group (6.48%) (P=0.005, **Table 3**).

Relationship between complications and functional scores

Spearman's correlation test was used to analyze the relationship between the occurrence of complications and changes in various functional scores after treatment. The results showed no significant correlation between the occurrence of complications and VAS scores (**Figure 4A**, P=0.051), CDI scores (**Figure 4C**, P=0.247), or MASC scores (**Figure 4D**, P=0.051). However, there were significant associations with a decrease in PedsQLTM scores (**Figure 4B**, P=0.019), indicating a close relationship between complications and reduced quality of life in children.

Comparison of baseline data between the complication group and non-complication group

Patients were divided into a complication group and a non-complication group based on the occurrence of complications. A comparison of the baseline data revealed significant differences in monthly family income (P=0.019), post-treatment VAS (P=0.033), post-treatment MASC (P=0.033), surgical time (P=0.001), and gender (P=0.005) between the complication group and the non-complication group (**Table 4**).

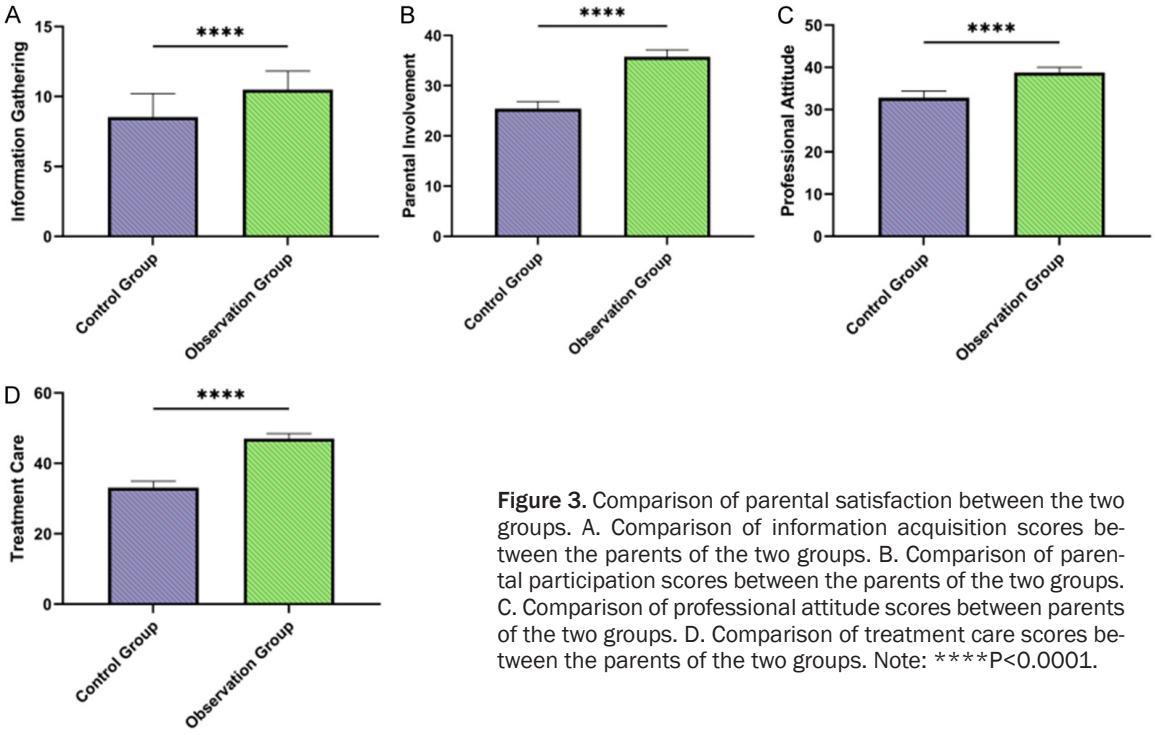

Figure 3. Comparison of parental satisfaction between the two groups. A. Comparison of information acquisition scores between the parents of the two groups. B. Comparison of parental participation scores between the parents of the two groups. C. Comparison of professional attitude scores between parents of the two groups. D. Comparison of treatment care scores between the parents of the two groups. Note: ****P<0.0001.

Table 3. Comparison of incidence of complications between the two groups

Group	Infection	Corneal Epithelial Damage	Visual Function Abnormality	Abnormal Eye Movement	Total Incidence Rate
Control Group (n=149)	8	7	7	6	28 (18.79%)
Observation Group (n=108)	2	2	2	1	7 (6.48%)
χ^2 Value	2.071	1.501	1.501	2.272	8.066
P Value	0.15	0.22	0.22	0.131	0.005

Logistic regression analysis of risk factors affecting complications

Multivariate logistic regression analysis (backward LR) was conducted based on variables with significant differences from **Table 4**. We further assigned values to those variables (**Table 5**). The results showed that the intervention program (P=0.007, HR=3.361, 95% CI: 1.387-8.14) and surgical time (P=0.001, HR=3.457, 95% CI: 1.642-7.28) were independent risk factors affecting the occurrence of postoperative complications in children (**Figure 5**).

Restrictive cubic spline regression analysis on the impact of treatment regimen and surgical time on adverse reactions

Risk factor analysis identified the treatment regimen and surgical time as independent risk factors for adverse reactions. Restrictive cubic spline analysis further demonstrated that when the treatment regimen shifts from the control group to the observation group, the predicted probability of adverse reactions slightly increases (**Figure 6A**). This indicates that the probability of adverse reactions may be slightly higher when using the observation group treatment regimen compared to the control group treatment regimen. Additionally, with the increase in surgical time, the predicted probability of adverse reactions shows a non-linear increasing trend. Adverse reactions are less likely when surgical time is relatively short (around 24 to 26 minutes), but the probability rises significantly when surgical time exceeds 30 minutes, indicating that longer surgical durations are associated with a higher risk of adverse reactions (**Figure 6B**).

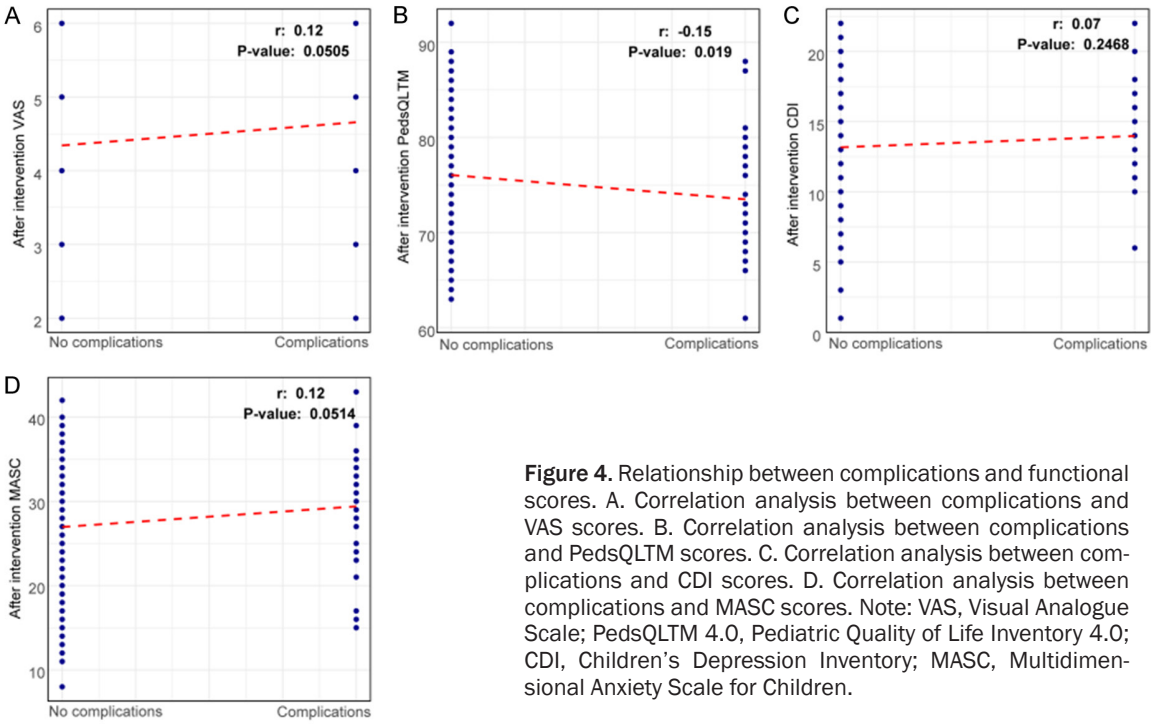

Figure 4. Relationship between complications and functional scores. A. Correlation analysis between complications and VAS scores. B. Correlation analysis between complications and PedsQLTM scores. C. Correlation analysis between complications and CDI scores. D. Correlation analysis between complications and MASC scores. Note: VAS, Visual Analogue Scale; PedsQLTM 4.0, Pediatric Quality of Life Inventory 4.0; CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children.

Table 4. Comparison of baseline data between the complication group and non-complication group

Factors	Non-Complication Group (n=222)	Complication Group (n=35)	Z/χ^2 Value	*P* Value
Age	9.00 [7.00, 11.00]	9.00 [7.00, 11.50]	0.416	0.675
BMI	16.55 [15.43, 17.90]	16.80 [15.60, 18.70]	0.829	0.407
Disease duration	3.00 [1.00, 4.00]	3.00 [2.50, 4.00]	1.226	0.215
Monthly family income	6000.00 [4000.00, 9000.00]	5000.00 [4000.00, 6000.00]	-2.329	0.019
Post-treatment VAS	4.00 [4.00, 5.00]	5.00 [4.00, 5.00]	2.012	0.033
Post-treatment PedsQLTM	76.00 [71.00, 80.00]	72.00 [69.50, 77.50]	-2.288	0.022
Post-treatment CDI	13.17 ± 3.89	13.97 ± 3.26	1.32	0.193
Post-treatment MASC	28.00 [22.00, 32.00]	31.00 [26.00, 34.50]	2.13	0.033
Surgical time	28.00 [26.00, 30.00]	30.00 [28.00, 32.00]	3.239	0.001
Intraoperative bleeding	12.00 [10.00, 14.00]	12.00 [10.00, 14.00]	-0.888	0.372
Wound recovery time	6.00 [5.00, 7.00]	6.00 [6.00, 7.00]	1.779	0.062
Gender (male/female)	101/121	45501	8.066	0.005
Disease type (exotropia/endotropia/paralytic strabismus)	98/124	16/19	0.03	0.862
Ethnicity (Han Chinese/Minority)	54/84/84	8/14/13	0.068	0.967
Place of residence (urban/rural)	29/193	45472	0.428	0.513
Only child (Yes/No)	85/137	45561	2.061	0.151

Note: BMI, Body Mass Index; VAS, Visual Analogue Scale; PedsQLTM 4.0, Pediatric Quality of Life Inventory 4.0; CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children.

Discussion

Childhood strabismus is an ophthalmic condition that not only impairs visual function but also impacts a child's mental health [23]. With the advancements in medical technology, ambulatory surgery has become an effective treatment for strabismus, providing benefits such as reduced hospital stays, lower costs, and decreased infection risks [24]. However, ambulatory surgery also poses challenges in postoperative care, particularly in reducing patient-doctor communication, which may affect the quality of care and increase the risk of complications [25].

In this study, we demonstrated the effectiveness of the Internet Family Engagement

Table 5. Assignment table

Factors	Assignment Content
Intervention program	Control group = 1, Observation group = 0
Gender	Male = 1, Female = 0
Monthly family income	≤6500 = 0, >6500 = 1
Post-treatment VAS	≤4.5 = 0, >4.5 = 1
Post-treatment PedsQLTM	≤72.5 = 0, >72.5 = 1
Post-treatment MASC	≤32.5 = 0, >32.5 = 1
Surgical time	≤29.5 = 0, >29.5 = 1
Complications	Occurrence = 1, Non-occurrence = 0

Note: VAS, Visual Analogue Scale; PedsQLTM 4.0, Pediatric Quality of Life Inventory 4.0; MASC, Multidimensional Anxiety Scale for Children.

Continuum of Care in pediatric strabismus surgery, particularly in enhancing postoperative outcomes. Our findings showed a significant decrease in VAS scores in both groups after the intervention, reflecting effective pain management. Notably, the observation group experienced a more pronounced reduction in pain, likely due to the real-time remote guidance offered through the Internet platform. This platform enabled the care team to monitor the children's postoperative pain closely and provide tailored advice, such as appropriate analgesic use and cold compresses, thereby minimizing pain perception [26]. Similarly, Luo et al. [27] observed that nursing interventions could effectively alleviate postoperative pain in patients with acute dacryocystitis, while Chen et al. [28] reported significant reductions in pain scores among patients undergoing ultrasound-guided microwave ablation for thyroid nodules following comprehensive nursing interventions. Additionally, our study revealed a substantial improvement in PedsQLTM scores in both groups post-intervention, with the observation group showing greater enhancement. This underscores the importance of continuous psychological and lifestyle support provided by the Internet Family Engagement Continuum of Care. By utilizing platforms like WeChat and dedicated apps, the care team was able to regularly distribute health education materials, promptly respond to parents' queries, and offer personalized lifestyle guidance, which facilitated better adaptation to postoperative life and significantly improved the children's overall quality of life [29].

Strabismus significantly affects the mental health of children, as its impact on appearance often leads to ridicule and social ostracism, exacerbating psychological issues such as anxiety and depression [30]. Studies have shown that children with strabismus are more vulnerable to these psychological problems, closely linked to their negative social interactions [31]. In our study, the intervention led to a significant reduction in CDI scores in both groups, indicating an alleviation of depressive symptoms, with more pronounced improvement in the observation group. This enhancement can be attributed to the continuous psychological support provided through the Internet Family Engagement Continuum of Care. The internet platforms facilitated regular communication between the care team, children, and their parents, enabling timely emotional support and psychological counseling, which effectively reduced depressive symptoms [32]. Additionally, the MASC scores showed a significant decrease post-intervention in both groups, reflecting reduced anxiety, with the observation group showing better improvement. This was likely due to the real-time interactions and ongoing care provided by the continuum of care. The internet platforms allowed for continuous monitoring of emotional changes, professional psychological interventions, and support to both children and their parents, which helped manage anxiety more effectively [33, 34]. Hou et al. [35] also found that interactive multimedia-based family interventions could reduce preoperative anxiety in children and improve anesthesia induction. Zhang et al. [36] reported that continuous care interventions significantly improved anxiety, depression, and quality of life in liver cancer patients. These findings support the conclusion that the Internet Family Engagement Continuum of Care is an effective solution for continuous care after strabismus surgery, with promising clinical application potential.

Postoperative readmission rates and parental satisfaction are critical indicators of care quality in pediatric strabismus surgery [37]. Readmissions typically result from inadequate postoperative care or poor complication management, while parental satisfaction reflects their overall assessment of the care provided [38]. In our study, the observation group demon-

Factor	β	SD	chi-square	P	Hazard Ratio(95%CI)
Intervention program	1.212	0.451	7.210	0.007	3.361(1.387-8.14)
Gender	-0.165	0.396	0.174	0.676	0.848(0.39-1.841)
Monthly Family Income	-0.423	0.580	0.533	0.465	0.655(0.21-2.041)
Post-treatment VAS	0.125	0.451	0.076	0.782	1.133(0.468-2.744)
Post-treatment PedsQLTM	-0.481	0.410	1.376	0.241	0.618(0.277-1.381)
Post-treatment MASC	0.525	0.429	1.495	0.221	1.69(0.729-3.92)
Surgery time	1.241	0.380	10.662	0.001	3.457(1.642-7.28)

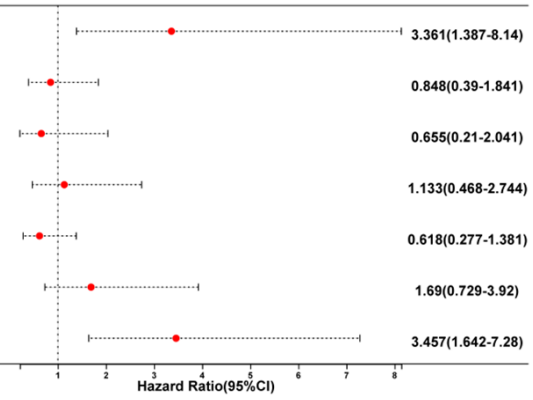

Figure 5. Multivariate logistic regression analysis of risk factors for complications. Note: VAS, Visual Analogue Scale; PedsQLTM 4.0, Pediatric Quality of Life Inventory 4.0; MASC, Multidimensional Anxiety Scale for Children.

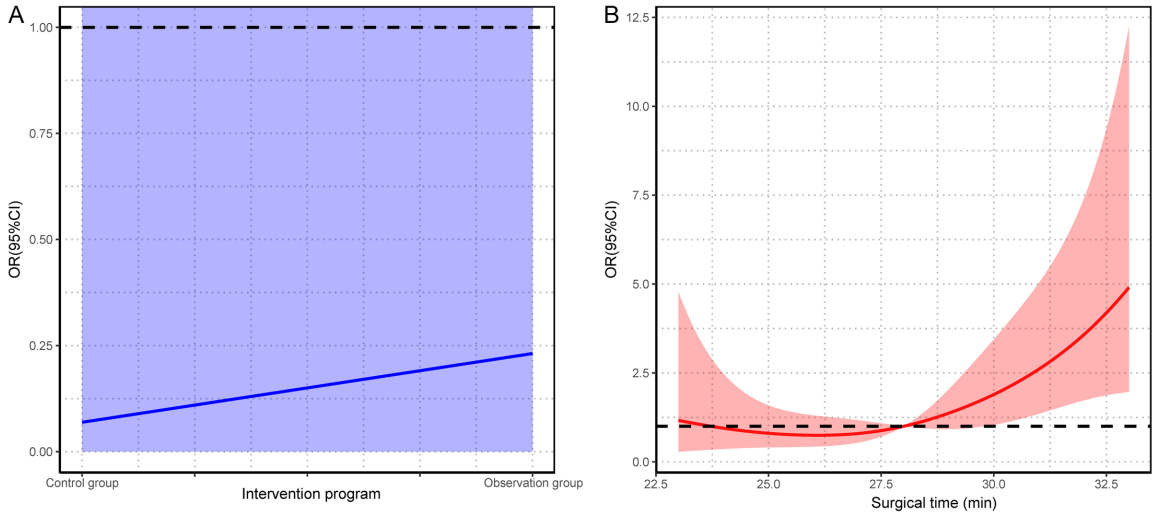

Figure 6. Restrictive cubic spline analysis. A. Impact of treatment regimen on the occurrence of adverse reactions; B. Impact of surgical time on the occurrence of adverse reactions.

strated a significantly lower readmission rate compared to the control group, highlighting the effectiveness of the Internet Family Engagement Continuum of Care in reducing readmissions. This approach allowed the care team to provide timely postoperative guidance and continuous health monitoring, enabling the early detection and resolution of potential complications, thereby improving overall postoperative management. Furthermore, parental satisfaction in the observation group was higher across multiple dimensions, including information acquisition, participation, professional attitude, and treatment care. The internet platform facilitated easier access to care information, encouraged active parental involvement, and maintained effective communication with the care team, contributing to higher satisfaction levels. Li et al. [39] similarly observed that integrated nurse-physician interventions improved both child comfort and parental satisfaction after concealed penis surgery. Moreover, a study on comprehensive care [40] reported that such interventions could improve PedsQLTM scores in children with diarrhea and further increase parental satisfaction.

The occurrence of complications following strabismus surgery significantly impacts the health and quality of life of children [41]. Common complications, such as infections, corneal epithelial damage, visual function abnormalities,

and eye movement disorders, can cause pain, discomfort, and may even lead to vision loss and binocular coordination dysfunction, thereby affecting the learning and daily activities of children [42]. In our study, the observation group exhibited a significantly lower complication rate compared to the control group, underscoring the effectiveness of the care modality in mitigating postoperative complications. Furthermore, Spearman correlation analysis revealed a strong association between the occurrence of complications and a decline in the PedsQLT scores, indicating that as complications increase, the quality of life decreases. This decline is likely due to the physical discomfort and functional impairments brought by complications, which negatively impact children's daily activities and overall health. Therefore, the prevention and management of postoperative complications are essential for maintaining and improving the quality of life in pediatric patients.

Multivariate logistic regression analysis identified the intervention regimen and surgical duration as the main risk factors for postoperative complications in strabismus surgery. The results indicated that while the introduction of continuity of care significantly reduced the risk of complications, longer surgical times were associated with an increased likelihood of complications [43]. Further analysis using restrictive cubic splines revealed a slightly higher predicted probability of adverse reactions when the treatment regimen shifted from the control group to the observation group, suggesting that although continuity of care is effective in reducing postoperative pain and improving quality of life, it may also carry a marginally higher risk of adverse reactions. This finding underscores the need for further research to optimize treatment regimens and balance potential risks and benefits. Additionally, the analysis showed a nonlinear increase in the predicted probability of adverse reactions with longer surgical times, particularly when exceeding 30 minutes. This suggests that prolonged surgical duration (longer than 30 min) may elevate the risk of intraoperative infection and tissue damage, leading to higher postoperative complication rates [44]. Continuity of care, through real-time monitoring and personalized guidance via the internet platform, helps mitigate these risks by enabling prompt identification and management of postoperative issues, ultimately improving recovery outcomes.

This study demonstrated that the Internet Family Engagement Continuum of Care effectively reduces postoperative complications in pediatric strabismus surgery, improves care outcomes, and increases parental satisfaction. However, there are limitations to this study. The single-center design restricts the generalizability of the findings, the six-month follow-up period may be too short to capture long-term effects, and the lack of random grouping could introduce selection bias. Future research should aim to include multi-center collaboration, extend the follow-up period to over a year, and utilize randomized controlled trial designs to strengthen the scientific validity and clinical relevance of the results.

In conclusion, this study demonstrates that Internet Family Engagement Continuum of Care significantly reduces postoperative complications in pediatric strabismus surgery, improves children's quality of life and mental health, and enhances parental satisfaction and engagement.

Acknowledgements

This study was supported by the Research Project of Xi'an Municipal Health Commission.

Disclosure of conflict of interest

None.

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