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EDITORIAL

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ORIGINAL ARTICLE

Retrospective Cohort Study

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LETTER TO THE EDITOR

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The primary aim of *World Journal of Gastrointestinal Surgery* (*WJGS, World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

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Retrospective Study

Impact of a visual mobile terminal-based continuity of care model on caregiver competence of children with enterostomies

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Abstract

BACKGROUND

Children with critical acute abdominal conditions often undergo intestinal stoma surgery.

AIM

To explore the impact of a visual mobile terminal-based extended care model on caregiver competence for children with enterostomies.

METHODS

One hundred twenty children with enterostomies and their caregivers in a children's hospital in Beijing were divided into a control group and a study group. The control group (60 cases) received traditional telephone follow-up for continuity of care, while the study group (60 cases) used a visualization mobile terminal-based care model. The incidence of stoma-related complications, caregiver burden scale, and competence scores of children with stoma were compared between the two groups.

RESULTS

The primary caregiver burden score in the study group (37.22 ± 3.17) was significantly lower than that in the control group (80.00 ± 4.47), and the difference was statistically significant ($P < 0.05$). Additionally, the caregiving ability score of the study group (172.08 ± 3.49) was significantly higher than that of the control group (117.55 ± 4.28 ; $P < 0.05$). The total incidence of complications in the study group (11.7%, 7/60) was significantly lower compared to the control group (33.3%, 20/60; $\chi^2 = 8.086$, $P = 0.004$).

CONCLUSION

The visual mobile terminal-based care model reduces caregiver burden, improves home care ability, lowers the incidence of complications and readmission rates, and supports successful second-stage reduction surgery for children with enterostomies.

Key Words: Mobile terminal; Enterostomy; Continuity of care; Caregiver burden; Visual mobile terminal; Caregiver competence; Stoma care; Caregiver competence

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Core Tip: This study examines a novel visual mobile terminal-based continuity of care model for children with enterostomies. Comparing traditional telephone follow-up (control group) to the new model (study group), significant improvements were observed. The study group exhibited lower caregiver burden scores (37.22 vs 80.00), higher caregiving ability scores (172.08 vs 117.55), and reduced stoma-related complications (11.7% vs 33.3%). This innovative approach enhances caregiver competence, decreases complications, and reduces readmission rates, laying a robust foundation for successful second-stage surgery in children with enterostomies.

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INTRODUCTION

Children with severe abdominal infection, strangulated intestinal obstruction, intestinal necrosis, congenital megacolon crisis, and other critical acute abdominal conditions often undergo intestinal stoma surgery. This surgery creates a temporary opening, and stomas are closed within three to six months after the initial surgery[1,2]. Providing high-quality care during this period is crucial due to the special characteristics of the pediatric population, poor compliance, and the general lack of expertise of caregivers and the special characteristics of the colostomy.

Therefore, providing professional continuity of care to such families and caregivers is essential to reducing complications and improving the quality of life for these children[3,4]. The rapid development of the Internet and the increasing use of social networking tools in healthcare services have increased the demand for health services for children and families[5]. The stoma conditions of children can be assessed through an information-based health education model using mobile terminals, forming a hospital-family visualization and interaction model of continuity of care.

This study examines the impact of a visual, mobile terminal-based continuity of care model on the competence of caregivers of children with enterostomies, comparing it to a traditional continuity of care model.

MATERIALS AND METHODS

Study design and participants

Children with enterostomies and their caregivers admitted to the Department of Children's Surgery of a tertiary-level children's hospital in Beijing participated in this study. The study was conducted from May 2020 to May 2021. The participants were divided into two groups: A control group (hospitalized from May 2020 to November 2020) and a study group (hospitalized from December 2020 to May 2021). To be included in the study, children had to meet the following criteria: (1) Underwent temporary enterostomy in our hospital but have not yet undergone reversal surgery; (2) Younger than 6 months old; (3) Able to use smartphones with a regular companion or a companion who can use smartphones with the assistance of other family members; (4) Stable network signal during the period of residence; and (5) Their caregivers were aware of, and voluntarily participated in, the study. Children were excluded from the study if they met any of the following criteria: (1) Had severe underlying conditions or malignant tumor; (2) Required full-time hospitalization for care after stoma surgery; (3) Had caregivers who were paid service workers; or (4) Had data with invalid entries. This study was approved by the Hospital Ethics Committee (Ethics No. 2021-21).

Determination of sample size

The readmission rate due to complications was used as an estimation index. The difference between the baseline and general information of the two groups was not statistically significant ($P > 0.05$) and is comparable, as shown in Table 1.

Table 1 Comparison of general information of children and caregivers in the two groups, n (%)

Groups	Number of examples	Sex of child		Age at admission (days)	Stoma site		Stoma type		Caregiver qualifications			Age of caregiver (years)
		Male	Daughter		Ileum (anatomy)	Second section of large intestine	Single lumen	Double lumen	Three-year college	Undergraduate (adjective)	Bachelor's degree	
Research group	60	39 (65.9)	21 (35.0)	28.0 ± 2.6	38 (63.8)	22 (36.3)	20 (32.5)	40 (67.5)	33 (55.0)	23 (38.8)	4 (6.3)	32.7 ± 4.4
Control subjects	60	45 (74.7)	15 (25.3)	28.2 ± 2.4	42 (66.7)	18 (33.3)	18 (31.6)	42 (68.4)	32 (53.2)	23 (38.0)	5 (8.9)	32.8 ± 4.5
<i>t</i> or χ^2 value		1.429		-0.369	1.280		0.154		0.126			-0.082
<i>P</i> value		0.232		0.713	0.258		0.695		0.939			0.935

Methods of intervention

Control group: Routine nursing measures were implemented during the hospitalization of the child with an enterostomy. One day after the replacement of the stoma bag, the child and the caregiver were introduced to the characteristics of the stoma products, the process of replacing the stoma bag, and the timing, skills, and key points. Before discharge, caregivers were instructed to operate independently once, with the nurse responsible for their care, who corrected irregular operations promptly. Monthly telephone follow-ups were conducted after discharge. The telephone follow-up program includes specific components such as psychological care, feeding support, stoma care skills, guidance on complications, daily care instructions, and reminders for follow-up visits. Primary caregivers are provided with a fixed phone number for the department, allowing them to call with any questions they may have. The on-duty nurse for that day is responsible for addressing the caregivers' inquiries and providing the necessary assistance and any issues were addressed at the hospital outpatient clinic.

Study group: In addition to the routine telephone and outpatient follow-up after discharge, a visualized mobile terminal was applied to carry out informative nursing intervention as follows: (1) Formation of a mobile terminal intervention group (a total of 10 members were formed, including the head nurse of the department as the team leader, two deputy chief physicians of pediatric surgery, two international wound stoma therapists, one network engineer, and four nurses who had been engaged in the specialty of pediatrics for more than 5 years; (2) Training of group members (the head nurse and deputy chief physician trained the nurses on stoma care techniques, common complications and care of stoma, characteristics of various dressings, cutting and fixation, stoma photo techniques, stoma-related health education points, stoma care assessment and records, stoma informed consent notification); Training was conducted through nursing workshops, academic salons, experience sharing, specialized training, joint room visits, and teleconsultation; and (3) Specific division of labor (team members worked together to develop the program). The head nurse was responsible for coordination and management, the consultant solved complex clinical problems, the network engineer maintained the network and published the public numbers, and the international stoma therapist searched for literature, compiled questionnaires, and formulated the nodes and main contents of the stoma-related knowledge push. The team implemented the specific intervention and assisted the international stoma therapist in integrating the contents, pictures, and video shooting. The specific implementation interventions are shown in Table 2 and Supplementary material.

Evaluation indicators

Application of the caregiver competency measurement scale for children with intestinal stomas: The research team developed the Caregiver Competency Measurement Scale for Children with Intestinal Stomas. We invited 11 experts in related fields to conduct two rounds of consultation and conducted a pre-survey of 20 caregivers. The scale includes six dimensions: Stoma knowledge comprehension (five entries), stoma care operation skills (five entries), infant daily life care (six entries), nutritional development monitoring of children with enterostomies (seven entries), recognition and management of enterostomies and complications (seven entries), and caregiver executive ability (seven entries), totaling 38 entries. The scale was based on a 5-point Likert scale, ranging from 1 (not able to do at all) to 5 (able to do at all), with the total score being the sum of the scores of each entry. A higher score indicates a better ability of the caregiver to take care of the child. The Cronbach's coefficient of the scale was 0.855.

Caregiver's burden inventory: The nurses collected the Caregiver's burden inventory (CBI)[6] through mobile terminal and telephone follow-ups in the study and control groups one month after the children were discharged from the hospital. The scale contains five dimensions: Time-dependent burden, developmentally limited burden, physiological burden, social burden, and emotional burden, and 24 entries; each entry was rated on a 5-point scale of 0-4 points based on the severity of the burden, with the total score ranging from 0-96 points. A higher total score indicates a heavier burden. The scale has good reliability and validity, with a Cronbach's α coefficient of 0.875.

Caregiver burden scale: The caregiver burden scale was collected from the study and control groups after one month of hospitalization.

Table 2 Main contents of terminal visualization modules and functions

Terminal visualization modules and functions	Fortunate timing	Thrust	Formality
Poll	The day of admission	The system uploads the results to the server for the team to view, count and analyze the basic information of the child and the disease information	Forms, questionnaires
	Day of discharge	Caregiver satisfaction questionnaires, which allow caregivers to evaluate the mobile terminal model of care and provide comments and suggestions on the work of the medical staff in the department	Poll
Nodalized push of stoma knowledge	The day of admission	Introduction to the department, basic knowledge about stoma, dietary instruction, use of mobile terminals and precautions	Graphic, video
	1 day before discharge	How to take pictures of children with stoma-related problems and precautions, the process of discharge-related procedures, preparation of pre-discharge supplies, main points to observe during the home stay, outpatient clinic visit time and review time	Graphic
	1 week after discharge	Preventive measures such as sending precautions and care measures for stoma-related complications that may occur in children, and educating caregivers about mental health and caregiving tips	Graphic, video
	3 weeks after discharge	Caregiving capacity questionnaire, dietary guidance	Forms, questionnaires
	2 months after discharge	Basic data collection form and re-admission process of the child, reminding parents to prepare supplies on time for admission procedures, in preparation for the second stage of reduction surgery	Forms, questionnaires, graphics
Image/video visualization capabilities	during home stay	Group nurses retrieve photos of children's problems from the background every day and distribute them to doctors or stoma therapists according to the problem attributes, so that healthcare professionals can visually and effectively solve children's existing problems, give real-time nursing guidance to caregivers, and provide explanations on key points of nursing care and how to use the products	Graphic, video
Text/voice message function	During home stay	Out-of-hours caregivers can leave a message for consultation, and healthcare professionals can follow up with the child and caregiver online and provide professional psychological care to the caregiver	Text, voice

Incidence of complications: The incidence of unplanned readmission and stoma-related complications (stoma prolapse, stoma retraction, parastomal hernia, and irritant dermatitis) was compared between the two groups of children from discharge to the time of reduction surgery.

Statistical analysis

Data were analyzed using SPSS 21.0. Count data were described by frequency and rate, and comparisons between groups were made using the χ^2 test or Fisher's exact probability method. Measurement data were described by mean \pm SD. Comparisons between groups were made using the *t*-test. A *P*-value of less than 0.05 ($P < 0.05$) was considered statistically significant.

RESULTS

Comparison of primary caregiver caregiving capacity scores between the two groups

The competence scores of the primary caregivers in the study group were significantly higher than those of the control group at one month after the intervention, and the difference was statistically significant ($P < 0.05$; Table 3).

Comparison of primary caregiver care burden scores between the two groups

The primary caregiver burden score of the study group was significantly lower than that of the control group at one month after the intervention, and the difference was statistically significant ($P < 0.05$; Table 4).

Comparison of the incidence of stoma complications between the two groups of children before and after the study

The overall incidence of complications in the study group (11.7%, 7/60) was lower than that in the control group (33.3%, 20/60), and the difference was statistically significant ($\chi^2 = 8.086, P = 0.004$; Table 5).

Table 3 Comparison of post-intervention caregiving competence scores between the two groups of caregivers, points

Groups	Number of examples	Ostomy knowledge comprehension	Ostomy care skills	Daily life care for infants	Nutritional development monitoring in children with enterostomies	Recognizing and responding to colostomy and peripheral complications	Caregiver implementation	Totals
Research group	60	22.85 ± 1.83	27.10 ± 1.34	26.00 ± 1.69	31.97 ± 1.18	32.10 ± 1.26	32.07 ± 1.22	172.08 ± 3.49
Control subjects	60	11.92 ± 1.34	18.58 ± 1.38	17.97 ± 1.35	22.90 ± 2.00	23.03 ± 1.67	23.15 ± 1.95	117.55 ± 4.28
<i>t</i> value		39.282	34.165	28.774	30.282	33.498	30.065	76.404
<i>P</i> value		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 4 Comparison of post-intervention care burden scores of primary caregivers in the two groups

Groups	Number of examples	The time-dependent burden	Burden of development constraints	Physiological burden	Social burden	Emotional burden	CBI total score
Research group	60	9.83 ± 1.68	6.12 ± 1.28	3.17 ± 1.04	8.73 ± 1.56	9.37 ± 1.43	37.22 ± 3.17
Control subjects	60	16.97 ± 1.59	17.18 ± 1.60	12.33 ± 1.96	12.58 ± 2.22	20.93 ± 1.77	80.00 ± 4.47
<i>t</i> value		-23.865	-41.882	-31.935	-10.992	-39.363	-60.433
<i>P</i> value		< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001

CBI: Caregiver’s burden inventory.

Table 5 Complications in the two groups of children, *n* (%)

Groups	Number of examples	Stoma dermatitis	Stoma prolapse	Stoma	Stoma retraction	Parastomal hernia
Research group	60	2 (3.8)	1 (1.3)	1 (1.3)	1 (1.3)	2 (3.8)
Control subjects	60	7 (11.4)	2 (3.8)	4 (6.3)	2 (3.8)	5 (7.6)
χ^2 value		3.003	¹	¹	¹	1.365
<i>P</i> value		0.083	0.559	0.171	0.559	0.243

¹Fisher's exact probability method.

DISCUSSION

Continuity of care enables comprehensive and systematic nursing care for children with enterostomies from admission to discharge and throughout their transition from hospital to home[7]. This approach allows families to effectively manage the home care period, addressing challenges as they arise underscoring the holistic nature of care[8]. Without a consistent care plan and standardized guidance from professional caregivers, children with stomas who are discharged from the hospital and cared for at home are prone to various problems, such as diarrhea, dehydration, and malnutrition due to inadequate diet, which can be life-threatening in severe cases[9]. Additionally, improper handling of the stoma bag, such as not securing it properly, falling off, or the leaking out of feces due to the inability of the caregiver to change the stoma bag, can lead to complications such as inflammation of the skin around the stoma[10]. Therefore, the difficulty of postoperative care and the burden of family care for children with enterostomies are significantly higher than that for adults. The competence of caregivers in pediatric stoma care greatly affects the outcome of second-stage re-institutionalization surgery and the overall health of children with stomas[10,11].

With the rise of the "Internet +" [12], more industries are integrating with the Internet[13] and the nursing industry is no exception. To provide more convenient and effective continuity of care services, nursing experts have created a variety of communication platforms on the Internet to meet the needs of patients[14,15]. Wound stoma care has gradually embraced this trend, with nursing scholars creating stoma web platforms to meet the care and communication needs of patients with stomas and their families. Dabas *et al*[16] developed a 9-minute video teaching program (VTP) for pediatric entero-

stomies, which improved the theoretical knowledge and practical skills of the caregivers after two weeks of use. The mobile terminal-based informational health education model uses information technology to assess the stoma condition of the child. Based on these assessments, professional disease knowledge and stoma care guidance are provided to the caregivers through various visual forms on the WeChat public platform, such as text, pictures, video, and voice[5,17]. This model enhances the knowledge of the child and the caregiver about the disease, strengthens their confidence in the treatment, and reduces the complication rates.

The study indicates that, following the intervention, the burden of care scores for primary caregivers in the study group was significantly lower than those in the control group ($P < 0.05$). Primary caregivers of children with stomas face numerous challenges, including those related to the disease, stoma care, daily life stress, social functionality loss, as well as difficulties arising from the child's limited language expression, sensitive skin, and weakened immunity. These challenges often contribute to negative psychological emotions. The application of a mobile terminal-based continuity of care model facilitated regular dissemination of health knowledge to primary caregivers. This approach enhanced caregivers' understanding of the prevention, treatment, and rehabilitation of stoma-related complications. Additionally, timely responses to caregivers' questions promoted communication and strengthened the effectiveness of health education, thereby deepening emotional connections with medical personnel. Knowledge was delivered in a timely sequence, effectively alleviating the caregivers' physiological, temporal, emotional, and social burdens. Post-intervention, the caregiving ability scores of primary caregivers in the study group were significantly higher than those of the control group ($P < 0.05$). The caregivers' skills are crucial for improving the quality of care and safeguarding the rights of patients. Through educational content presented in multimedia formats, such as images, text, and videos, caregivers were able to better understand and master the key steps of stoma care. Notably, VTP and the integration of text with images greatly facilitated caregivers in learning and mimicking proper caregiving techniques, thereby improving the accuracy of stoma care procedures. The continuity of care model delivered through mobile terminals allowed caregivers to address many caregiving issues at home, reducing the risk of infections and other complications associated with frequent hospital visits. The implementation of this visual mobile terminal continuity of care model resulted in a lower incidence of complications in children with stomas; the overall complication rate in the study group was significantly lower than that in the control group ($P = 0.004$). By utilizing this visual mobile terminal continuity of care model, primary caregivers gained greater knowledge and skills for self-management, thus effectively performing daily care and preventing complications. This timely and convenient access to information significantly enhanced the awareness of health knowledge and facilitated the prompt identification and management of potential complications, ultimately leading to a reduction in the incidence of stoma-related complications.

This study shows that this continuity of care model can improve the ability of the caregivers to care for their children. The visual mobile terminal extended care model uses nodes to push stoma care knowledge through pictures, words, and videos, helping caregivers better master stoma care skills. It also proactively sends information about potential stoma-related problems at different time nodes and provides solutions, enabling caregivers to learn and prepare in advance, to reduce the sense of helplessness of the caregiver when the child has a problem[18]. This continuity of care model can meet the needs of child caregivers who use fragmented time to learn about stoma care during their stay at home, improve stoma care skills, and enhance the ability of the caregiver to care for the child.

The present study showed that the caregiver burden score was significantly lower in the study group after the intervention. The incidence of stoma-related complications was also significantly lower in the study group compared to the control group. Ostomy-related complications can reduce the quality of life of the children, affect late fistula surgery, and can be life-threatening in severe cases. Through online voice and video communication, caregivers can communicate directly with the healthcare personnel at home, making problem-solving more precise and effective. The combination of graphics and text aids mutual understanding and corrects misconceptions. Through the mobile terminal, child caregivers can proactively acquire and apply stoma-related knowledge in daily life and care processes, which is more targeted and personalized than the traditional issuance of publicity brochures[19]. Caregivers can improve their nursing skills through online learning, thereby reducing the incidence of stoma-related complications, thus improving the outcome of the child [20]. The study was conducted with a small sample, which imposed inherent limitations. Future studies should expand the sample size and refine the continuity of care model using a visualization mobile terminal.

CONCLUSION

In summary, visualized mobile terminal extended care can update the knowledge of relevant diseases for the caregivers and provide accurate one-to-one accurate services to address their problems promptly. It can also effectively reduce the CBI score, improve the caregiver competence of children with enterostomies, and reduce the incidence of complications during home care.

FOOTNOTES

Author contributions: Yu Y wrote the paper; Wang XQ and Liu G analyzed the data; Xia Q, Li L, and Chen LN planned the study; Yu Y and Zhang LJ executed the study and collected most of the data. All authors contributed to drafting the article and revised the manuscript for important intellectual content. All authors had access to the study data and reviewed and approved the final manuscript.

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