



The effect of intestinal stoma care training on knowledge and skill levels of pediatric surgery nurses

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The opening of an organ directly or with the help of a tube is called an ostomy, and the opened area is called a stoma.^[1] There are different types of stomas located in the respiratory, digestive, urinary, or intestinal systems. Indications for intestinal stoma are inflammatory bowel diseases, trauma, congenital disorders, such as Hirschsprung's disease, imperforate anus, anorectal malformation, nonmalignant diseases, such as familial adenomatous polyposis, and diverticulitis.^[2] Today, operative techniques in pediatric surgery have evolved with advances in healthcare. Techniques using laparoscopic and robotic surgical approaches to create stomas are becoming more common. These new techniques reduce the length of hospitalization, postoperative pain, and the risk of ileus. However, ostomy surgery continues to have high rates of surgical complications compared to other common surgical procedures.^[3] These complications are bleeding, mucocutaneous separation, such as bleeding, mucocutaneous separation, stoma retraction, stoma occlusion, pyoderma gangrenosum, necrosis, laceration, hernia, and prolapse, or peristomal skin problems, such as

Abstract

Objectives: The study aimed to examine the effect of intestinal stoma care training on the knowledge and skill levels of pediatric surgery nurses in stoma care and to determine the factors affecting the knowledge and skill levels of pediatric surgery nurses in stoma care.

Materials and methods: This quasi-experimental prospective study included 30 nurses (28 females, 2 males; mean age: 33.0±7.5 years; range, 23 to 46 years) working in pediatric surgery clinics who met the inclusion criteria between September 2023 and January 2024. A pediatric intestinal stoma care training was given to the nurses using a 20-min video prepared by the researchers. Data were collected by using a sociodemographic survey and a pediatric stoma care knowledge and skills survey developed by the researchers. The knowledge and skill levels of the nurses before and after the training and after three months were compared.

Results: It was found that the pediatric intestinal stoma care training increased the knowledge and skill levels of the nurses. There was a difference between the mean number of practiced skills of nurses working only during the day and nurses working only at night before the training, and this difference was found to be statistically significant.

Conclusion: Increasing the knowledge and skill levels of nurses about stoma care could decrease the risk of complications and the duration of hospitalization, ensure cost-effective care, and support the national economy in this direction.

Keywords: Intestinal stoma care, pediatric nursing, pediatric surgery.

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allergy, dermatitis, infection, papules, hyperkeratosis, and erythema.^[1,4] In improving the quality of care of children with stoma, nurses have great duties and responsibilities. These responsibilities include monitoring whether the stoma is working or not, determining and preventing the risk of complications, providing quality stoma care, and conducting discharge training.^[5]

A colostomy is a surgical opening of the colon into the abdominal wall, and an ileostomy is a surgical opening of the last part of the small intestine into the abdominal wall. The stool content is more solid in colostomies and more liquid in ileostomies. For this reason, intestinal stoma care is performed three times a day in children with colostomy and five to seven times a day in children with ileostomy.^[6] Adequate knowledge and skills about stoma care of nurses caring for children and adolescents with stoma will ensure correct guidance of children and parents, reduce the risk of surgical complications, and improve the quality of nursing care.^[7,8] However, some studies have shown that the majority of nurses working with patients with stoma do not have sufficient knowledge about basic stoma care and that nurses do not accept stoma care as one of their responsibilities.^[8-10] There is no formal program to train nurses in stoma care, and there is insufficient evidence to show that nurses are knowledgeable about pediatric gastrointestinal stoma care. Determining the current knowledge and skills of nurses in the care of children with recently opened stomas and their parents is important for planning discharge education programs.^[11]

The primary aim of this study was to examine the effect of intestinal stoma care training on the knowledge and skill levels of pediatric surgery nurses on stoma care. The secondary aim of the study was to determine the factors affecting the knowledge and skill levels of pediatric surgery nurses on intestinal stoma care.

MATERIALS AND METHODS

This quasi-experimental prospective study included 30 nurses (28 females, 2 males; mean age: 33.0±7.5 years; range, 23 to 46 years) working in pediatric surgery clinics in hospitals in the Izmir province who met the inclusion criteria between September 2023 and January 2024. No randomization was performed in the selection of the sample. The inclusion criteria were (i) working in a pediatric surgery clinic for at least six months and (ii) not having received any training on stoma care. The study recorded the age, sex, education level, duration of working as a pediatric surgery nurse, and working shifts. Participants' knowledge and skill level of stoma care were assessed before training, after training, and after three months.

The data of this study were collected through a sociodemographic survey and a pediatric stoma care knowledge and skills survey. The sociodemographic survey included five questions related to variables such as age, sex, education level, duration of working as a nurse, and working arrangement of the participants. The pediatric stoma care knowledge and skills survey was prepared by the researchers by reviewing the literature to determine the level of knowledge and skills of pediatric surgery nurses about stoma care.^[12,13] The questionnaire consisted of 14 questions. In the knowledge level part of the questionnaire, nurses were asked to mark which of the statements were true or false. In the skill level part of the questionnaire, it was questioned whether the interventions in the statements were practiced correctly by the nurses. This questionnaire was used both before the training, immediately after the training, and three months later.

According to the Kirkpatrick four-stage education learning model, in the participant outcomes-learning stage, participants' knowledge and skill level should be measured immediately after the training, and in the performance development-behavior stage, participants' knowledge and skill level should be measured three months after the training. Therefore, posttest evaluations were conducted immediately after the training and in the third month.^[14]

The nurses were given pediatric intestinal stoma care training using a 20-min video prepared by the researchers. In the training video prepared based on the current literature, pediatric stoma change and care was applied on a child mannequin with ostomy, and information was given about the materials used. The video was sent to the nurses participating in the study via electronic mail, social media, or Google Forms so that they could watch it whenever they wanted, and the video was kept available for 24 h. This study was registered at the U.S. National Library of Medicine Clinical Trials (code: NCT04984161).

Statistical analysis

Power analysis was performed using G*Power version 3.1.9.2 (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) to determine the number of participants included in the study. According to the calculation made with 95% power (1-β), alpha of 0.05, and effect size d=0.71,^[12]

it was concluded that the study required at least 28 participants. Considering the risk of data loss during the study, the study was conducted with 30 participants.

Data analysis was performed using the IBM SPSS version 26.0 software (IBM Corp., Armonk, NY, USA). The descriptive characteristics of the nurses were given as number and percentage distributions. The comparisons between the descriptive characteristics of the nurses and the stoma knowledge and skills questionnaire before and after the training were analyzed by the Kruskal-Wallis test. The comparisons between the pediatric stoma knowledge and skills questionnaire of the nurses in the pretraining and posttraining period were evaluated by the Wilcoxon test if normally distributed. A p-value 0.05 was considered statistically significant.

RESULTS

Seventy percent (n=21) of the participants were graduates, and 36.7% (n=11) worked as pediatric surgery nurses for more than 10 years. Of the

participants, 46.7% (n=14) worked mixed day and night shifts, and 73.3% (n=22) thought of stoma care as the duty of the nurse (Table 1).

Table 2 shows that the time-dependent change in the statement “While gently pushing the child’s skin down and away from the adapter, the stoma bag is removed by lifting the adapter” is statistically significant ($p<0.001$). This significance was found to be due to the difference between before and after training, as well as before training and after three months. The change in the statement “The child’s skin is cleaned with a soft cloth and hot water from the dirty area to the clean area and dried thoroughly” was statistically significant ($p<0.001$), and the significance was found to be due to the difference between before and after training, as well as before training and after three months.

The time-dependent change in the participants’ response to the statement “Peristomal area and stoma are evaluated” was statistically significant ($p=0.018$). It was concluded that this significance was due to the difference between before and after training, as well as before training and after three months.

TABLE 1				
Characteristics of the participants				
Sociodemographic characteristics	n	%	Mean±SD	Min-Max
Age (year)			33.0±7.5	23-46
Sex				
Female	28	93.3		
Male	2	6.7		
Education level				
Health Vocational High School	4	13.3		
Graduate	21	70		
Master/PhD	5	16.7		
Years as a Pediatric Surgery Nurse				
Less than 1 year	8	26.7		
2-5 years	6	20		
6-10 years	5	16.7		
More than 11 years	11	36.7		
Working shifts				
Only day time	8	26.7		
Only night time	8	26.7		
Both	14	46.7		
Perception of stoma care responsibility				
Nurse	22	73.3		
Physician	1	3.3		
Auxiliary Health Personnel	7	23.3		
SD: Standard deviation.				

Knowledge level	TABLE 2 Comparison of participants' responses to the knowledge test before and after training												
	Before training (pretest)-0				After training (post-test 1)-1				3 months after training (post-test 2)-2				
	Correct		Wrong		Correct		Wrong		Correct		Wrong		
	n	%	n	%	n	%	n	%	n	%	n	%	p
Statements	27	90	3	10	30	100	-	-	27	90	3	10	0.223*
Hands are washed and the procedure is explained to the child and family.	26	86.7	4	13.3	29	96.7	1	3.3	26	86.7	4	13.3	0.325*
The stoma bag is emptied.	19	63.3	11	36.7	30	100	-	-	29	96.7	1	3.3	0.000* 0-1/0-2β
While gently pushing the child's skin down and away from the adapter, the stoma bag is removed by lifting the adapter.	13	43.3	17	56.7	30	100	-	-	29	96.7	1	3.3	0.000* 0-1/0-2β
The skin of the child is cleaned with a soft cloth and hot water from the dirty area to the clean area and dried thoroughly.	23	76.7	7	23.3	29	96.7	1	3.3	29	96.7	1	3.3	0.018* 0-1/0-2β
The peristomal area and stoma are evaluated.	21	70	9	30	30	100	-	-	29	96.7	1	3.3	0.001* 0-1/0-2β
Stoma size is measured.	13	43.3	17	56.7	24	80	6	20	26	86.7	4	13.3	0.000* 0-10-2β
It is ensured that the diameter of the adapter is close to the stoma diameter to prevent skin irritation. A 3 mm gap is left between the stoma and the adapter.	29	96.7	1	3.3	30	100	-	-	29	96.7	1	3.3	0.607*
The adapter diameter is cut according to the stoma diameter.	23	76.7	7	23.3	30	100	-	-	29	96.7	1	3.3	0.174*
If there are lumps on the skin surface, they are filled with stoma paste to ensure that the area where the adapter will adhere is smooth.	15	50	15	50	30	100	-	-	28	93.9	2	6.7	0.000* 0-1/0-2β
The adapter is adhered to the skin, stoma paste is used if necessary. Since the adapters will adhere better to heat, warming is provided by moving the fingers around the adapter for about 1-2 min.	29	96.7	1	3.3	28	93.3	2	6.7	29	96.7	1	3.3	0.779*
The stoma bag is closed.	29	96.7	1	3.3	30	100	-	-	28	93.9	2	6.7	0.368*
The stoma bag is placed in the adapter and it is checked whether it is placed or not.	28	93.9	2	6.7	29	96.7	1	3.3	29	96.7	1	3.3	0.779*
Wash hands after changing the stoma.	27	90	3	10	30	100	-	-	29	96.7	1	3.3	0.174*
Waste is thrown into the red waste bin.													
Mean of correct answers		10.73±3.02†				13.63±0.55†						13.20±0.92†	0.000** 0-1/0-2β
		5-14‡				12-14‡						11-14‡	

† Mean ± standard deviation; ‡ Minimum-Maximum; * Cochran Q test; ** Related samples Friedman's two-way analysis; β: Considering the adjusted p-value, the groups with a significant difference after Bonferroni correction.

The time-dependent change of the statement "Stoma size is measured" was statistically significant ($p < 0.001$). This significance was due to the difference between before and after training, as well as before training and after three months. The change in the statement "It is ensured that the adapter diameter is close to the stoma diameter, and a 3-mm gap is left between the stoma and the adapter" was statistically significant ($p < 0.001$). It was concluded that this significance was due to the difference between before and after training, as well as before training and after three months. The change in the statement "The adapter is glued to the skin, stoma paste is used if necessary, and since the adapters will adhere better with heat, warming is provided by moving the fingers around the adapter for about 1 to 2 min" was statistically significant ($p < 0.001$). It was concluded that this significance was due to the difference between before and after training, as well as before training and after three months. The mean of correct answers given by the participants before the training was 10.73 ± 3.02 , the mean of correct answers given immediately after the training was 13.63 ± 0.55 , and the mean of correct answers given three months after the training was 13.20 ± 0.92 . This difference between the mean correct responses was statistically significant ($p < 0.001$). It was observed that this difference was due to the difference between before and after training, as well as before training and after three months.

Table 3 shows that 53.3% of the participants before the training, 100% immediately after the training, and 90% after three months stated that they practiced or would practice the statement "Hands are washed, and the procedure to be performed is explained to the child and family." The time-dependent change in this skill practice was statistically significant between before and after training, as well as before training and after three months ($p < 0.001$). Seventy percent of the nurses before the training, 100% of the nurses immediately after the training, and 96.7% of the nurses after three months stated that they applied or would apply the statement "The child's skin is cleaned with a soft cloth and hot water from the dirty area to the clean area and dried thoroughly." The time-dependent change in this skill was statistically significant ($p = 0.002$). It was concluded that this significance was due to the difference between before and after training, as well as before training and after three

months. Of the nurses who participated in the study, 50% before the training, 100% immediately after the training, and 96.7% after three months stated that they practiced or would practice the expression "Peristomal area and stoma are evaluated." The time-dependent change of this skill was statistically significant, which was due to the difference between before and after training, as well as before training and after three months ($p < 0.001$).

Of the participants, 73.3%, 100%, and 96.7% stated that they practiced or would practice the expression "Measure the size of the stoma" before the training, immediately after the training, and three months after training, respectively. The time-dependent change of this skill was statistically significant between before and after training, as well as before training and after three months ($p = 0.001$). The statement "It is ensured that the diameter of the adapter is close to the stoma diameter to prevent skin irritation, and a 3-mm gap is left between the stoma and the adapter" was practiced by 46.7% of the participants before the training, 86.7% of the participants immediately after the training, and 86.7% of the participants three months after the training. The time-dependent change of this skill was statistically significant between before and after training, as well as before training and after three months ($p < 0.001$). Fifty percent of the participants before the training, 96.7% immediately after the training and 93.3% after 3 months stated that "The adapter is adhered to the skin, stoma paste is used if necessary. Since the adapters will adhere better with heat, warming is provided by moving the fingers around the adapter for about 1-2 min." The time-dependent change of this skill was statistically significant between before and after training, as well as before training and after three months ($p < 0.001$).

The mean number of skills that nurses practiced before the training was 11.13 ± 2.44 , the mean number of skills that nurses stated that they would practice immediately after the training was 13.83 ± 0.37 , and the mean number of correct skills that they stated that they practiced three months after the training was 13.46 ± 0.81 . This difference between the mean correct skills was statistically significant ($p < 0.001$). This difference was observed between before and after training, as well as before training and after three months.

Table 4 shows that there was no sex-related difference between the mean number of correct

TABLE 3
Comparison of participants' responses to the skill test before and after the training

Skill level	Before training (pretest)-0			After training (post-test 1)-1			3 months after training (post-test 2)-2						
	I practice		I do not practice	I practice		I do not practice	I practice		I do not practice				
	n	%	n	%	n	%	n	%	n	%	p		
Practices	16	53.3	14	46.7	30	100	-	-	27	90	3	10	0.000* 0-1/0-2β
Hands are washed and the procedure is explained to the child and family.	26	86.7	4	13.3	30	100	-	-	26	86.7	4	13.3	0.074*
The stoma bag is emptied.	28	93.3	2	6.7	30	100	-	-	29	96.7	1	3.3	0.135*
While gently pushing the child's skin down and away from the adapter, the stoma bag is removed by lifting the adapter.	21	70	9	30	30	100	-	-	29	96.7	1	3.3	0.002* 0-1/0-2β
The skin of the child is cleaned with a soft cloth and hot water from the dirty area to the clean area and dried thoroughly.	15	50	15	50	30	100	-	-	29	96.7	1	3.3	0.000* 0-1/0-2β
The peristomal area and stoma are evaluated.	22	73.3	8	26.7	30	100	-	-	29	96.7	1	3.3	0.001* 0-1/0-2β
Stoma size is measured.	14	46.7	16	53.3	26	86.7	4	13.3	26	86.7	4	13.3	0.000* 0-1/0-2β
It is ensured that the diameter of the adapter is close to the stoma diameter to prevent skin irritation. A 3 mm gap is left between the stoma and the adapter.	30	100	-	-	30	100	-	-	29	96.7	1	3.3	0.368*
The adapter diameter is cut according to the stoma diameter.	27	90	3	10	30	100	-	-	29	96.7	1	3.3	0.174*
If there are lumps on the skin surface, they are filled with stoma paste to ensure that the area where the adapter will adhere is smooth.	15	50	15	50	29	96.7	1	3.3	28	93.3	2	6.7	0.000* 0-1/0-2β
The adapter is adhered to the skin, stoma paste is used if necessary. Since the adapters will adhere better to heat, warming is provided by moving the fingers around the adapter for about 1-2 min.	30	100	-	-	30	100	-	-	29	96.7	1	3.3	1.000*
The stoma bag is closed.	30	100	-	-	30	100	-	-	28	93.3	2	6.7	0.368*
The stoma bag is placed in the adapter and it is checked whether it is placed or not.	30	100	-	-	30	100	-	-	29	96.7	1	3.3	0.135*
Wash hands after changing the stoma.	30	100	-	-	30	100	-	-	29	96.7	1	3.3	1.000*
Waste is thrown into the red waste bin.	11.13±2.44 8-14	13.83±0.37 13-14	13.46±0.81 11-14	0.000** 0-1/0-2β									
Mean of skills practiced													

+ Mean ± standard deviation; † Minimum-Maximum; * Cochran Q test; ** Related samples Friedman's two-way analysis; β: Considering the adjusted p-value, the groups with a significant difference after Bonferroni correction.

TABLE 4
Relationship between participants' sociodemographic characteristics before and after training

Sociodemographic characteristics	Correct response before training (Pretest)		Correct response after training (post-test 1)		Correct response after 3 months (post-test 2)		Practised skill before training (Pretest)		Practised skill after training (post-test 1)		Practised skill after 3 months (post-test 2)	
	Mean±SD	<i>p</i>	Mean±SD	<i>p</i>	Mean±SD	<i>p</i>	Mean±SD	<i>p</i>	Mean±SD	<i>p</i>	Mean±SD	<i>p</i>
Age												
<i>r</i>	0.314		0.005		-0.223		0.374		-0.147		-0.194	
<i>p</i>	0.091		0.978		0.237		0.042*		0.437		0.305	
Sex												
Female	10.53±3.03		13.64±0.55		13.17±0.94		10.96±2.44		13.85±0.35		13.50±0.79	
Male	13.50±0.70		13.50±0.70		13.50±0.70		13.50±0.70		13.50±0.70		13.00±1.41	
<i>p</i>	0.165		0.649		0.720		0.197		0.198		0.497	
Mann-Whitney U test	11.500		23.500		24.000		13.000		18.000		21.000	
Education level												
Health Vocational High School	7.50±3.69		13.75±0.50		13.00±0.81		10.00±2.00		13.75±0.50		13.50±1.00	
Graduate	11.33±2.79		13.71±0.56		13.47±0.81		11.47±2.56		13.90±0.30		13.52±0.87	
Postgraduate	10.80±2.16		13.20±0.44		12.20±0.83		10.60±2.30		13.60±0.54		13.20±0.44	
<i>p</i>	0.089		0.083		8.428		0.586		0.242		0.281	
Kruskal-Wallis test	4.841		4.979		0.015		1.069		2.834		2.536	
Years as a pediatric surgery nurse												
Less than 1 year	9.37±3.33		13.50±0.75		13.62±0.51		10.62±0.61		13.87±0.35		13.75±0.70	
2-5 years	11.66±2.51		13.50±0.54		12.83±0.98		11.16±2.40		13.83±0.40		13.50±0.54	
6-10 years	11.20±1.64		13.80±0.44		13.20±0.44		9.60±2.50		14.00		13.00±1.41	
More than 11 years	11.00±3.49		13.72±0.46		13.09±1.22		12.18±2.13		13.72±0.46		13.45±0.68	
<i>p</i>	0.562		0.706		0.429		0.490		0.665		0.393	
Kruskal-Wallis test	2.052		1.400		2.768		1.426		0.816		1.869	
Working shifts												
Only day time	13.25±0.70		13.75±0.46		13.12±1.35		13.37±0.74		13.75±0.46		13.37±0.74	
Only night time	8.62±2.50		13.75±0.46		13.00±0.75		8.75±0.46		14		13.37±1.18	
Both	10.50±3.18		13.50±0.65		13.35±0.74		11.21±2.51		13.78±0.42		13.57±0.64	
<i>p</i>	0.008		0.539		0.538		0.002		0.341		0.774	
Kruskal-Wallis test	9.566		1.235		1.238		12.173		2.154		0.513	
Perception of stoma care responsibility												
Nurse	11.04±2.53		13.45±0.59		13.04±0.95		11.13±2.55		13.81±0.39		13.36±0.90	
Physician	14.00		14.00		14.00		14.00		14.00		14.00	
Auxiliary Health Personnel	9.28±4.15		13.85±0.37		13.57±0.78		10.71±2.13		13.85±0.37		13.71±0.48	
<i>p</i>	0.268		0.336		0.218		0.376		0.880		0.553	
Kruskal-Wallis test	2.634		2.183		3.044		1.955		0.256		1.185	

SD: Standard deviation.

answers and the mean number of practiced skills before and after the training. It was observed that there was no difference between the mean number of correct answers and the mean number of skills practiced before and after the training of the nurses participating in the study with regard to their educational status. Although there was a difference between the mean number of correct responses of nurses who graduated from a vocational high school of health services and undergraduate nurses before the training, this difference was not statistically significant.

It was observed that there was no difference between the mean of correct answers and the mean of practiced skills of the nurses before and after the training regarding the duration of their employment as pediatric surgery nurses. There was a difference between nurses who worked for less than a year and nurses who had work experience for more than a year, but this difference was not statistically significant.

It was found that there was no difference between the mean of correct answers of the nurses before and after the training with regard to their working shifts. There was a difference between the mean of correct responses of nurses working only during the day and nurses working only at night before the training, but this difference was not statistically significant. However, there was a difference between the mean of practiced skills of nurses working only during the day and nurses working only at night before the training, and this difference was statistically significant ($p=0.002$). The practiced skills of nurses working only at night were lower than those of nurses working only during the day or both. The reason for this difference may be related to the fact that fewer nurses worked at night and the workload intensity.

It was observed that there was no difference between the mean number of correct responses and the mean number of practiced skills of the nurses before and after the training regarding the perception of stoma care as a duty. However, there was a difference between the mean number of correct answers and the mean number of practiced skills before and after the training of the nurses who perceive stoma care as the duty of the auxiliary staff and the nurses who perceive stoma care as the duty of the nurse, but this difference was not statistically significant. It was found that there was no statistically significant relationship between the age of the nurses

and the mean number of correct responses, as well as the mean number of practiced skills after the training. However, it was found that there was a weak direct relationship between the age of the nurses and the number of correct skills in the pretraining period ($r=0.374$, $p=0.042$).

DISCUSSION

This study aimed to examine the effect of stoma care training given via video on the knowledge and skill levels of pediatric surgery nurses on stoma care and to determine the factors affecting these levels. Of the nurses, 73.3% stated that stoma care was a nursing intervention. Similarly, the nurses in Salami et al.'s^[15] study also considered stoma care as a nursing intervention.

According to the results, it was identified that both knowledge and skill levels were low before the training, particularly in the statements of removing the stoma bag, cleaning the dirty stoma area, and placing and sticking the stoma adapter. It was found that the nurses did not evaluate the peristomal area before the training and could not perform correct stoma placement and adhesion. Similarly, in the studies of Bagheri et al.,^[8] Amin et al.,^[16] Hashem and Abusaad,^[17] and Tiruneh et al.,^[18] nurses' knowledge of ostomy care was low.

It was observed that the stoma care training increased the knowledge level of the nurses. In the statements asked immediately after the training, almost 100% correct answers were given in almost all statements. In the measurements made three months after the training, it was identified that the level of knowledge was still high compared to before the training. Similarly, in the studies of Findik et al.^[7] and Amin et al.,^[16] it was concluded that the training provided a significant increase in the knowledge level of the nurses. In the study of Hashem and Abusaad,^[17] it was observed that the knowledge levels of the nurses were significantly higher both immediately after the training and three months after the training.

Based on the results, approximately half of the nurses stated that they did not perform the steps of washing their hands and giving information to the child/family before the training. It was also observed that 50% of them did not evaluate the peristomal area, did not leave a gap between

the stoma and the adapter, and could not adhere the adapter to the skin properly. These findings suggest that the skill level of the nurses was low in the pretraining period. However, after the training, a significant increase was obtained in the skill levels of the nurses both immediately after the training and in the measurements made three months later. Similarly, in the study of Amin et al.,^[16] a significant increase was obtained in the stoma care skills of nurses after training. Furthermore, Hashem and Abusaad^[17] reported that the skill levels of nurses were significantly higher both immediately after the training and three months after the training.

In this study, no significant relationship was found between nurses' age, sex, educational status, working year as a nurse working shifts, and their knowledge level of pediatric stoma care. In Hashem and Abusaad's^[17] study, which was different from our study, it was determined that there was a relationship between the level of education and working years as a nurse and their level of knowledge of pediatric stoma care. In Amin et al.'s^[16] study, a significant difference was found between the educational level and knowledge levels of nurses.

It was observed that there was a difference between the working shifts and age of the nurses and the number of practiced skills before the training and that only nurses who worked during the day and older nurses had better skills. In contrast to our results, in the study of Amin et al.,^[16] no significant difference was found between the age of the nurses and their skill levels.

The results of this study demonstrated the effectiveness of the training program in improving both the knowledge and practiced skills of pediatric surgery nurses in stoma care. Post hoc achieved power analysis revealed a large effect size (over 0.9) and high power (0.99) for both knowledge retention (measured by correct responses before and immediately after training and again three months later) and skill acquisition (measured by practiced skills before and immediately after training and again three months later). These findings indicate that the training not only significantly increased nurses' knowledge of stoma care immediately but also that this knowledge was retained three months later. Similarly, the training led to a significant improvement in stoma care skills, with this positive

change persisting even after three months. Overall, this study suggests that the training program is a successful intervention for enhancing both the theoretical knowledge and practical abilities of pediatric surgery nurses in stoma care.

In conclusion, there are not enough studies in the literature investigating the effect of pediatric stoma care training given to nurses on the knowledge and skill levels of nurses. This study will contribute to the literature and other clinical studies that will support this aim. Increasing the knowledge and skill levels of nurses about stoma care could decrease the risk of complications and the duration of hospitalization and ensure cost-effective care, supporting the national economy in this direction.

Ethics Committee Approval: The study protocol was approved by the İzmir Katip Çelebi University Non-Interventional Clinical Research Ethics Committee (date: 24.11.2022, no: 0644). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Consent for Publication: Written informed consent was obtained from 30 nurses working in pediatric surgery clinics who met the inclusion criteria.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Conceptualization, funding acquisition, investigation, resources, software, visualization, roles/writing - original draft: T.E., D.Z.H., T.Y.G., E.A.A.; Data curation: T.E., D.Z.H., T.Y.G.; Formal analysis, methodology, project administration, writing - review & editing, supervision, validation: E.A.A. All authors have reviewed and approved of the article before submission.

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