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Impact of Nurse-Led Versus Surgeon-Led Preoperative Counseling and Follow-Up on Postoperative Outcomes in Pediatric Tonsillectomy: A Longitudinal Observational Study

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Background: Pre-tonsillectomy complex challenges in explaining surgeries requirements and preparing children for curative surgeries. In addition, post-tonsillectomy pain and complications are reported in children with tonsillitis. The objective of the study was to compare the intensities of postoperative pain and frequencies of postoperative complications among children undergoing elective tonsillectomy who received different types of counseling and follow-up care.

Material/Methods: Children received pre-tonsillectomy nurse-led counseling and post-tonsillectomy nurse-led follow-up care for 6 months (NCC cohort, n=29), pre-tonsillectomy surgeon-led counseling and post-tonsillectomy surgeon-led follow-up care for 6 moths (FSS cohort, n=35), or did not receive counseling and received everyday surgeons' visits during hospital stays only (UUS cohort, n=38).

Results: Post-tonsillectomy pain was 4 (IQ range, 5-4) per child at discharge from the hospital. The children reported mild pain during the 1-month follow-up. Children in the NCC cohort had fever, post-tonsillectomy pain at discharge and 1 months after surgeries, needed less tramadol, had fewer hospital stays, had fewer immediate and late post-tonsillectomy complications (especially anxiety and vomiting), and had higher personal satisfaction and higher clinical benefits than children in the FSS and UUS cohorts ($P<0.05$). Nausea was reported in all children. A total of 56 (55%) children had a decrease in oral intake during the follow-up period.

Conclusions: Children may experience more post-tonsillectomy pain than expected at discharge and during follow-up. After tonsillectomy, children had a decrease in oral intake. Nurse-led counseling and follow-up care have favorable post-tonsillectomy outcomes and high personal satisfaction of children undergoing curative tonsillectomies.

Keywords: Aftercare • Counseling • Nurses, Pediatric • Pain, Postoperative • Postoperative Care • Tonsillectomy

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Introduction

Tonsillectomy is a minor and common surgical procedure in children [1]. Caregivers experience complex preoperative challenges in explaining and preparing children for tonsillectomy [2]. Parents face problems while providing preoperative care for children undergoing tonsillectomy [3]. Tonsillectomy causes postoperative pain as well as early and late postoperative complications [4]. Because of high postoperative pain, children have problems with behavior, oral intake, and sleep after tonsillectomy [5]. The quality of life of children after tonsillectomy is often unsatisfactory [6]. These confounding effects increase the risk of secondary hemorrhage, inadequate rest periods, and suboptimal pain management after tonsillectomy in children [7]. Most parents have inadequate knowledge of how to manage their children's post-tonsillectomy pain and complications [1] and pre-tonsillectomies counseling of children regarding postoperative pain and complications [3].

Because of parents' inadequate knowledge, they provide improper medication for post-tonsillectomy pain and complications or they would misguide in the follow-up period [8]. Many interventions and techniques are adopted by parents after tonsillectomy for pain and complication management, but these are not sufficient [1]. Postoperative outcomes are influenced by pain management interventions and the context in which these are provided [9]. Nurse-led telephonic aftercare has been reported to be beneficial for partial postoperative pain management and complications among children aged 4-12 years who underwent tonsillectomy in Canada [1]. However, nurse-led telephonic aftercare has been reported to be partially effective for postoperative pain management and complications among children undergoing tonsillectomy in western Hubei Province, China [10]. In addition, preoperative nursing counseling could be useful in identifying and defining risk factors for elective surgery patients and preoperative care policies [11]. Nurses have an important role in the early postoperative phase and post-discharge follow-up because they have the most contact with patients throughout the perioperative pathways [12]. There is the lack of consensus on the most effective strategies for preoperative counseling and postoperative follow-up care for children undergoing tonsillectomy. Therefore, there is need for pre-tonsillectomy counseling on children's well-being and post-tonsillectomies care and to address caregivers' challenges for better pain management and prevention of complications in children with tonsillitis.

The objectives of the current retrospective study of electronic medical records were to compare the intensities of postoperative pain and frequencies of postoperative complications among children undergoing elective tonsillectomy who receive different types of counseling and follow-up care (nurse-led pre-tonsillectomy counseling and nurse-led post-tonsillectomy follow-up, or surgeon-led pre-tonsillectomy counseling, and surgeon-led post-tonsillectomy follow-up care, or children and their parents who did not receive pre-tonsillectomy counseling and received only post-tonsillectomy surgeon visits during hospital stays) in western Jiangsu Province, China.

Material and Methods

Ethics Approval and Consent to Participate

The designed protocols were prepared by the authors themselves and approved by the Human Ethics Committee of the First Affiliated Hospital of Soochow University ((2024) Lunyan Approval No. 755ehT, September 14, 2020). The study followed the laws of China and the v2008 Helinski Declaration. The requirement for informed consent was waived by the Human Ethics Committee of the First Affiliated Hospital of Soochow University because of the retrospective nature of the study.

Inclusion Criteria

We included children aged 4-12 years undergoing elective tonsillectomy for tonsillitis with an American Society of Anesthesiologists (ASA) physical status of 1 (a normal healthy patient) or 2 (a patient with mild systemic disease).

Exclusion Criteria

We excluded children with neurocognitive deficits (cognitive impairment, especially in complex attention) and/or chronic pain (persistent ongoing and recurrent episodic pain), as well as children with recurrent tonsillitis, as these can affect the post-tonsillectomy clinical course.

Sample Size Calculation

We used OpenEpi software (version 3.0, Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com). We assumed that professional-led counseling and professional-led follow-up care would decrease intensities of postoperative pain by 15% and result in a 10% reduction in postoperative complications (hypothesized% frequency of outcome factor in the population) of children undergoing elective tonsillectomy compared to children and their parents who did not receive preoperative professional-led counseling and received only postoperative surgeons' visits during hospital stays (effect size). In addition, α was 0.05, β was 0.1, at a 95% confidence interval (CI), and a standard deviation (SD) of 5%. The required sample size (minimum children required in the cohort) was calculated to be 27 [1,13].

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Cohorts

In the NCC cohort, a total of 29 children undergoing elective tonsillectomy received preoperative nurse-led counseling and nurse-led postoperative follow-up care for 6 months (a nurse visit every month at the institute, a surgeon visit every day until discharge, and a postoperative surgeon visit when required for complications). In the FSS cohort, a total of 35 children undergoing elective tonsillectomy received preoperative surgeon-led counseling and postoperative surgeon-led follow-up care for 6 months (a surgeon visit every month at the institute, a surgeon visit every day until discharge, and a postoperative surgeon visit when required for complications). In the UUS cohort (usual care), 38 children undergoing elective tonsillectomy did not receive professional-led preoperative healthcare counseling and received only daily postoperative surgeon visits during hospital stays and postoperative surgeon-led follow-up visits when required. The selection of professionals for counseling and follow-up care was based on the availability of professionals in the institute. Children and their parents who did not receive preoperative healthcare professional-led counseling were included in the UUS cohort. In addition to professional-led counseling and professional-led follow-up care, children also received treatment directed by surgeons during the study period.

Professional-Led Counseling and Professional-Led Follow-Up Care

Nurse-Led Preoperative Counseling and Nurse-Led Postoperative Follow-Up Care

One day before the operation in the ward or operating room, nurses educated the children and their parents (including caregivers) regarding surgeries, their necessities, and postoperative complications, including average hospital stays with or without the help of verbal or visual aids. After the operation in the postoperative anesthesia care unit and ward, nurses provided verbal education regarding average hospital stays, postoperative complications including pain and swallowing disorders, and measures to overcome postoperative complications [13,14].

Surgeon-Led Preoperative Counseling and Surgeon-Led Postoperative Follow-Up Care

One day before the operation in the ward or operating room, surgeons educated children and their parents (including caregivers) regarding surgeries, their necessities, postoperative complications including average hospital stays, and surgical charges with or without the help of verbal or visual aids. After the operation in the postoperative anesthesia care unit and ward, surgeons provided verbal education regarding average hospital stays, postoperative complications including pain and swallowing disorders, and treatments to overcome postoperative complications (during patients' visits to surgeons in the hospital) [13].

Usual Care

In usual care for children undergoing elective tonsillectomy, children and their parents did not receive preoperative healthcare professional-led counseling at the hospital and received only daily postoperative surgeon visits during hospital stays and surgeon-led postoperative follow-up visits when required (for postoperative complications such as swallowing disorders and bleeding.

Outcome Measures

Postoperative Pain Intensity

When children regained consciousness after anesthetization, postoperative pain was evaluated by nurses using the Faces Pain Scale-Revised, with scores from 0 to 10. A score of 0 indicates no pain, and 10 indicates the maximum possible pain. Children were asked to choose a face that corresponded to their pain, and each face was associated with a number [15]. Postoperative pain was evaluated after tonsillectomies, at discharge, and -month after surgery. Pain scores of 3 or less were considered mild [1].

Postoperative Analgesic Dosage

For postoperative pain, children received 25 mg of mouth-dissolving tramadol tablets (available brands in the Chinese market) twice a day during hospital stays. In follow-up, children received 25 mg of mouth-dissolving tramadol tablet when they indicated they were feeling pain. During the hospital stay after surgery and at 6-month follow-up, the total consumption of tramadol (mg) was calculated for each patient.

Hospital Stays

Length of hospital stay was the time from admission to the hospital to discharge.

Frequencies of Postoperative Complications

Data on immediate (during hospital stays) and late (after discharge of patients at 6-month follow-up) postoperative complications in children were collected and analyzed.

During hospital stays, data were collected by nurses, and at the end of 6-month follow-up data were collected by caregivers with or without the help of healthcare professionals (nurses or surgeons) who were engaged in aftercare. In the case of

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missing data, hospital records of patient visits and pharmacy records of purchases were collected. Caregivers were asked to provide information on any further purchases of medication(s) in the follow-up period.

Clinical Benefits of Health Professional-Led Counseling and Professional-Led Aftercare

The clinical benefits of health professional-led counseling and aftercare of children who underwent elective tonsillectomy for tonsillitis were evaluated. Scores for health professional-led counseling and health professional-led aftercare were calculated from the risk of undercare, as expressed in equation 1. The risk of undercare was defined by a calculation that involved the intensities of post-tonsillectomy pain above which the children was received post-tonsillectomy analgesic medications (equation 2). The differences in postoperative pain intensities ranged from 0% to 100%. The beneficial score of the health professional-led counseling and health professional-led aftercare is the area above the curve of the counseling and care method, and the working area is the area under the curve of the adopted counseling and care methods. For all counseling and care, the reference standard used was 15% or more difference in postoperative pain and 10% or more difference in incidence of postoperative immediate and late complications in children regarding the negative control group (children and their parents who did not receive preoperative professional-led counseling and received only postoperative surgeons' visits during hospital stays) [16].

$$\text{Benefit score} = \frac{\text{Number of children with 15\% or more of differences of postoperative pain and 10\% or more of the differences in the incidence of postoperative immediate and late complication}}{\text{Total number of children}} - \left(\frac{\text{Number of children with less than 15\% differences in postoperative pain or less than 10\% of the differences in the incidence of postoperative immediate and late complication}}{\text{Total number of children}} \times \text{Risk of under care}\right) \quad (1)$$

$$\text{Risk of under care} = \frac{\text{The \% differences in the postoperative pain intensities}}{\text{100-the \% differences in the postoperative pain intensities}} \quad (2)$$

Personal Satisfaction

Our institute has its own personal satisfaction form for the parents or guardians of the enrolled children. It includes 3 items: prehospital service, hospital stay, and posthospital service. Personal satisfaction was assessed at the 6-months of follow-up. The grading of personal satisfaction (for prehospital service, hospital stay, and posthospital service) was 0=completely dissatisfied; 0.25=dissatisfied; 0.5=partially satisfied; 0.75=satisfied; and 1=extremely satisfied. The total score was 3, and the higher the score, the higher the satisfaction level.

Statistical Analyses

GraphPad 3.01 Software (San Diego, CA, USA) was used for statistical analysis. Categorial, continuous normal, and continuous non-normal variables are depicted as frequencies with percentages in parenthesis, mean±SD, and median with Q3-Q1 in parenthesis. Soup calculator® was used to calculate quartile values. The chi-square test (χ^2 test) with Yate's corrections (2×2 tables) of independence (large numbers of tables) or Fisher's exact test (2×2 tables) was used for categorical variables for statistical analysis. Kolmogorov and Smirnov methods are used to check the normality of data distribution. For normal continuous variables, one-way analysis of variance (ANOVA) was used for statistical analysis. Kruskal-Wallis' test (nonparametric ANOVA) and Mann-Whitney test (between cohorts) or Friedman's test (within cohort) were used for statistical analysis of non-normal continuous variables. Tukey's (for normal) and Dunn's (for non-normal) multiple comparisons tests were used for post hoc analysis of continuous variables. A *P* value less than 0.05 was considered significant.

Results

Study population

From September 20, 2020, to October 1, 2023, 114 children who underwent elective tonsillectomies were reported at the First Affiliated Hospital of Soochow University, Suzhou, Jiangsu, China, and the referring institute for tonsillitis. Among these 114 children, 5 had neurocognitive deficits and 7 had chronic pain. Therefore, the data from these (5+7=12 children) were excluded from analyses. Intensities of postoperative pain (Faces Pain Scale-Revised scale) at discharge and at 6-month follow-up, frequencies of postoperative complications in 102 children undergoing elective tonsillectomy, postoperative analgesic dosage (during 6 months after surgery), and hospital stay were collected from electronic records of institutes and evaluated. A flow diagram of this retrospective study is shown in **Figure 1**.

Demographic and Clinical Conditions

The sex ratio was almost 1: 1. The children were 7.78±2.25 years of age (minimum: 4 years, maximum: 12 years), ethnically Han Chinese, and caregivers were mostly their mothers. The demographic and clinical conditions of the children are presented in **Table 1** and there were no significant differences among the 3 groups.

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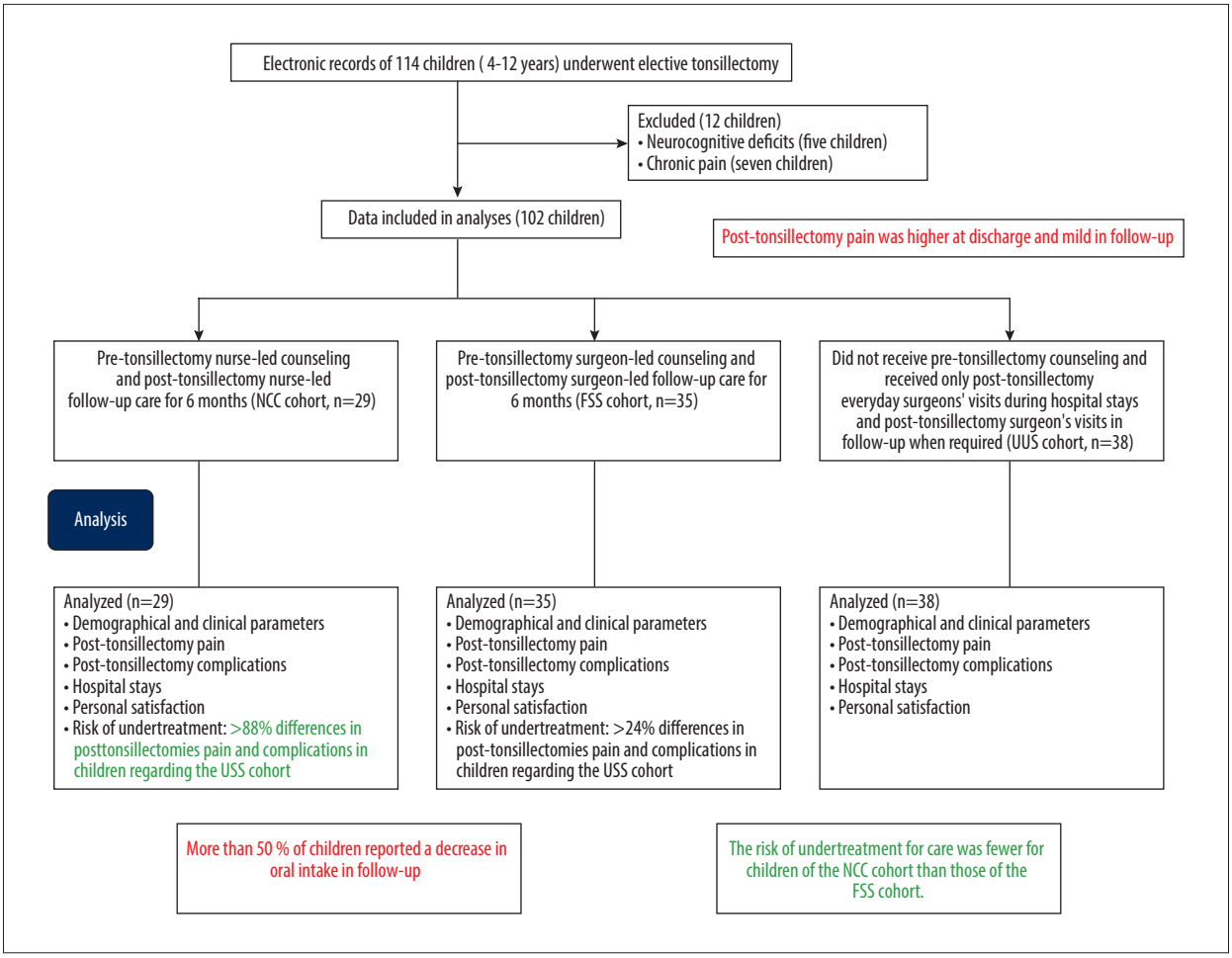

Figure 1. The flow diagram of the retrospective study. Red color indicates poor outcomes. Green color indicates good outcomes. Black color indicates not worse but not good outcomes.

Outcome Measures

Postoperative Pain Intensity

All the children experienced postoperative pain at discharge. Postoperative pain was 4 (IQ range, 5-4) per child at discharge from the hospital. At 1-month follow-up, postoperative pain was reported to be 2 (3-1) per child, 1 (1-0) per child, and 0 (0-0) for the USS, FSS, and NCC cohorts, respectively. At 1-month follow-up, postoperative pain was reported to be decreased in all children of all cohorts as compared to at the discharge conditions. Children in the NCC cohort had less postoperative pain at discharge and at 1 month after surgeries than those in the FSS and UUS cohorts. The children in the FSS cohort had less postoperative pain at discharge and 1 month after surgeries than those in the UUS cohort.

Postoperative Analgesic Dosage

Children in the NCC cohort consumed less tramadol during hospital stays after surgery and 6 months of follow-up than those in the FSS and UUS cohorts. The children in the FSS cohort consumed less tramadol during hospital stays after surgery and 6 months of follow-up than those in the UUS cohort.

Hospital Stays

Hospital stays were longer for children in the UUS cohort than in the NCC cohort. Hospital stays were equal for children in the FSS and UUS cohorts, and between the NCC and FSS cohorts.

Personal Satisfaction

Personal satisfaction for parents or guardians of patients was higher for children in the NCC cohort than for children in the FSS and UUS cohorts. Personal satisfaction for parents or guardians of patients was higher for children in the FSS cohort than

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Table 1. Demographical and clinical conditions of the enrolled children who underwent curative surgeries for tonsillitis.

Parameters		Total	Cohorts			Comparisons among cohorts		
			NCC	FSS	UUS			
Healthcare professionals associated with non-treatment interventions		–	Nurse	Surgeon	None			
Numbers of children		102	29	35	38	*p*-value	df	Test value
Gender	Boys	44 (43)	12 (41)	14 (40)	18 (47)	0.7968 (χ^2-test for Independence)	2	0.4543
	Girls	58 (57)	17 (59)	21 (60)	20 (53)			
Age (years)		7.78±2.25	7±2.38	8.06±2.27	8±2.08	0.2224 (one-way ANOVA)	101	1.526
Ethnicity								
Han Chinese		96 (94)	27 (97)	33 (94)	35 (92)	0.764 (χ^2-test for Independence)	2	1.847
Mongolian		5 (5)	1 (3)	2 (6)	2 (5)			
Tibetan		1 (1)	0 (0)	0 (0)	1 (3)			
Caregiver								
Mother		98 (96)	27 (93)	34 (97)	37 (97)	0.6206 (χ^2-test for Independence)	2	0.9543
Other than mother		4 (4)	2 (7)	1 (3)	1 (3)			

Variables are depicted as frequencies (percentages) or mean±SD (standard deviation). df – degree of freedom; χ^2 – Chi-squared test; ANOVA – analysis of variance. Test value (χ^2-value for χ^2-test; F-value for one-way ANOVA).

for children in the USS cohort. The details of outcome measures are presented in **Table 2**.

Post-Tonsillectomies Complications

Incidences of immediate and late postoperative complications, especially anxiety and vomiting, were higher among children in the UUS cohort, followed by those of children in the FSS and NCC cohorts. Nausea was reported in all the children who underwent tonsillectomies. Dysphagia was reported only in children in the UUS cohort. Half of children across all cohorts who underwent tonsillectomy had fever and vomiting, and one-third experienced dizziness. A total of 56 (55%) children had a decrease in oral intake during the follow-up period. The details of immediate (during hospital stays of patients) and late (after discharge of patients at 6 months of follow-up) postoperative complications are reported in **Table 3**.

Clinical Benefits for Health Professional-Led Counseling and Professional-Led Aftercare

A total of 26 and 8 children from the NCC and FSS cohorts, respectively, had 15% or more differences in postoperative pain and 10% or more in the differences in the incidence of postoperative immediate and late complications in the UUS cohort. Children in the NCC, FSS, and UUS cohorts had 0-0.9 beneficial scores of 0-0.1 beneficial scores, and no beneficial scores, respectively. Above 0.9, 0.1, and 0 beneficial scores, the children of the NCC, FSS, and UUS cohorts were at risk of under-treatment, respectively. If there were more than the 88% and more than the 24% differences in the incidence of post-tonsillectomies pain and immediate and late complications in children regarding the USS cohort, the children were at risk of under-treatment for the NCC and the FSS cohorts, respectively. The details of the clinical benefits of health professional-led counseling and professional-led aftercare are shown in **Figure 2 and Table 4**. Results of the assumption tests are presented in **Table 5**.

Discussion

Postoperative pain was higher at discharge and mild at 1-month follow-up visit. The results of postoperative pain in the current study are consistent with those of a randomized clinical trial [1], a prospective study on adult patients [17], and observational, longitudinal study [4], a randomized controlled trial [9], a prospective study [10], a qualitative interview study [18], a

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Table 2. Outcome measures of the enrolled children after curative surgeries for tonsillitis.

Parameters		Cohorts					Comparisons between FSS and UUS	
		NCC	FSS		UUS			
Healthcare professionals associated with non-treatment interventions		Nurse	Surgeon		None			
Numbers of children		29	35	#*p*-value	38	#*p*-value	$*p*-value	KW
Outcome		Value	Value		Value			
Postoperative pain intensity	At discharge	4 (5-4)	6 (6-5)	<0.001	6 (7-6)	<0.001	<0.001	56
	1-months after surgeries	0 (0-0)	1 (1-0)	<0.05	2 (3-1)	<0.001	<0.001	55
Between at the time of discharge and 1-months after surgeries	*p*-value	<0.001		<0.001		N/A	<0.001	N/A
	Fr	58		45		N/A	43	N/A
Postoperative analgesic dosage (mg)		575 (613-525)	675 (725-600)	<0.01	800 (875-725)	<0.001	<0.001	60
Hospital stays (days)		2 (2-1)	2 (2-2)	0.2512	2 (2-2)	<0.01	0.2855	13
Personal satisfaction		1.5 (2-1.25)	1.25 (1.5-1)	<0.05	0.75 (0.75-0.5)	<0.001	<0.001	64

Variables are depicted as median (Q3–Q1). Faces Pain Scale-Revised scale in the range of 0 to 10. 0 indicates no pain and 10 indicates maximum possible pain. Kruskal-Wallis' test (between cohorts), Mann-Whitney test (between cohorts), or Friedman test (within cohort) was used for statistical analysis. Dunn's multiple comparisons test was used for *post hoc* analysis. # Compared to the NCC cohort; $ between FSS and USS cohorts. N/A – not applicable; KW – Kruskal-Wallis' Statistic (corrected for ties); Fr – Friedman Statistic (corrected for ties). The grading of personal satisfaction (for prehospital service, hospital stay, and posthospital service) was provided as 0: completely dissatisfied, 0.25: dissatisfied, 0.5: partially satisfied, 0.75: satisfied, 1: extremely satisfied. The total score was 3, the higher the score higher is satisfaction level. A *p*-value less than 0.05 was considered significant.

prospective quasi-experimental pilot study [2], and a randomized trial [19]. The higher incidence of postoperative pain at discharge and at 1-month follow-up could be attributed to specific factors such as surgical technique, children characteristics, for example, female gender. The enrolled children had more postoperative pain than expected at discharge and at 1-month follow-up after tonsillectomy.

Immediate and late postoperative complications, especially anxiety and vomiting, were higher among children in the UUS cohort, followed by those of children in the FSS and NCC cohorts. The results of postoperative complications are consistent with those of randomized controlled trials [9], prospective studies [10], qualitative interview studies [18], and randomized clinical trials [1]. Follow-up care does not affect postoperative events [10]. The significant differences in anxiety and vomiting in the study populations from the available studies [1, 10] could be due to the small sample size or the use of analgesic medicine itself (more analgesic use among children in the UUS cohort). Critical assessments are required for the potential reasons for the observed differences between cohorts, such as the impact of sample size or analgesic use. Professional-led counseling and follow-up care did not have a significant effect on postoperative complications in children after tonsillectomy.

More than 50% of children had a decrease in oral intake, consistent with results of a randomized clinical trial [1], but differing from a prospective study [10]. Pain intensity after surgery in the 1-month follow-up was higher in the current study, and children with pain often have decreased oral intake [10]. In addition, early discharge of children after tonsillectomy is associated with more complications during follow-up [1]. After tonsillectomy, children generally have a decrease in oral intake because of poor pain control and nausea.

Personal satisfaction for children and their caregivers was highest among children and caregivers of the NCC cohort, followed

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Table 3. Immediate (during hospital stays of patients) and late (after discharge of patients in 6-months of follow-up) postoperative complications of the enrolled children after tonsillitis.

	Cohorts											
	NCC	FSS				UUS				Between FSS and USS cohorts		
Healthcare professionals associated with non-treatment interventions	Nurse	Surgeon				None						
Event	Value	Value	#p-value	Relative risk	95% CI	Value	#p-value	Relative risk	95% CI	p-value	Relative risk	95% CI
Numbers of children	29	35				38						
Nausea	28 (97)	34 (97)	0.9999	0.9032	0.2198 to 3.711	37 (97)	0.9999	0.8485	0.2062 to 3.491	0.9999	0.9577	0.2345 to 3.912
Vomiting	12 (41)	20 (57)	0.3152	0.7059	0.4059 to 1.228	24 (63)*	0.043	0.549	0.3168 to 0.9514	0.6386	0.8788	0.5449 to 1.417
Dizziness	7 (24)	11 (31)	0.5849	0.8131	0.4231 to 1.563	11 (29)	0.5849	0.8131	0.4231 to 1.563	0.9999	1.063	0.6384 to 1.768
Constipation	6 (21)	11 (31)	0.4017	0.7212	0.3557 to 1.463	12 (32)	0.4085	0.7101	0.3463 to 1.456	0.9999	0.9964	0.5951 to 1.668
Fever	12 (41)	18 (51)	0.4601	0.8	0.4604 to 1.390	22 (58)	0.2218	0.6851	0.3902 to 1.203	0.6419	0.8735	0.5424 to 1.407
Bleeding	1 (3)	1 (3)	0.9999	0.9032	0.2198 to 3.711	2 (5)	0.9999	0.7619	0.1501 to 3.868	0.9999	0.6863	0.1360 to 3.464
Dysphasia	0 (0)	1 (3)	0.9999	0	-Infinity to Infinity	3 (8)	0.2524	0	-Infinity to Infinity	0.6157	0.5074	0.09134 to 2.818
Anxiety	8 (28)	15 (43)	0.2958	0.6791	0.3601 to 1.281	30 (79)*#	<0.0001	0.2907	0.1509 to 0.56	0.0019	0.4667	0.2902 to 0.7505
Depression	5 (17)	9 (26)	0.5471	0.744	0.3480 to 1.591	12 (32)	0.2588	0.6127	0.2778 to 1.352	0.6145	0.8571	0.4877 to 1.506
Bed taste	3 (10)	4 (11)	0.9999	0.9396	0.3815 to 2.314	5 (13)	0.9999	0.851	0.3324 to 2.178	0.9999	0.9176	0.4235 to 1.988
Decrease in oral intake	15 (51)	19 (54)	0.9999	0.9454	0.5519 to 1.619	22 (58)	0.63	0.8687	0.5029 to 1.501	0.8159	0.9268	0.5746 to 1.495

Variables are depicted as frequencies (percentages). # Compared to the NCC cohort. Test value (relative risk for Fisher exact test). Anxiety and depression were evaluated hospital anxiety and depression scale. A hospital anxiety and depression scale score of more than 7 is considered anxiety or depression. Children may have one or more events. CI: Confidence interval (using the approximation of Katz.). * Significantly higher value than those of the NCC cohort; # significantly higher value than those of the FSS cohort. A *p*-value less than 0.05 was considered significant.

by those of children and caregivers of the UUS and FSS cohorts. Greater frequency and availability of nurses at institutes may increase personal satisfaction among children and their caregivers. The details of the comparative studies on children and adults undergoing tonsillectomy in different settings are presented in **Table 6**.

The risk of under-treatment was lower for children in the NCC cohort than in the FSS cohort. Nurse-led counseling and postoperative care can provide good pain control and patient satisfaction, which can help to decrease pain intensity in children. Nurse-led counseling and postoperative care are more helpful for children after tonsillectomy than other professional-led counseling and postoperative care.

This study has several limitations. The small sample size may have led to type I errors. The measurement of pain intensity, which was the primary objective of the study, was subjective but not objective. The study explained the reason for good personal satisfaction as frequencies and availabilities of nurses

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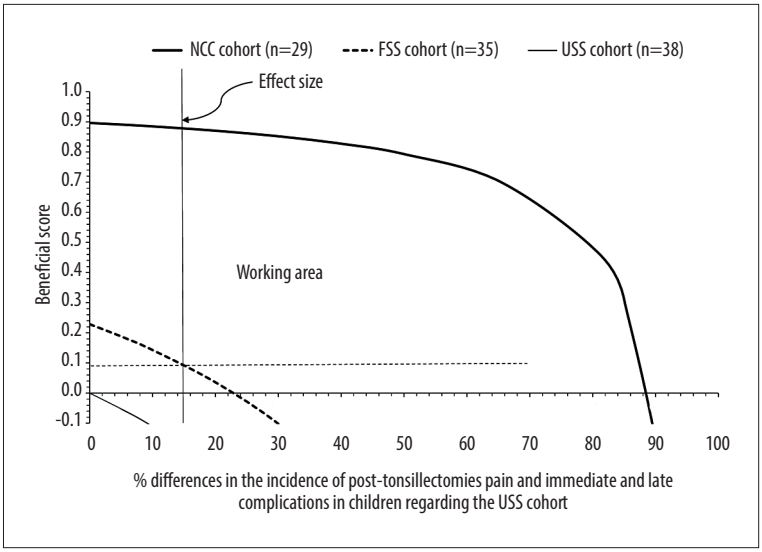

Figure 2. The schematic presentation of the clinical benefits of health professional-led counseling and professional-led aftercare.

Table 4. Values of the clinical benefits of health professional-led counseling and professional-led aftercare for curative tonsillitis in children.

% differences in postoperative pain intensity and immediate and late complications concerning children of the USS cohort	Cohort		
	Beneficial score		
	NCC	FSS	UUS
0	0.9	0.23	0
5	0.9	0.19	-0.05
10	0.89	0.14	-0.11
20	0.87	0.04	-0.25
30	0.85	-0.10	-0.43
40	0.83	-0.29	-0.67
50	0.79	-0.54	-1
65	0.70	-1.20	-1.86
80	0.48	-2.86	-4
85	0.31	-4.14	-5.67
95	-1.07	-14.43	-19
99	-9.34	-76.14	-99
Beneficial scores	0-0.9	0-0.1	None
Risk of under care (beneficial scores)	>0.9	>0.1	>0
Risk of under care (% differences in the incidence of post-tonsillectomies pain and immediate and late complications in children regarding the USS cohort)	>88%	>24%	None

at institutes than those of surgeons. However, the statement about intervention of NCC and FSS were similarly that a nurse or surgeon visit every month. The possible justification for this is that a nurse or surgeon visit every month this is protocol but surgeons visit during their outpatient department (OPD), however, nurse were not engaged in the OPD. The study has avoided reporting of postoperative pain and frequencies of postoperative complications according to the matter of surgical technique for the procedure itself, which as previous studies showed patients who undergo intracapsular tonsillectomy particularly using coblation have a shorter recovery period and require less analgesia. This is a limitation of our study. Types of surgical technique and anesthesia methods were not evaluated because these were accessible to anesthesiologists and surgeons. However, the authors are nursing staff from the pediatric surgery department.

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Table 5. Results of assumption tests.

Variables	Selected test
Categorical variable	Chi-square (χ^2) test with Yate's correction when sample size >40 and each column have sample >5 in 2×2 tables otherwise Fisher's exact test in 2×2 tables, For larger tables χ^2-test with dependence
Age (years)	All columns passed the normality test (Normality test p-value >0.1 for all)
Postoperative pain intensity (at discharge, 6-months after surgeries, and between discharge and 6-months after surgeries) and hospital stays (days)	All columns failed in the normality test (Normality test p-value <0.05 for all), i.e. non-parametric test
Postoperative analgesic dosage	All columns passed the normality test (Normality test p-value >0.1 for all). However, Bartlett statistic (corrected)=6.988. The P value is 0.0304. Bartlett's test suggests that the differences among the SDs are significant, i.e. non-parametric test
Personal satisfaction	one column failed in the normality test (Normality test p-value <0.05 for all), i.e. non-parametric test

Table 6. Comparative studies on children/adults undergoing tonsillectomy in different settings for tonsillitis.

Study	Published year	Study population	Sample size (N; patients)	Age (years)
Randomized clinical trial, Paquette et al [1]	2012	Canadian	45 (24/21)	5.87±1.7
Prospective quasi-experimental pilot study, Wozney et al [2]	2022	Canadian	51	3-14
Observational, longitudinal study, Lao et al [4]	2020	North American	827 patients	Between 2 and 15
Randomized controlled trial, van Vliet et al [9]	2020	Dutch	128 (64/64)	>18
Prospective study, Xin et al [10]	2019	Chinese	680 (341/329)	8.5 to 8.8 (4-12)
Prospective study, Zagólski et al [15]	2016	Polish	61	29±6.6
Qualitative interview study, Idvall et al [16]	2005	Scandinavian	6	7-18
Randomized trial, Sutters et al [17]	2007	Canadian	80	6-15

Conclusions

Children may have more post-tonsillectomy pain than expected at discharge and follow-up for tonsillitis due to specific factors of children themselves. Professional-led counseling and follow-up care did not have a significant effect on post-tonsillectomy complications. After tonsillectomy, children generally had a decrease in oral intake attributed to post-tonsillectomy complications, especially nausea. Professional-led counseling, especially nurse-led counseling and professional-led follow-up care, can improve personal satisfaction for children and their caregivers for curative tonsillectomy surgeries due more frequent nurse visits and greater availability of nurses.

List of Abbreviations

ASA physical status: The American Society of Anesthesiologists physical status; **CI:** confidence interval; **SD:** standard deviation; **NCC cohort:** children received pre-tonsillectomy nurse-led counseling and post-tonsillectomy nurse-led follow-up care for 6 months (every month had nurse visit at institute) + post-tonsillectomy surgeon visit every day until discharge + treatment directed by surgeons + postoperative surgeon's when required for complications; **FSS cohort:** children received pre-tonsillectomy surgeon-led counseling and post-tonsillectomy surgeon-led follow-up care for 6-months (every month they had a surgeon visit at the institute) + post-tonsillectomy surgeon visit every day until discharge + treatment directed by surgeons + postoperative surgeon's when required for complications; **UUS cohort:** children and their parents did not receive

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pre-tonsillectomy professional-led counseling and received only post-tonsillectomy everyday surgeons' visits during hospital stays and post-tonsillectomy surgeon-led follow-up visit when required + treatment directed by surgeons; **Q1:** first quarantine; **Q3:** third quarantine; **χ^2-test:** Chi-square test; **ANOVA:** analysis of variance; **OPD:** outpatient department.

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Availability of Data and Materials

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

Declaration of Figures' Authenticity

All figures submitted have been created by the authors, who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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