

RESEARCH ARTICLE

Knowledge, attitudes and practices of enhanced recovery after surgery among paediatric surgical nurses in China: A Cross-Sectional study

Ke-Xian Liu¹  | Meng Lv¹ | Xiao-Shu Liu² | Hong-Qin Wang³ | Zhi-Min Chen⁴ | Hong-Zhen Xu¹ 

¹Nursing Department, Children's Hospital, Zhejiang University School of Medicine, National Clinical Research Center for Child Health, China, Hangzhou, China

²Nursing Department, Children's Hospital of Jiangxi Province, Nanchang, China

³Nursing Department, Children's Hospital of Anhui Province, Hefei, China

⁴Respiratory Department, Children's Hospital, Zhejiang University School of Medicine, National Clinical Research Center for Child Health, China, Hangzhou, China

Correspondence

Hong-Zhen Xu, Binsheng Rd. 3333#, Binjiang district, Hangzhou, Zhejiang, China.

Email: 6184020@zju.edu.cn

Funding information

Health Science and Technology Plan Project of Zhejiang Province, Grant/Award Number: 2021KY187

Abstract

Aim: To investigate paediatric surgical nurses' knowledge, attitudes and practices (KAP) regarding enhanced recovery after surgery (ERAS).

Design: A cross-sectional study.

Methods: A 34-question survey was developed. An electronic version of the questionnaire was distributed to nurses working in paediatric surgical departments of 22 tertiary hospitals from 14 provinces of China by means of convenience sampling from February to April 2021. A total of 855 nurses' data was used as the final sample. The statistical analysis included nonparametric test, Spearman's correlation and multiple linear regression.

Results: There is still room for improvement regarding the KAP of paediatric surgical nurses, especially in the knowledge of "postoperative recovery" and "preoperative preparation". The influencing factors of KAP were educational level, geographical region (South, Central, North, Northwest), years of work experience, hospital category (general hospital, women and children's hospital), and familiarity with ERAS.

KEYWORDS

attitudes, enhanced recovery after surgery, knowledge, nurses, paediatric, practices

1 | INTRODUCTION

Enhanced recovery after surgery (ERAS) is a paradigm aiming to optimize perioperative care and improve patient outcomes by maintaining physiological homeostasis and reducing surgical stress through evidence-based practices (Ljungqvist et al., 2017). It has been shown to reduce postoperative complications, shorten the length of stay (LOS), and decrease overall costs in a variety of operational procedures in adults (Kiong et al., 2021; Olson et al., 2021; Pickens et al., 2021). Although the ERAS protocol for a paediatric surgical

department is different from that used in adults (Gibb et al., 2018), several studies have revealed that ERAS protocols were associated with decreasing postoperative pain and opioid usage, as well as improving comfort and outcomes in children (Han et al., 2021; Zhang et al., 2021). Therefore, incorporating ERAS pathways into the care of paediatric patients is necessary.

Nurses' awareness of ERAS is a predictor of implementation of ERAS (McLennan et al., 2014); good knowledge and understanding are crucial in this regard (Cohen & Goberman-Hill, 2019). Thus, figuring out how paediatric surgical nurses understand, perceive

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Nursing Open* published by John Wiley & Sons Ltd.

and practice ERAS protocols, and taking action to improve nurses' knowledge, attitudes and practices of ERAS, are pivotal points in implementing ERAS pathways in a paediatric surgical department. Therefore, we performed a large-scale, cross-sectional, multicenter survey to investigate the knowledge, attitudes and practices (KAP) regarding the ERAS of paediatric surgical nurses in China, and also to explore the predictors of ERAS-related KAP to encourage nurses' active ERAS-related future learning and behaviours in the perioperative period.

2 | METHODS

2.1 | Design, setting and samples

This study had a cross-sectional design with paediatric surgical nurses as the target group, and was conducted in 22 tertiary hospitals, including 13 general hospitals, 3 women and children's hospitals, and 6 children's hospitals in 17 cities of 14 provinces in China. Convenience sampling was employed to select the research samples from February to April 2021. The inclusion criteria were nurses with at least 2 years of clinical experience in paediatric surgical departments and those who voluntarily participated in this research. To explore the influencing factors, the sample size should be at least 5–10 times the number of variables (Ni et al., 2010). In our study, this number was 8. Considering the participants lost to follow-up, the sample size was expanded by 20% of the original value. Given the 20% rate of incomplete or invalid cases, the sample size was set at 96.

2.2 | Variables and instruments

2.2.1 | Basic characteristics

The basic characteristics collected were age, gender, educational level, city of work, years of work experience, professional title, hospital category, and self-reported familiarity with ERAS.

2.2.2 | KAP questionnaire

The questionnaire was designed by referring to experts' consensus (Brindle et al., 2020), and the relevant reviews (Roberts et al., 2020; Rove et al., 2018; Shu & Tou, 2019; Wu et al., 2019). It consisted of three parts corresponding to knowledge, attitudes, and self-reported practices of ERAS among paediatric surgical nurses. The content validity of the questionnaire was evaluated by 15 paediatric surgical ERAS experts (six doctors and nine nurses). The item-level content validity index (I-CVI) coefficient for each item was >0.867 , the scale-level content validity index/universal agreement (S-CVI/UA) coefficient was 0.882, and the scale-level content validity index/average (S-CVI/Ave) coefficient was 0.904, which indicated good content

validity (Shi et al., 2012). In a pilot trial of this questionnaire with 97 participants, the Cronbach's α coefficients of the knowledge, attitude and practice sections of the questionnaire were .820, .989, and .957, respectively.

The knowledge questionnaire consisted of three domains: preoperative preparation, intraoperative management and postoperative recovery, with 11 items in total. Two of these questions (3 and 6) were negatively worded. For each item, the answers were in the form of true or false. One point was awarded for each correct answer and zero for the wrong answer. The total score of the knowledge questionnaire was 11 points, and the higher the achieved score, the higher the knowledge level of the nurse.

The attitude questionnaire consisted of three domains: the importance of nurses in ERAS, the learning attitude towards ERAS, and the attitude towards ERAS practice. There was a total of nine items, each with the following five options: "strongly disagree," "disagree," "neutral," "agree," or "strongly agree," corresponding to 1–5 points, respectively. The total score of the attitude questionnaire was 45 points, and the higher the achieved score, the more positive the attitude of the nurse.

The practice questionnaire for doctors consisted of 14 items and 4 domains that included psychological nursing, preoperative preparation, intraoperative management, and postoperative recovery. The options for items were ordered by the degree of execution and included "never," "sometimes," "about half the time," "most of the time," and "always," corresponding to 1–5 points, respectively. The total score of the practice questionnaire was 70, and the higher the score, the better the self-reported compliance of the nurse in practicing ERAS.

2.3 | Data collection

This study used the professional questionnaire survey platform "Wenjuan Xing" (<https://www.wjx.cn/>) through WeChat, which is a popular and widely used social app in China. The head nurse of the paediatric surgical departments distributed the questionnaires to nurses through WeChat via a hyperlink. We invited 1,222 nurses from 22 tertiary hospitals in 17 cities of 14 provinces in China to participate in the survey. A total of 860 questionnaires were completed, with a response rate of 70.38%. After excluding questionnaires with obvious errors, a total of 855 questionnaires were included in this study, with an effective rate of 99.42%.

2.4 | Data analysis

Statistical analyses were conducted using SPSS (v.23.0). Qualitative data were shown as frequency distribution and percentages, and quantitative data were presented as median and quartile range (none of the quantitative data were normally distributed). We used nonparametric tests (Mann-Whitney *U* test

or Kruskal-Wallis H test) to explore the relation between demographical characteristics and ERAS-related KAP. Multiple linear regression was performed to analyse the predictors of ERAS-related KAP. The Spearman's correlation coefficients were calculated to define the correlations among ERAS-related knowledge, attitudes and practices. Statistical significance was assessed at the 5% level ($p < .05$).

2.5 | Ethical considerations

The study protocol was approved by the research ethics committee of the Children's Hospital, Zhejiang University School of Medicine (Number: 2021-IRB-112). Informed consent was provided on the first page of the survey. The participants provided their consent by clicking a button on this page.

3 | RESULTS

3.1 | Basic Characteristics

In total, 855 valid questionnaires were received in the survey. A total of 377 (44.1%) of the respondents were younger than 30 years and 839 (98.1%) were female. Respondents with undergraduate degrees accounted for 85.0%. They came from 14 provinces of China, with the East (41.6%) accounting for the largest proportion. Most of the respondents (66.7%) worked in children's hospitals, and the professional titles of 538 (62.9%) were elementary (Table 1).

3.2 | The KAP of Paediatric surgical nurses

The KAP information of nurses in paediatric surgical departments towards ERAS was summarized in Table 2. In terms of knowledge, nurses had a poor grasp of "postoperative recovery" (the median average score and lower quartile was 0.75 and 0.50, respectively, which was lower than the average score of knowledge), but presented a good grasp of "intraoperative management" (the median average score and lower quartile was 1.00 and 1.00, respectively, which was higher than the average score of knowledge). In terms of attitude, the median average score of all three domains and the total score was ≥ 4.00 , and in the lower quartile, this was never < 4.00 , indicating that the attitude of the majority of nurses was "agree" or "strongly agree". In terms of practice, the median of the mean scores of each four domains and the total score was ≥ 4.00 , and in the lower quartile, this was never < 3.00 , indicating that the self-reported compliance of most nurses to practice ERAS was "about half the time" to "always".

In general, the median score (IQR) of knowledge, attitude and practice were 0.82 (0.73, 0.91), 4.33 (4.00, 5.00), and 4.29 (3.93, 4.79), respectively. In the correlation analysis, knowledge, attitude

TABLE 1 Basic characteristics of nurses ($N = 855$)

Variables	N (%)
Age group (years)	
≤ 30	377 (44.1)
31–40	392 (45.8)
≥ 41	86 (10.1)
Gender	
Male	16 (1.9)
Female	839 (98.1)
Educational level	
Associate college and below	116 (13.6)
Undergraduate	727 (85.0)
Master and above	12 (1.4)
Geographical region	
The East	356 (41.6)
The South	24 (2.8)
The Central	82 (9.6)
The North	113 (13.2)
The Northwest	97 (11.3)
The Southwest	183 (21.4)
Work experience (years)	
≤ 5	253 (29.6)
6–10	290 (33.9)
11–15	178 (20.8)
≥ 16	134 (15.7)
Professional title	
Elementary	538 (62.9)
Intermediate	286 (33.5)
Advanced	31 (3.6)
Hospital category	
General hospital	220 (25.7)
Women and children's hospital	65 (7.6)
Children's hospital	570 (66.7)
Familiarity with ERAS	
Not familiar	137 (16.0)
Slightly familiar	263 (30.8)
Moderately familiar	229 (26.8)
Very familiar	167 (19.5)
Extremely familiar	59 (6.9)

and practice were positively correlated with each other ($p < .01$) (Table 3).

3.3 | Influencing factors associated with knowledge

According to the univariate analysis results shown in Table S1, knowledge was significantly correlated with educational level,

TABLE 2 The knowledge, attitudes and practices (KAP) of paediatric surgical nurses ($N = 855$)

KAP	Domain	Min	Max	Median (interquartile range)
Knowledge (average score)	Preoperative preparation	0.00	1.00	0.80 (0.80, 1.00)
	Intraoperative management	0.00	1.00	1.00 (1.00, 1.00)
	Postoperative recovery	0.00	1.00	0.75 (0.50, 0.75)
	Average score of knowledge	0.00	1.00	0.82 (0.73, 0.91)
Attitude (average score)	The importance of nurses in ERAS	1.00	5.00	5.00 (4.00, 5.00)
	Learning attitude towards ERAS	1.00	5.00	4.25 (4.00, 5.00)
	Attitude towards ERAS practice	1.00	5.00	4.50 (4.00, 5.00)
	Average score of attitude	1.00	5.00	4.33 (4.00, 5.00)
Practice (average score)	Psychological nursing	1.00	5.00	4.00 (3.33, 5.00)
	Preoperative preparation	1.00	5.00	4.00 (3.00, 5.00)
	Intraoperative management	1.00	5.00	4.60 (4.00, 5.00)
	Postoperative recovery	1.00	5.00	4.75 (4.00, 5.00)
	Average score of practice	1.14	5.00	4.29 (3.93, 4.79)

TABLE 3 Correlation matrix of knowledge, attitudes, and practices ($N = 855$)

Variables	Knowledge	Attitude	Practice
Knowledge	1		
Attitude	0.335**	1	
Practice	0.261**	0.640**	1

** $p < .01$.

geographical region, professional title, hospital category, and familiarity with ERAS ($p < .01$); preoperative preparation was significantly correlated with educational level, geographical region, professional title, hospital category, and familiarity with ERAS ($p < .001$); intraoperative management was significantly correlated with age, geographical region, years of work experience, hospital category, and familiarity with ERAS ($p < .05$ or $.01$); and postoperative recovery was significantly correlated with educational level, professional title, hospital category, familiarity with ERAS ($p < .05$ or $.01$).

The significant factors obtained from the univariate analyses were included in the multiple linear regression analysis (Table 4). The results showed that the influencing factors of knowledge were as follows: educational level ($\beta = .077$, $p = .022$), the North region ($\beta = -.075$, $p = .026$) (compared with the Southwest), general hospital ($\beta = .083$, $p = .015$), women and children's hospital ($\beta = .073$, $p = .031$) (compared with children's hospital), and familiarity with ERAS ($\beta = .208$, $p < .001$). Meanwhile, the influencing factors of preoperative preparation were as follows: the regions of South ($\beta = -.083$, $p = .018$), North ($\beta = -.111$, $p = .001$) and Northwest ($\beta = -.098$, $p = .004$) (compared with the Southwest), general hospital ($\beta = .104$, $p = .003$) (compared with children's hospital), and familiarity with ERAS ($\beta = .154$, $p < .001$). The influencing factors of intraoperative management were as follows: the Central region ($\beta = .108$, $p = .002$)

(compared with the Southwest), years of work experience ($\beta = -.104$, $p = .002$), women and children's hospital ($\beta = .101$, $p = .003$) (compared with children's hospital), and familiarity with ERAS ($\beta = .127$, $p < .001$). The influencing factors of postoperative recovery were as follows: women and children's hospital ($\beta = .106$, $p = .002$) (compared with children's hospital), and familiarity with ERAS ($\beta = .203$, $p < .001$).

3.4 | Influencing factors associated with attitude

The univariate analysis results shown in Table S2 revealed that attitude was significantly correlated with educational level, geographical region, professional title, hospital category, and familiarity with ERAS ($p < .05$ or $.01$); the importance of nurses in ERAS was significantly correlated with their educational level, geographical region, professional title, hospital category, and familiarity with ERAS ($p < .01$); learning attitude towards ERAS was significantly correlated with the educational level, geographical region, professional title, hospital category, and familiarity with ERAS ($p < .05$ or $.01$); and attitude towards ERAS practice was significantly correlated with the educational level, geographical region, professional title, hospital category, and familiarity with ERAS ($p < .05$ or $.01$).

The significant factors obtained from the univariate analyses were included in the multiple linear regression analysis (Table 5). The results showed that the influencing factors of attitude were as follows: the Central region ($\beta = .125$, $p < .001$) (compared with the Southwest), women and children's hospital ($\beta = .103$, $p = .001$) (compared with children's hospital), and familiarity with ERAS ($\beta = .316$, $p < .001$). The influencing factors of the importance of nurses in ERAS were as follows: educational level ($\beta = .080$, $p = .015$), the Central region ($\beta = .082$, $p = .015$) (compared with the Southwest), women and children's hospital ($\beta = .086$, $p = .009$) (compared with children's hospital), and familiarity with ERAS ($\beta = .255$, $p < .001$).

TABLE 4 Multiple regression of knowledge scores (N = 855)

Factors	B	SE	β	t	p	
Knowledge scores	Educational level	0.338	0.147	.077	2.300	.022*
	Geographical region (compared with the Southwest)	-0.355	0.159	-.075	-2.230	.026*
	Hospital category (compared with children's hospital)	0.306	0.126	.083	2.439	.015*
	Familiarity with ERAS	0.439	0.204	.073	2.157	.031*
Preoperative preparation	Familiarity with ERAS	0.288	0.047	.208	6.141	<.001**
	Geographical region (compared with the Southwest)	-0.434	0.182	-.083	-2.381	.018*
	The South	-0.283	0.086	-.111	-3.299	.001**
	The North	-0.265	0.092	-.098	-2.893	.004**
Hospital category (compared with children's hospital)	The Northwest	0.205	0.070	.104	2.944	.003**
	General hospital	0.115	0.025	.154	4.534	<.001**
	Familiarity with ERAS	0.176	0.057	.108	3.093	.002**
	The Central	-0.048	0.016	-.104	-3.070	.002**
Intraoperative management	Geographical region (compared with the Southwest)	0.183	0.061	.101	2.993	.003**
	Work experience (years)	0.053	0.014	.127	3.678	<.001**
	Hospital category (compared with children's hospital)	0.325	0.102	.106	3.183	.002**
	Familiarity with ERAS	0.143	0.023	.203	6.094	<.001**
Postoperative recovery	Hospital category (compared with children's hospital)	0.325	0.102	.106	3.183	.002**
	Familiarity with ERAS	0.143	0.023	.203	6.094	<.001**
	Women and children's hospital	0.053	0.014	.127	3.678	<.001**
	Women and children's hospital	0.325	0.102	.106	3.183	.002**

Note: Knowledge scores: $R^2 = .084$, adjusted $R^2 = .078$, $F = 15.494$, $p < .001$. Preoperative preparation: $R^2 = .061$, adjusted $R^2 = .055$, $F = 10.952$, $p < .001$. Intraoperative management: $R^2 = .054$, adjusted $R^2 = .050$, $F = 12.143$, $p < .001$. Postoperative recovery: $R^2 = .053$, adjusted $R^2 = .051$, $F = 23.946$, $p < .001$.

* $p < .05$, ** $p < .01$.

TABLE 5 Multiple regression of attitude scores (N = 855)

Factors	B	SE	β	t	p
Attitude scores					
Geographical region (compared with the Southwest)	2.315	0.609	.125	3.800	<.001**
Hospital category (compared with children's hospital)	2.137	0.659	.103	3.242	.001**
Familiarity with ERAS	1.498	0.155	.316	9.679	<.001**
The importance of nurses in ERAS					
Educational level	0.139	0.057	.080	2.434	.015*
Geographical region (compared with the Southwest)	0.177	0.072	.082	2.446	.015*
Hospital category (compared with children's hospital)	0.205	0.078	.086	2.619	.009**
Familiarity with ERAS	0.140	0.018	.255	7.589	<.001**
Learning attitude towards ERAS					
Geographical region (compared with the Southwest)	1.028	0.281	.120	3.656	<.001**
Hospital category (compared with children's hospital)	0.852	0.304	.089	2.799	.005**
Familiarity with ERAS	0.704	0.071	.321	9.849	<.001**
Attitude towards ERAS practice					
Geographical region (compared with the Southwest)	-0.990	0.495	-.065	-2.000	.046*
Hospital category (compared with children's hospital)	1.041	0.284	.121	3.672	<.001**
Familiarity with ERAS	1.033	0.306	.108	3.376	.001**
	0.671	0.073	.307	9.246	<.001**

Note: Attitude scores: $R^2 = .142$, adjusted $R^2 = .139$, $F = 47.114$, $p < .001$. The importance of nurses in ERAS: $R^2 = .103$, adjusted $R^2 = .098$, $F = 24.316$, $p < .001$. Learning attitude towards ERAS: $R^2 = .142$, adjusted $R^2 = .139$, $F = 46.976$, $p < .001$. Attitude towards ERAS practice: $R^2 = .136$, adjusted $R^2 = .132$, $F = 33.554$, $p < .001$.

* $p < .05$, ** $p < .01$.

The influencing factors of learning attitude towards ERAS were as follows: the Central region ($\beta = .120, p < .001$) (compared with the Southwest), women and children's hospital ($\beta = .089, p = .005$) (compared with children's hospital), and familiarity with ERAS ($\beta = .321, p < .001$). The influencing factors of attitude towards ERAS practice were as follows: the regions of South ($\beta = -.065, p = .046$), and Central ($\beta = .121, p < .001$) (compared with the Southwest), women and children's hospital ($\beta = .108, p = .001$) (compared with children's hospital), and familiarity with ERAS ($\beta = .307, p < .001$).

3.5 | Influencing factors associated with practice

According to the univariate analysis results shown in Table S3, practice was significantly correlated with the geographical region, hospital category, and familiarity with ERAS ($p < .001$); psychological nursing was significantly correlated with age, geographical region, years of work experience, hospital category, and familiarity with ERAS ($p < .05$ or $.01$); preoperative preparation was significantly correlated with the geographical region, hospital category, and familiarity with ERAS ($p < .001$); intraoperative management was significantly correlated with the geographical region, hospital category, and familiarity with ERAS ($p < .001$); and postoperative recovery was significantly correlated with hospital category and familiarity with ERAS ($p < .001$).

The significant factors obtained from the univariate analyses were included in the multiple linear regression analysis (Table 6). The results showed that the influencing factors of practice were as follows: the regions of Central ($\beta = .111, p = .001$) and North ($\beta = .072, p = .026$) (compared with the Southwest), women and children's hospital ($\beta = .158, p < .001$) (compared with children's hospital), and familiarity with ERAS ($\beta = .316, p < .001$). Meanwhile, the influencing factors of psychological nursing were as follows: the regions of Central ($\beta = .098, p = .003$) and North ($\beta = .134, p < .001$) (compared with the Southwest), years of work experience ($\beta = -.141, p < .001$), women and children's hospital ($\beta = .103, p = .002$) (compared with children's hospital), and familiarity with ERAS ($\beta = .294, p < .001$). The influencing factors of preoperative preparation were as follows: the regions of South ($\beta = .091, p = .004$) and Central ($\beta = .073, p = .025$) (compared with the Southwest), women and children's hospital ($\beta = .187, p < .001$) (compared with children's hospital), familiarity with ERAS ($\beta = .311, p < .001$). The influencing factors of intraoperative management were as follows: general hospital ($\beta = .092, p = .007$), and women and children's hospital ($\beta = .127, p < .001$) (compared with children's hospital), familiarity with ERAS ($\beta = .237, p < .001$). The influencing factors of postoperative recovery were as follows: general hospital ($\beta = .078, p = .021$), and women and children's hospital ($\beta = .122, p < .001$) (compared with children's hospital), familiarity with ERAS ($\beta = .239, p < .001$).

4 | DISCUSSION

In this study, the median average score for the knowledge questionnaire was 0.82, and that for the attitude and practice questionnaire

was 4.33 and 4.29, respectively, indicating that the KAP of paediatric surgical nurses towards ERAS was generally acceptable, but there was still room for improvement. Based on knowledge, nurses had a poor grasp of "postoperative recovery" and a mediocre grasp of "preoperative preparation". The lowest correct rate was found for question 3, (negatively worded) "postoperative analgesia should be mainly non-pharmacological measures such as hugging and soothing" (correct rate: 10.18%). The correct rate was 78.95% for question 9, "early postoperative fasting should be advocated, taking into account the diagnosis of the child's disease, the state of awakening, the presence of nausea and vomiting, and other factors" in the postoperative recovery part and 47.02% for question 6 (negatively worded) "preoperative mechanical bowel preparation (oral catheterization, enema, etc.) should be performed regardless of the type of surgery the child undergoes" in the preoperative preparation part. This indicated that the nurses' knowledge of postoperative pain management, preoperative bowel preparation, and postoperative dietary care for children was particularly poor. Hospitals and departments can provide targeted training in these aspects to improve the knowledge of nurses in the perioperative period with ERAS. The above results were similar to these of a previous study (Li, 2021), which reported that the correct rate of knowledge of preoperative bowel preparation was low among nurses.

However, in contrast to our results, other studies found lower practice levels in nurses. A multicenter cross-sectional study involving 16 tertiary hospitals found that the total implementation rate was 45.82% among operating room nurses (Li, 2021). A study by Zhang et al. established that only 33.44% of health care professionals were often practicing ERAS in their clinical work (Zhang et al., 2016). Wang et al. also suggested the inadequate practice of ERAS of surgical staff (Wang, 2018). Consistent with our study, these researches revealed the nurses' poor grasp of knowledge of ERAS and positive attitude towards it. The possible reasons for these phenomena might be that different targeted samples were selected in different studies, and the KAP of ERAS in paediatric wards is destined to differ from that in adult wards. In addition, ERAS in paediatrics has improved over time, and the practice shows the related differences.

Our study showed a positive correlation between knowledge, attitude and practice, similar to the findings of Wang (Wang, 2018), which study focused on adult wards in Shandong Province. Correspondingly, hospitals and departments can improve the practice of ERAS by holding lectures and by other means to improve the knowledge and correct the attitude of the nurses. However, when considering correlation coefficients $< .35$ as low or weak correlations (Koo & Li, 2016), in our study, there was a weak (although significant) correlation between knowledge and attitude, or knowledge and practice. The possible reasons is that the attitude of nurses towards ERAS is influenced by many other factors besides knowledge, such as their own personality and professional qualities. The factors that affect the clinical practice of nurses are more complicated. Even if the knowledge level is high, if the attitude is inappropriate, the implementation of clinical practice can also be unsatisfactory.

In the present study, the influencing factors of KAP were educational level, geographical region (South, Central, North,

TABLE 6 Multiple regression of practice scores (N = 855)

Factors			B	SE	β	t	p
Practice scores	Geographical region (compared with the Southwest)	The central	3.256	0.962	.111	3.386	.001**
		The North	1.823	0.816	.072	2.234	.026*
	Hospital category (compared with children's hospital)	Women and children's hospital	5.141	1.039	.158	4.946	<.001**
		Familiarity with ERAS	2.356	0.242	.316	9.733	<.001**
Psychological nursing	Geographical region (compared with the Southwest)	The Central	0.883	0.301	.098	2.934	.003**
		The North	1.049	0.254	.134	4.131	<.001**
	Work experience (years)	-0.359	0.083	-.141	-4.330	<.001**	
	Hospital category (compared with children's hospital)	Women and children's hospital	1.027	0.323	.103	3.174	.002**
	Familiarity with ERAS		0.676	0.076	.294	8.902	<.001**
Preoperative preparation	Geographical region (compared with the Southwest)	The South	1.028	0.359	.091	2.862	.004**
		The Central	0.462	0.206	.073	2.245	.025*
	Hospital category (compared with children's hospital)	Women and children's hospital	1.311	0.222	.187	5.902	<.001**
		Familiarity with ERAS	0.502	0.053	.311	9.526	<.001**
Intraoperative management	Hospital category (compared with children's hospital)	General hospital	0.632	0.233	.092	2.710	.007**
		Women and children's hospital	1.437	0.378	.127	3.805	<.001**
	Familiarity with ERAS		0.617	0.087	.237	7.090	<.001**
Postoperative recovery	Hospital category (compared with children's hospital)	General hospital	0.516	0.223	.078	2.310	.021*
		Women and children's hospital	1.319	0.362	.122	3.647	<.001**
	Familiarity with ERAS		0.596	0.083	.239	7.151	<.001**

Note: Practice scores: $R^2 = .151$, adjusted $R^2 = .147$, $F = 37.700$, $p < .001$. Psychological nursing: $R^2 = .140$, adjusted $R^2 = .134$, $F = 27.534$, $p < .001$. Preoperative preparation: $R^2 = .161$, adjusted $R^2 = .157$, $F = 40.632$, $p < .001$. Intraoperative management: $R^2 = .086$, adjusted $R^2 = .083$, $F = 26.714$, $p < .001$. Postoperative recovery: $R^2 = .083$, adjusted $R^2 = .080$, $F = 25.743$, $p < .001$.

* $p < .05$, ** $p < .01$.

Northwest), years of work experience, hospital category (general hospital, women and children's hospital), and familiarity with ERAS.

Our results were similar to those of Wang (Wang, 2018) and Zhang et al. (Zhang et al., 2016), which indicated that the scores of knowledge and attitude of nurses increased with the level of education. A possible explanation for this might be that nurses with higher education have more opportunities to participate in cutting-edge knowledge exchange and learning activities. Although educational level was not a significant influencing factor of the attitude scores in our study, the first domain of attitude—"the importance of nurses in ERAS"—was still influenced by it, indicating a better

self-identification of nurses with higher education. Therefore, highly educated nurses can be a pioneering force in the development of paediatric ERAS.

Nurses in North China were found to have a lower level of knowledge than those in the Southwest, especially concerning the knowledge of preoperative preparation. In addition, nurses in the South and the Northwest also scored lower in the knowledge of preoperative preparation, while those in the Central region scored higher in the knowledge of intraoperative management. The knowledge level of nurses varied from region to region in China, possibly due to the lack of systematic training. According to the advocacy of the National Health and Family

Planning Commission of China (2022), hospitals in the South, North, and Northwest can organize regular training of specialist nurses in ERAS, with a focus on bridging gaps in the knowledge of preoperative preparation. Nurses in Central China had higher levels of attitude and all of its domains than those in the Southwest, while nurses in the South scored lower in attitude towards ERAS practice. The self-reported behavioural compliance of nurses in the Central and North region was higher than those in the Southwest. In particular, they scored higher in the practice of psychological nursing (both the Central and North China) and preoperative preparation (the Central China). The different levels of KAP in these regions provide a reference for future development and clinical practice of paediatric surgical ERAS.

Surprisingly, the knowledge score of intraoperative management and the practice score of psychological nursing decreased with the years of work experience, which is in contrast to the findings of Zhang et al. (Zhang et al., 2016). It is difficult to explain this result, although it might be that some nurses with more years of work experience are accustomed to the traditional nursing model, while others have been rusty in clinical knowledge and practices because they are in management positions. Nurses in general hospitals and women and children's hospitals had a higher level of knowledge than those in children's hospitals, and nurses in women and children's hospitals also had higher levels of attitude and practice. Besides, the behavioural compliance of intraoperative management and postoperative recovery of nurses in general hospitals was better than those in children's hospitals. There is a lack of research on the effect of hospital category on the KAP of ERAS (Wang, 2018; Xu & Wang, 2019; Zhang et al., 2016). The results of our study are likely to be attributed to more developed ERAS in adult wards, especially in obstetrics and gynaecology (Guo et al., 2021), which may have led to the development of paediatric ERAS in their corresponding hospitals. It is suggested that multidisciplinary collaboration is performed to facilitate the development of ERAS. Herein, Nurses with better familiarity with ERAS had a higher level of KAP, which can be because better familiarity is the result of repetition in learning and practice. The study of Li also found that nurses who had participated in standardized training or studied the guidelines of ERAS scored higher in KAP (Li, 2021).

This study has some limitations. Knowledge, attitude and practice were measured by self-reporting. Thus, as with all self-reports, common methodological variance, social desirability biases, and response distortion due to ego-related defensive tendencies cannot be ignored (Liu et al., 2020). Another limitation is that this survey was conducted only in tertiary hospitals in China, so the results may have poor generalizability to other nurses. In addition, the convenience sampling method does not mark the research subjects as representative of nurses in China; hence, the generality of the research results is limited. Future studies could use random sampling to improve the external validity of the results.

5 | CONCLUSIONS

Overall, our findings revealed that there is still room for improvement in the KAP of paediatric surgical nurses, especially in the knowledge of "postoperative recovery" and "preoperative preparation". The

influencing factors of KAP were educational level, geographical region (South, Central, North, Northwest), years of work experience, hospital category (general hospital, women and children's hospital), and familiarity with ERAS.

CLINICAL IMPLICATIONS

Educational level, geographical region (South, Central, North, Northwest), years of work experience, hospital category (general hospital, women and children's hospital), and familiarity with ERAS are considered as predictors of the KAP of ERAS in paediatric surgical nurses. To ultimately realize the good practice of paediatric ERAS, both education and clinical training should be carried out accordingly. Nursing educators should incorporate the ERAS paradigm and related new viewpoints into the teaching process, thereby improving the knowledge and attitude of nurses.

CLINICAL RESOURCES

ERAS Society. <https://erassociety.org/>

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the nurses who participated in the study.

FUNDING INFORMATION

This study was funded by the Health Science and Technology Plan Project of Zhejiang Province (2021KY187).

CONFLICTS OF INTEREST

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

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

ETHICAL STATEMENT

The study protocol was approved by the research ethics committee of the Children's Hospital, Zhejiang University School of Medicine (Number: 2021-IRB-112).

ORCID

Ke-Xian Liu  <https://orcid.org/0000-0001-6505-0023>

Hong-Zhen Xu  <https://orcid.org/0000-0001-9962-1963>

REFERENCES

- Brindle, M. E., McDiarmid, C., Short, K., Miller, K., MacRobie, A., Lam, J., Brockel, M., Raval, M. V., Howlett, A., Lee, K. S., Offringa, M., Wong, K., de Beer, D., Wester, T., Skarsgard, E. D., Wales, P. W., Fecteau, A., Haliburton, B., Goobie, S. M., & Nelson, G. (2020). Consensus guidelines for perioperative care in neonatal intestinal surgery: Enhanced recovery after surgery (ERAS([R])) society recommendations. *World Journal of Surgery*, 44(8), 2482–2492. <https://doi.org/10.1007/s00268-020-05530-1>
- Cohen, R., & Goberman-Hill, R. (2019). Staff experiences of enhanced recovery after surgery: Systematic review of qualitative studies. *BMJ Open*, 9(2), e22259. <https://doi.org/10.1136/bmjopen-2018-022259>

- Gibb, A., Crosby, M. A., McDiarmid, C., Urban, D., Lam, J., Wales, P. W., Brockel, M., Raval, M., Offringa, M., Skarsgard, E. D., Wester, T., Wong, K., de Beer, D., Nelson, G., & Brindle, M. E. (2018). Creation of an enhanced recovery after surgery (ERAS) guideline for neonatal intestinal surgery patients: A knowledge synthesis and consensus generation approach and protocol study. *BMJ Open*, 8(12), e23651. <https://doi.org/10.1136/bmjopen-2018-023651>
- Guo, X. Q., Lu, W., & Wan, X. P. (2021). The core idea and basic principle of enhanced recovery after surgery in gynecology. *Journal of Practical Obstetrics and Gynecology*, 37(2), 81–83.
- Han, D. S., Brockel, M. A., Boxley, P. J., Donmez, M. I., Saltzman, A. F., Wilcox, D. T., & Rove, K. O. (2021). Enhanced recovery after surgery and anesthetic outcomes in pediatric reconstructive urologic surgery. *Pediatric Surgery International*, 37(1), 151–159. <https://doi.org/10.1007/s00383-020-04775-0>
- Kiong, K. L., Vu, C. N., Yao, C., Kruse, B., Zheng, G., Yu, P., Weber, R. S., & Lewis, C. M. (2021). Enhanced recovery after surgery (ERAS) in head and neck oncologic surgery: A case-matched analysis of perioperative and pain outcomes. *Annals of Surgical Oncology*, 28(2), 867–876. <https://doi.org/10.1245/s10434-020-09174-2>
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>
- Li, H. Y. (2021). *Knowledge-attitude-practice investigation on the enhanced recovery after surgery by operating room nurses and analysis of its influencing factors*. Shanxi Medical University. <https://kns.cnki.net/kcms/detail/detail.aspx?FileName=1021725847.nh&DbName=CMFD2022>
- Liu, K., Yin, T., & Shen, Q. (2020). Relationships between sleep quality, mindfulness and work-family conflict in Chinese nurses: A cross-sectional study. *Applied Nursing Research*, 55, 151250. <https://doi.org/10.1016/j.apnr.2020.151250>
- Ljungqvist, O., Scott, M., & Fearon, K. C. (2017). Enhanced recovery after surgery: A review. *JAMA Surgery*, 152(3), 292–298. <https://doi.org/10.1001/jamasurg.2016.4952>
- McLennan, E., Renwick, A., & Moug, S. J. (2014). The current undergraduate medical school curriculum needs to improve awareness of enhanced recovery after surgery. *Colorectal Disease*, 16(11), 927–929. <https://doi.org/10.1111/codi.12755>
- Ni, P., Chen, J. L., & Liu, N. (2010). The sample size estimation in quantitative nursing research. *Chinese Journal of Nursing*, 45(4), 378–380.
- Olson, K. A., Fleming, R., Fox, A. W., Grimes, A. E., Mohiuddin, S. S., Robertson, H. T., Moxham, J., & Wolf, J. J. (2021). The enhanced recovery after surgery (ERAS) elements that most greatly impact length of stay and readmission. *The American Surgeon*, 87(3), 473–479. <https://doi.org/10.1177/0003134820951440>
- Pickens, R. C., Cochran, A. R., Lyman, W. B., King, L., Iannitti, D. A., Martinie, J. B., Baker, E. H., Ocuin, L. M., Riggs, S. B., Davis, B. R., Matthews, B. D., & Vrochides, D. (2021). Impact of multidisciplinary audit of enhanced recovery after surgery (ERAS)(R) programs at a single institution. *World Journal of Surgery*, 45(1), 23–32. <https://doi.org/10.1007/s00268-020-05765-y>
- Roberts, K., Brindle, M., & McLuckie, D. (2020). Enhanced recovery after surgery in paediatrics: A review of the literature. *BJA Education*, 20(7), 235–241. <https://doi.org/10.1016/j.bjae.2020.03.004>
- Rove, K. O., Edney, J. C., & Brockel, M. A. (2018). Enhanced recovery after surgery in children: Promising, evidence-based multidisciplinary care. *Paediatric Anaesthesia*, 28(6), 482–492. <https://doi.org/10.1111/pan.13380>
- Shi, J., Mo, X., & Sun, Z. (2012). Content validity index in scale development. *Zhong Nan Da Xue Xue Bao. Yi Xue Ban*, 37(2), 152–155. <https://doi.org/10.3969/j.issn.1672-7347.2012.02.007>
- Shu, Q., & Tou, J. F. (2019). Applications and future prospects of enhanced recovery after surgery during pediatric surgery. *Journal of Clinical Pediatric Surgery*, 18(4), 253–256.
- The National Health and Family Planning Commission of China. (2022). *Notice of the National Health and Family Planning Commission on the Issuance of the National Nursing Career Development Plan (2016–2020)*. Accessed April 26, 2022 <http://www.nhc.gov.cn/cms-search/xxgk/getManuscriptXxgk.htm?id=92b2e8f8cc644a899e9d0fd572aefef3>
- Wang, D. (2018). *The study on the knowledge, attitude and practice (KAP) of surgical staff on enhanced recovery after surgery (ERAS)*. Shanong University. <https://kns.cnki.net/kcms/detail/detail.aspx?FileName=1018110479.nh&DbName=CMFD2019>
- Wu, T. M., Guo, H., Ma, Y. Q., Lu, Y., & Ge, W. C. (2019). Application and development of enhanced recovery after pediatric surgery during peri-operative period. *Chinese Journal of Pediatric Surgery*, 40(7), 668–672.
- Xu, C. L., & Wang, C. L. (2019). Research progress on knowledge-attitude-practice of enhanced recovery after surgery among health care provider. *Chin J Mod Nurs*, 25(2), 133–136. <https://doi.org/10.3760/cma.j.issn.1674-2907.2019.02.001>
- Zhang, X. Y., Ning, N., Li, P. F., Chen, J. L., Zeng, J. C., & Pu, X. C. (2016). Study on the status of knowledge, attitude and practice in ERAS among surgical medical staff and its influencing factors. *Chin J Mod Nurs*, 22(33), 4790–4795.
- Zhang, Y., Liu, D., Chen, X., Ma, J., & Song, X. (2021). An enhanced recovery programme improves the comfort and outcomes in children with obstructive sleep apnoea undergoing adenotonsillectomy: A retrospective historical control study. *Clinical Otolaryngology*, 46(1), 249–255. <https://doi.org/10.1111/coa.13655>

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Liu, K.-X., Lv, M., Liu, X.-S., Wang, H.-Q., Chen, Z.-M., & Xu, H.-Z. (2023). Knowledge, attitudes and practices of enhanced recovery after surgery among paediatric surgical nurses in China: A Cross-Sectional study. *Nursing Open*, 10, 1830–1839. <https://doi.org/10.1002/nop2.1443>