


Knowledge, attitudes and practices of ICU nurses regarding postextubation dysphagia in tracheal intubation patients in 25 hospitals in China: A multicentre cross-sectional survey

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Abstract

Background: Postextubation dysphagia is common in the ICU, with varying incidence rates. However, few studies have focused on ICU nurses' knowledge, attitudes and practices regarding postextubation dysphagia, as well as the various influencing factors.

Aims: To investigate ICU nurses' knowledge, attitudes and practices regarding postextubation dysphagia and provide suggestions for improvement.

Study Design: This was a multicentre cross-sectional survey. Data were collected using a validated questionnaire to assess knowledge, attitudes and practices regarding postextubation dysphagia.

Results: A total of 510 valid questionnaires were analysed. The median scores with interquartile ranges for knowledge, attitudes and practices regarding postextubation dysphagia were 8 (7, 9), 8 (7, 9) and 4.9 (3.8, 6.2), respectively. Multivariate analysis revealed that knowledge scores were significantly influenced by education level, ICU experience and managerial role ($p < .05$). Nurses with a bachelor's degree (OR = 3.636; 95% CI: 1.587–8.33) or a master's degree and above (OR = 7.742; 95% CI: 1.968–30.465) demonstrated higher knowledge scores than those with a postsecondary diploma. Nurses in managerial roles had higher scores (OR = 1.924; 95% CI: 1.053–3.515). Attitude (OR = 1.616; 95% CI: 1.092–2.39) and practice scores (OR = 4.079; 95% CI: 2.692–6.182) were significantly impacted by targeted PED training ($p < .05$). The correlation analysis revealed a weak but significant correlation only between knowledge and attitudes ($r_b = 0.196$, $p < .001$).

Conclusion: Education level, ICU experience, managerial role and targeted PED training may enhance knowledge, attitudes or practices individually but do not lead to

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cohesive improvement across all three areas. Relying on knowledge alone is far from sufficient to drive behavioural change, indicating the need for comprehensive interventions to bridge these gaps.

Relevance to Clinical Practice: To bridge this gap, comprehensive interventions beyond standard training are essential. These may include applying an implementation science strategy to ensure that ICU nurses' enhanced knowledge and positive attitudes are consistently translated into clinical practice.

KEYWORDS

airway extubation, deglutition disorders, dysphagia, endotracheal intubation, ICU

1 | INTRODUCTION AND BACKGROUND

Dysphagia refers to the challenge or inability to efficiently and safely transport food and liquids from the mouth to the stomach.¹ Dysphagia often occurs in ICU patients following tracheal intubation extubation, which is termed 'postextubation dysphagia' (PED) and is usually considered an ICU-acquired disorder.² Rates of PED are reported to range from 3% to 62%.¹ A meta-analysis revealed that the combined weighted incidence of PED was 41% (95% CI: 0.33–0.50; $p < .001$).³ An international multicentre online cross-sectional survey of 746 ICUs in 26 countries on PED prevention and evaluation revealed that the incidence of PED among ICU patients with an intubation time greater than 48 h was 50%.⁴ PED has been linked to an increased risk for aspiration, aspiration-induced pneumonia, delayed resumption of oral intake/malnutrition, decreased quality of life, prolonged ICU stay and increased morbidity and mortality.⁵ PED in mechanically ventilated ICU patients remained an independent predictor of 28- and 90-day mortality.⁶

ICU nurses are health care professionals who maintain close contact with patients;⁷ they play crucial roles in the early detection of diseases, delivery of patient education and improvement of patient outcomes.⁸ The performance of early screening and rehabilitation by nurses for PED in ICU patients can significantly improve outcomes, including promoting oral feeding, preventing aspiration pneumonia and shortening the duration of ICU stay.^{5,9,10} However, because of the complexity of ICU patients' conditions, PED is often given limited attention by clinical nurses.^{5,11}

Knowledge, attitudes and practices (KAP) research is a comprehensive survey method used to investigate the KAP of specific populations, including the general public, patients and health care professionals, in particular domains.¹² According to the KAP model, individual practices (behaviours) are determined by their knowledge and attitudes. It is evident that nurses' KAP regarding a disease impacts their decision-making in clinical practice, which in turn directly correlates with the welfare of patients.¹³ Al-Dossary et al. reported that nurses equipped with ample knowledge reserves are capable of employing various coping strategies as the disease progresses.¹⁴ When nurses possess a positive attitude, they are more likely to engage proactively in clinical practice. Variations in ICU

What is known about the topic

- Postextubation dysphagia is a common ICU complication postextubation, with incidence rates up to 63% in patients intubated over 48 h. It increases the risks of aspiration, pneumonia, malnutrition and prolonged ICU stays, underscoring the need for effective management.
- ICU nurses play critical roles in postextubation dysphagia management through early detection, patient education and preventive care. However, the limited focus on postextubation dysphagia underscores the need to assess ICU nurses' knowledge, attitudes and practices to guide targeted training and improvements.

What this paper adds

- Education level, ICU experience, managerial roles and targeted PED training influence implementation science strategy, informing targeted training needs.
- A gap exists between knowledge and practice, underscoring the need for hands-on, skill-based training to enhance postextubation dysphagia management.
- Developing an implementation science strategy potentially represents a valuable approach in future research to address the knowledge–practice gap and improve postextubation dysphagia management and patient outcomes in the ICU.

nurses' KAP significantly affect their ability to effectively identify and manage the condition.¹⁵ The absence of standardized protocols and multidisciplinary collaboration can also lead to inconsistencies in care, affecting patient outcomes.⁵ Therefore, improving ICU nurses' KAP in this area is essential for better detection and treatment of PED.¹¹ Understanding nurses' KAP towards PED can help nurse managers develop training programmes based on their current KAP.

Although ICU nurses are important in managing PED, few studies have focused on the KAP related to PED among ICU nurses. Various

factors also influence the KAP of ICU nurses. Therefore, the aim of this study was to investigate ICU nurses' KAP regarding patients with PED. This information can provide a scientific basis for personalized training and interventions. Using surveys of ICU nurses, we aimed to explore potential variations.

2 | AIMS AND OBJECTIVES OF STUDY

This study aimed to assess ICU nurses' KAP regarding PED in tracheal intubation patients. Additionally, influencing factors, such as educational level, hospital level, training and other relevant factors, should be identified to guide targeted interventions for improving PED management and patient care outcomes.

3 | DESIGN AND METHODS

3.1 | Setting and sample

This was a hospital-based, cross-sectional survey conducted from 1 January 2024 to 1 February 2024. The convenience sampling method was utilized to enlist ICU nurses from 19 tertiary Grade A hospitals and 6 secondary Grade A hospitals in Yunnan Province to participate in a questionnaire-based survey. The inclusion criteria were (1) registered nurses and (2) voluntary agreement to participate in the study. The exclusion criteria were as follows: (1) nurses who do not belong to this hospital, (2) rotation personnel and (3) personnel on long-term vacation. Based on the descriptive study sample size, the estimated sample size was calculated as 10 times the total number of entries in the questionnaire and increased by 10% to eliminate the effect of the presence of unqualified questionnaires,¹⁶ as the finalized questionnaire had a total of 30 entries, that is sample size = number of entries $\times 10 \times (1 + 10\%) = 330$. Finally, the above sample size requirements and the composition of ICU nurses in the surveyed hospitals were integrated. Finally, 510 participants were enrolled in the study.

3.2 | Data collection tools

The questionnaire used in this study consisted of two sections. The first section was developed by the researchers and collected general data such as sex, age, years of experience in the ICU and other relevant factors. These factors were derived from a combination of literature review and clinical practice.¹⁷ The second section is 'The Questionnaire on ICU Nurses' Knowledge, Attitude, and Practice of Postextubation Swallowing Disorders in Patients with Tracheal Intubation', which was developed by Yang et al. and was published in the Chinese language (Data S1).¹⁸ The participants were categorized as having low knowledge, a negative attitude or poor practice if their scores were below or equal to the median and as having high knowledge, a positive attitude or good practice if their scores were above

the median.¹⁹ The answers are categorized as follows: Items 1–10 pertain to 'knowledge', where correct responses are scored as 1 point and incorrect or unclear responses are scored as 0 points. Except for questions 7 and 10, which are reverse questions, all the other questions are forward questions. The scores of this section ranged from 0 to 10, which categorized the correct rating for each item into low-level (<50%) and high-level ($\geq 50\%$) to describe the results.²⁰ Items 11–20 address 'attitudes', and items 21–30 focus on 'practice'. The total possible scores on these two dimensions items were answered on a five-point Likert scale as follows: disagree (0.2 points), not agree (0.4 points), not sure (0.6 points), agree (0.8 points) and strongly agree (1 point). Practice items were also answered on a five-point Likert scale as follows: never (0.2 points), occasionally (0.4 points), sometimes (0.6 points), often (0.8 points) and always (1 point). The Cronbach's alphas were 0.901 for the total scale and 0.864, 0.944 and 0.974 for the knowledge, attitude and practice subscales, respectively. The test-retest reliability coefficients were 0.990 for the total scale and 0.987, 0.978 and 0.996 for the knowledge, attitude and practice subscales, respectively.

3.3 | Data collection methods

Based on a preliminary survey involving 30 nurses in the ICU, questionnaires completed in less than 150 s were deemed incomplete and consequently excluded from the analysis. The research team initially reached out to the nursing departments of 25 Grade A hospitals, securing consent to involve ICU nursing managers in coordinating the participation of nurses within their respective departments in the survey. Participation was voluntary, with informed consent obtained from each nurse. The questionnaires were distributed via the Questionnaire Star platform (www.wjx.cn), which requires the completion of all questions and the restriction of respondents to a single submission. The survey was conducted between 1 January 2024, and 1 February 2024. Two researchers subsequently jointly reviewed the collected questionnaires, excluding those with incomplete questionnaires.

3.4 | Data analysis

Statistical analyses were performed via IBM SPSS Statistics 26.0. Descriptive Statistics: Categorical data were summarized using frequencies and percentages. Continuous variables are reported as medians with interquartile ranges (IQR) for non-normally distributed data. The normality of the data distribution was assessed via the Kolmogorov–Smirnov (K–S) test, skewness, kurtosis and Q–Q plots. We also analysed the differences in KAP scores among participants' demographic variables with the Mann–Whitney *U* test (two groups) and the Kruskal–Wallis *H* test (three or more groups). Kendall's tau-*b* test was used to analyse the relationships among the KAP scores. For all analyses, $p < .05$ was considered statistically significant. For Kendall's tau-*b* test, a τb less than ± 0.10 indicated a very weak

correlation, a $r_b \pm 0.10$ to 0.19 indicated a weak correlation, a $r_b \pm 0.20$ to 0.29 indicated a moderate correlation and a $r_b \pm 0.30$ or above indicated a strong correlation.²⁰ Binary logistic regression analysis was used to examine the influencing factors, with statistical significance set at $p < .05$. The goodness of fit of the model was assessed using the Hosmer–Lemeshow test.

3.5 | Ethical and research approvals

This study was conducted in accordance with the principles of the Declaration of Helsinki. Before data collection, the study received approval from the relevant medical ethics committee of the Institutional Review Board of the First Affiliated Hospital of Kunming Medical University on 28 December 2023 (Approval No. 2023-219). Nurses participated in the survey voluntarily, and the anonymity and confidentiality of the participants were guaranteed. In addition, the researcher obtained written permission for the use of the KAP questionnaire from its creator.

4 | RESULTS

4.1 | ICU nurses' demographic characteristics and differences in KAP scores based on demographic variables

A total of 548 questionnaires were collected for this study. Of these, 10 were excluded because their completion times were less than 150 s, and 28 were excluded based on incomplete responses. Consequently, 510 questionnaires (93.07%) were deemed valid and included in the analysis. The respondents were from 25 hospitals in Yunnan Province. The median (IQR) age was 32 (10) years, and the median (IQR) duration of ICU service was 6 (9) years. Among them, 85.7% (437 of 510) were women, 83.7% (427 of 510) had a bachelor's degree and 42.0% (214 of 510) had a junior title (nurse practitioner). Approximately 30% of the participants demonstrated a high level of knowledge, and 46.7% held a positive attitude. Moreover, half of the participants (50%) practised good measures.

This study also analysed the differences in KAP scores based on nurses' demographic variables. The results revealed significant differences in PED-related knowledge scores among nurses based on their educational level, hospital level and role in ICU management ($p < .05$). Familiarity with the term 'dysphagia after extubation' and receipt of PED training emerged as influential factors shaping ICU nurses' attitudes towards PED ($p < .05$). Gender, educational level, professional title, familiarity with the term 'dysphagia after extubation', contact with or care for PED patients and receipt of PED training influenced the practical dimension of nurses ($p < .05$). Further details on the demographic characteristics of the nurses, as well as the medians and interquartile ranges of the KAP scores across different demographic categories, are provided in Table 1.

4.2 | Nurses' KAP regarding PED

With respect to ICU nurses' knowledge of PED in the ICU, the maximum possible score was 10. The median (IQR) overall score for nurses was 8 (2). The percentage of correct answers for the 10 questions ranged between 38.2% and 95.5%. In particular, the correct rates for enquiries related to the incidence and potential mechanisms of PED were less than 50% (Items 2 and 3). Further information is provided in Table 2. Regarding ICU nurses' attitudes towards PED in the ICU, the total score was 10.0. The median (IQR) total score of the participants was 8.0 (2.0). The scores for each item ranged from 0.8 (0.2) to 1.0 (0.4) in Table 3. Regarding nurses' practices related to PED in the ICU, the total score was 10.0. The median (IQR) total score of the participants was 4.9 (2.4). The scores for each item ranged between 0.4 (0.2) and 0.6 (0.4). Notably, the lowest scoring items in the practice domain were as follows: Item 1, 0.4 (0.2); Item 2, 0.4 (0.4); Item 4, 0.4 (0.2); Item 5, 0.4 (0.2); Item 7, 0.4 (0.2); and Item 10, 0.4 (0.2). Moreover, for Item 2, 'How frequently have you received PED-related training in the past 2 months?', 34.7% of the nurses reported never having received any training during this period. In contrast, the scores for Items 3 (preventive measurement frequency), 6 (swallow function assessment), 8 (identifying PED risk factors) and 9 (timely response to PED outcomes) in the practice domain were relatively high, as shown in Table 4.

4.3 | Multivariable analysis of factors influencing ICU nurses' KAP

Binary logistic regression analysis revealed significant associations between ICU nurses' knowledge of PED and three independent variables ($p < .05$). Nurses with more than 10 years of ICU nursing experience had significantly lower knowledge scores than those with less than 5 years of experience did (AOR = 0.471; 95% CI: 0.234–0.947; $p = .035$). Educational attainment was also a significant factor, with nurses holding a bachelor's degree (AOR = 3.636; 95% CI: 1.587–8.33; $p = .002$) or a master's degree or higher (AOR = 7.742; 95% CI: 1.968–30.465; $p = .003$) demonstrating higher knowledge levels than those with only a postsecondary diploma. Additionally, ICU managers presented significantly greater knowledge than nonmanagers did (AOR = 1.924; 95% CI: 1.053–3.515; $p = .033$). For the attitude dimension, ICU nurses who received relevant training in managing patients with swallowing disorders postextubation were more likely to exhibit a positive attitude compared with those without such training (AOR = 1.616; 95% CI: 1.092–2.39, $p = .016$). For the practice dimension, nurses who received training in managing swallowing disorders postextubation demonstrated significantly better practice scores than those who had not received such training (AOR = 4.079; 95% CI: 2.692–6.182; $p < .001$). These findings suggest that education level, the role of the ICU and training in PED management are important determinants influencing ICU nurses' KAP regarding PED management. Further details are shown in Tables 5 and 6.

TABLE 1 Demographic characteristics of ICU nurses and differences in KAP scores ($n = 510$).

Variables	Categories	n (%) / Median (IQR)	Knowledge		Attitude		Practice	
			Median (IQR)	p	Median (IQR)	p	Median (IQR)	p
Gender				.903		.454		.034
Male		73 (14.3)	8 (2)		8 (2.3)		5.6 (2.6)	
Female		437 (85.7)	8 (2)		8 (2)		4.8 (2.2)	
Age [median (IQR)]		32 (10)	–	–	–	–	–	–
Age (years)				.87		.524		.22
≤25		65 (12.7)	8 (3)		8 (1.7)		5.4 (2.7)	
26 < to ≤ 30		156 (30.6)	8 (2)		7.8 (2)		4.8 (2.4)	
31 < to ≤ 35		132 (25.9)	8 (2)		8 (1.8)		4.8 (3)	
35 < to ≤ 40		94 (18.4)	8 (2)		8 (2.4)		4.8 (2.4)	
>40		63 (12.4)	8 (2)		8.2 (2)		5.2 (2.4)	
Years of ICU nursing experience [median (IQR)]		6 (9)	–	–	–	–	–	–
Years of ICU nursing experience (years)				.555		.529		.133
<5		216 (42.4)	8 (2)		8 (2)		5.2 (2.4)	
5–10		127 (24.9)	8 (2)		7.8 (1.8)		4.8 (2.4)	
>10		167 (32.7)	8 (2)		8.2 (2)		4.8 (2.6)	
Educational level				<.001		.758		.079
Post-secondary Diploma		69 (13.5)	7 (2)		7.8 (1.9)		5.2 (2.2)	
Bachelor's degree		427 (83.7)	8 (2)		8 (2)		5 (2.4)	
Master's degree or above		14 (2.7)	9 (2)		8.5 (2.15)		4 (2.2)	
Professional title				.339		.247		.002
Primary nurse		65 (12.7)	8 (3)		8 (1.9)		6 (3.4)	
Nurse practitioner		214 (42.0)	8 (2)		7.8 (2.05)		5 (2.6)	
Supervisor nurse		209 (41.0)	8 (2)		8 (2)		4.4 (2.8)	
Co-chief nurse		19 (3.7)	8 (2)		8.4 (1.8)		5.4 (2.8)	
Chief nurse		3 (0.6)	–		–		–	
Hospital level				.007		.333		.109
Level II		94 (18.4)	8 (2)		7.8 (1.85)		5.2 (2.6)	
Level III		416 (81.6)	8 (2)		8 (2)		4.8 (2.4)	
ICU style				.071		.457		.53
Specialized ICU		90 (17.6)	8 (2)		8.3 (2.25)		4.8 (2.8)	
General ICU		420 (82.4)	8 (2)		8 (2)		5 (2.4)	
Is it the manager of the ICU				.019		.556		.369
No		433 (84.9)	8 (2)		8 (2)		4.8 (2.4)	
Yes		77 (15.1)	8 (2)		8 (2.1)		5 (2.2)	
Are you familiar with the term 'dysphagia after extubation'				.93		.015		<.001
No		91 (17.8)	8 (2)		7.8 (1.8)		4 (3.2)	
Yes		419 (82.2)	8 (2)		8 (1.8)		5.2 (2.4)	
Have you ever been in contact with or cared for patients with swallowing disorders after extubation				.694		.101		<.001
No		132 (25.9)	8 (2)		7.8 (1.95)		4.2 (3)	
Yes		378 (74.1)	8 (2)		8 (2)		5.3 (2.6)	
Have you received relevant training in the management of patients with swallowing disorders after extubation				.788		<.001		<.001
No		303 (59.4)	8 (2)		7.8 (2)		4 (2.6)	
Yes		207 (40.6)	8 (2)		8.4 (1.6)		6 (2.8)	

(Continues)

TABLE 1 (Continued)

Variables	Categories	n (%) / Median (IQR)	Knowledge		Attitude		Practice	
			Median (IQR)	p	Median (IQR)	p	Median (IQR)	p
Knowledge	High	153 (30)						
	Low	357 (70)						
Attitude	Positive	238 (46.7)						
	Negative	272 (53.3)						
Practice	Good	255 (50)						
	Poor	255 (50)						

Note: Values marked with ‘–’ indicate unavailable calculations because of insufficient sample size.

TABLE 2 Results of nurses' knowledge of PED in the ICU.

Item	Correct, n (%)	Incorrect or unclear, n (%)	Score [Median (IQR)]
K1 Post-extubation dysphagia (PED) refers to the symptoms in patients with tracheal intubation who often experience swallowing dysfunction after extubation and are unable to effectively transfer food from the mouth to the stomach	401 (78.6)	109 (21.4)	1 (0)
K2 Currently, there is no unified and authoritative data on the incidence of PED either domestically or internationally. Published studies have shown that the overall incidence of PED is relatively high	195 (38.2)	315 (61.8)	0 (1)
K3 The potential mechanisms for producing PED include damage to normal anatomical structures; muscle weakness; sensory dysfunction of the mouth, pharynx, and throat; gastroesophageal reflux; and disharmony between breathing and swallowing	234 (45.9)	276 (54.1)	0 (1)
K4 The main clinical manifestations of PED include coughing after drinking water, no obvious swallowing action, saliva or food flowing out of the mouth, changes in eating habits, hoarseness, difficulty chewing or pain	487 (95.5)	23 (4.5)	1 (0)
K5 The presence of PED in patients can lead to adverse outcomes such as aspiration, aspiration pneumonia, malnutrition, decreased quality of life, and increased re-intubation rate, ICU hospitalization time and total hospitalization time	473 (92.7)	37 (7.3)	1 (0)
K6 The main risk factors for PED include the use of sedatives and anaesthetics in the ICU, tracheal intubation, tracheostomy, prolonged intubation and mechanical ventilation time, and the number of intubations	483 (94.7)	27 (5.3)	1 (0)
K7 Due to the drawbacks of requiring special equipment, professional personnel, complex operating procedures and the need to accept radiation for the gold standard inspection of PED, bedside evaluation methods are currently still preferred	326 (63.9)	184 (36.1)	1 (1)
K8 At present, the main methods for bedside evaluation of PED in China include the water drinking test, standard swallowing function evaluation, and Gugging swallowing function evaluation	464 (91.0)	46 (9.0)	1 (0)
K9 For patients with severe swallowing disorders and repeated aspiration who have undergone rehabilitation treatment or have failed compensation, surgical treatments such as vocal cord transposition, laryngotracheal dissection, cricopharyngeal muscle resection, nasopharyngeal closure or gastric/jejunostomy can be adopted	392 (76.9)	118 (23.1)	1 (0)
K10 The training and treatment methods that promote the recovery of swallowing function include oral sensory training, oral motor training, low-frequency electrical stimulation, balloon dilation surgery and acupuncture treatment	442 (86.9)	67 (13.1)	1 (0)
Total			8 (2)

4.4 | Correlations among nurses' KAP scores

The results revealed a weak positive correlation between the knowledge score and attitude score ($r_b = 0.196$; $p < .001$). However, no

statistically significant positive correlation was identified between the knowledge score and practice score and between the attitude score and practice score ($r_b = -0.031$, $p = .482$; $r_b = 0.074$, $p = .095$) in Table 7.

TABLE 3 Results of nurses' attitudes towards PED in the ICU.

Item	Strongly agree, n (%)	Agree, n (%)	Not sure, n (%)	Not quite agree, n (%)	Disagree, n (%)	Score [Median (IQR)]
A1 You are interested in PED-related knowledge	201 (39.4)	193 (37.8)	105 (20.6)	10 (2.0)	1 (0.2)	0.8 (0.2)
A2 You can actively attain PED-related knowledge	172 (33.7)	198 (38.8)	122 (23.9)	16 (3.1)	2 (0.4)	0.8 (0.4)
A3 Do you think it is necessary to receive training on PED?	218 (42.7)	93 (18.2)	52 (10.2)	66 (12.9)	81 (15.9)	0.8 (0.6)
A4 Do you think nurses can master knowledge about PED and take preventive and treatment measures?	210 (41.2)	199 (39.0)	83 (16.3)	18 (3.5)	0 (0)	0.8 (0.2)
A5 When patients encounter problems related to PED, you can proactively solve them with the knowledge you have mastered	140 (27.5)	204 (40.0)	130 (25.5)	33 (6.5)	3 (0.6)	0.8 (0.4)
A6 Do you think that screening/evaluating PED by health care professionals with considerable professional knowledge is an effective measure to prevent adverse outcomes and should be carried out in a team collaboration mode?	215 (42.2)	206 (40.4)	74 (14.5)	13 (2.5)	2 (0.4)	0.8 (0.2)
A7 Do you think it is unnecessary to establish a comprehensive screening/evaluation process, routine handling measures, and work records for PED?	204 (40.0)	92 (18.0)	63 (12.4)	81 (15.9)	70 (13.7)	0.8 (0.6)
A8 Do you think it is necessary to strengthen the importance that patients and their families attach to PED and improve cooperation?	255 (50.0)	190 (37.3)	53 (10.4)	10 (2.0)	2 (0.4)	0.9 (0.2)
A9 Do you think nurses can provide appropriate guidance on swallowing function exercises for patients?	217 (42.5)	197 (38.6)	79 (15.5)	14 (2.7)	3 (0.6)	0.8 (0.2)
A10 Do you think strengthening the management of PED is not crucial for the treatment and prognosis of this disease?	265 (52.0)	74 (14.5)	50 (9.8)	74 (14.5)	47 (9.2)	1.0 (0.4)
Total						8 (2)

5 | DISCUSSION

This study assessed ICU nurses' KAP regarding PED management and identified key influencing factors. Based on the original authors' classification criteria (low <6, medium 6–8.5, high >8.5), the findings from this cross-sectional study indicate medium levels of knowledge and attitudes and low levels for practices. These results aligned with those reported in the original study, underscoring the need for comprehensive interventions to bridge the gap between theoretical understanding and practical application.¹⁸ The study demonstrated that educational level, ICU experience and managerial roles significantly impacted knowledge scores, whereas specific training was the primary predictor in both the attitudes and practice domains. These results highlight the importance of structured education and training in enhancing PED management skills, particularly in the ICU.

In the knowledge domain, multivariate analysis revealed that educational level, ICU experience and managerial role significantly affected knowledge scores. Higher educational attainment was positively associated with knowledge. Nurses with a bachelor's degree (AOR = 3.636, 95% CI: 1.587–8.33, $p = .002$) or a master's degree and above (AOR = 7.742, 95% CI: 1.968–30.465, $p = .003$) scored significantly higher than those with a diploma. These findings align with the literature, suggesting that advanced academic training equips nurses with more comprehensive theoretical understanding and clinical skills, particularly in specialized areas such as PED management.²¹ Higher education programmes typically emphasize critical thinking, evidence-based practice and continuing professional

development, all of which contribute to greater knowledge acquisition.^{22,23} These findings underscore the importance of promoting greater educational opportunities for nurses to ensure optimal patient care in critical care settings. Nurses in managerial roles also scored higher in terms of knowledge (AOR = 1.924, 95% CI: 1.053–3.515, $p = .033$) potentially because of the additional responsibilities they hold, such as decision-making, protocol development and staff training.²⁴ ICU managers often need to stay updated on current best practices, which may necessitate a deeper understanding of specialized areas such as PED.²² This emphasizes that leadership roles in the ICU demand a strong clinical knowledge base, highlighting the need for ongoing education and training for nurse managers. Interestingly, nurses with more than 10 years of ICU experience had lower knowledge scores (AOR = 0.471, 95% CI: 0.234–0.947, $p = .035$). Although this difference was not significant in the univariate analysis, it became significant in the multivariate analysis after controlling for other factors. Experienced nurses may rely more on established practices, which could limit their engagement with new theoretical knowledge. This highlights the importance of continuous education programmes to ensure that experienced nurses stay current with evidence-based practices in PED management.²²

In the attitudes domain, professional training in PED management was the only significant predictor. Nurses who received specific training in PED management scored significantly higher in attitudes (AOR = 1.616, 95% CI: 1.092–2.39, $p = .016$). This finding is consistent with previous research indicating that structured training not only enhances clinical knowledge but also positively shapes attitudes by

TABLE 4 Results of nurses' practices in PED in the ICU.

Item	Always, n (%)	Often, n (%)	Sometimes, n (%)	Occasionally, n (%)	Never, n (%)	Score [Median (IQR)]
P1 How often have you actively learned PED-related knowledge in the past 2 months?	14 (2.7)	42 (8.2)	142 (27.8)	208 (40.8)	104 (20.4)	0.4 (0.2)
P2 How frequently have you received PED-related training in the past 2 months?	9 (1.8)	37 (7.3)	119 (23.3)	168 (32.9)	177 (34.7)	0.4 (0.4)
P3 The frequency of proactive preventive measures taken by you in the past 2 months to avoid or reduce the risk factors and adverse outcomes of PED in patients	22 (4.3)	87 (17.1)	156 (30.6)	160 (31.4)	85 (16.7)	0.6 (0.2)
P4 How often have you proactively screened/evaluated the patients' PED status in the past 2 months?	24 (4.7)	75 (14.7)	143 (28.0)	161 (31.6)	107 (21.0)	0.4 (0.2)
P5 In the past 2 months, to ensure the safety of a patient's diet and prevent malnutrition, you will suggest adjusting the patient's dietary structure based on the screening/evaluation results of PED	16 (3.1)	93 (18.2)	127 (24.9)	171 (33.5)	103 (20.2)	0.4 (0.2)
P6 In the past 2 months, when patients experienced adverse outcomes such as aspiration, aspiration pneumonia, or an increased rate of re-intubation due to PED, you should take appropriate measures in a timely manner to alleviate the frequency of symptoms.	24 (4.7)	95 (18.6)	148 (29.0)	151 (29.6)	92 (18.0)	0.6 (0.2)
P7 The frequency of your suggestions and training to promote swallowing function recovery, such as oral sensory training techniques, oral motor training techniques or airway protection methods, within the past 2 months	19 (3.7)	81 (15.9)	143 (28.0)	156 (30.6)	111 (21.8)	0.4 (0.2)
P8 How often have you actively encouraged patients to participate in swallowing function rehabilitation exercises in the past 2 months?	32 (6.3)	104 (20.4)	142 (27.8)	159 (31.2)	73 (14.3)	0.6 (0.4)
P9 In the past 2 months, during the nursing process, to understand their psychological status in a timely manner, you proactively asked the patient and their family how they felt	40 (7.8)	113 (22.2)	143 (28.0)	155 (30.4)	59 (11.6)	0.6 (0.4)
P10 Within the past 2 months, you have proactively provided feedback to the department on the frequency of issues related to PED during the nursing process	18 (3.5)	78 (15.3)	135 (26.5)	169 (33.1)	110 (21.6)	0.4 (0.2)
Total						4.9 (2.4)

increasing confidence in managing complex conditions.²⁵ The study demonstrated that structured educational programmes, particularly those involving hands-on practice, improve the early identification and management of PED. Involving nurses in targeted dysphagia training leads to better patient outcomes, including a reduced incidence of complications such as aspiration pneumonia.²⁶ These results support the implementation of regular training initiatives to maintain high standards of nursing care in critical care settings. Therefore, regular training initiatives could promote more favourable attitudes towards PED management among ICU nurses.²⁷

In the practice domain, targeted training was also the only significant factor. Nurses who underwent specific training in PED management exhibited significantly higher practice scores (AOR = 4.079, 95% CI: 2.692–6.182, $p < .001$). Such training equips nurses with essential skills to effectively apply theoretical knowledge in clinical settings, reinforcing the importance of hands-on training in translating knowledge and attitudes into clinical competencies.⁶ These findings support the implementation of skill-focused training to increase the practical ability of ICU nurses to manage PED.

Finally, Kendall's tau-*b* correlation analysis was conducted to assess the relationships among the nurses' KAP scores. A previous study revealed that knowledge plays a crucial role in shaping positive attitudes and fostering effective practices in health care.²¹ In the present study, a weak positive correlation was observed between nurses' knowledge and attitudes ($\tau b = 0.196$, $p < .001$), suggesting that greater knowledge is linked to more favourable attitudes. However, no significant correlation was noted between knowledge and practice ($\tau b = -0.031$, $p = .482$) or between attitude and practice ($\tau b = 0.074$, $p = .095$). These findings suggest that although enhancing knowledge may improve attitudes, it does not necessarily result in better clinical practices. Despite the availability of evidence-based guidelines, a significant gap exists between evidence and clinical practice.²⁸ The implementation science strategy provides an effective approach to bridge this gap.²⁹ Guided by the knowledge-to-action (KTA) framework, Zhang et al. identified barriers, such as insufficient nurse training and unclear processes, and implemented strategies, including targeted training, policy changes and audit feedback. The results revealed significant improvements in nurses' adherence to best

TABLE 5 Binary logistic regression analysis of factors influencing ICU nurses' KAP.

Variables	Categories	Knowledge AOR (95% CI)	Attitude AOR (95% CI)	Practice AOR (95% CI)
Gender	Male	Ref.	Ref.	Ref.
	Female	0.916 (0.517, 1.622)	0.877 (0.517, 1.489)	0.885 (0.503, 1.558)
Age (years)	≤25	Ref.	Ref.	Ref.
	26 < to ≤30	0.995 (0.461, 2.146)	0.732 (0.357, 1.502)	0.871 (0.407, 1.866)
	31 < to ≤35	1.057 (0.401, 2.787)	0.738 (0.304, 1.788)	1.54 (0.603, 3.936)
	35 < to ≤40	0.671 (0.224, 2.006)	0.69 (0.258, 1.844)	1.381 (0.491, 3.884)
	>40	0.631 (0.193, 2.068)	0.836 (0.292, 2.392)	1.708 (0.565, 5.16)
Years of ICU nursing experience (years)	<5	Ref.	Ref.	Ref.
	5–10	0.612 (0.339, 1.105)	0.793 (0.462, 1.362)	0.846 (0.477, 1.502)
	>10	0.471 (0.234, 0.947)*	1.038 (0.55, 1.959)	0.686 (0.348, 1.35)
Educational level	Post-secondary Diploma	Ref.	Ref.	Ref.
	Bachelor's degree	3.636 (1.587, 8.33)**	1.207 (0.644, 2.262)	1.24 (0.636, 2.416)
	Master's degree or above	7.742 (1.968, 30.465)**	2.02 (0.572, 7.128)	0.33 (0.07, 1.549)
Professional title	Primary nurse	Ref.	Ref.	Ref.
	Nurse practitioner	0.559 (0.237, 1.316)	1.062 (0.486, 2.322)	0.661 (0.289, 1.515)
	Supervisor nurse	0.866 (0.299, 2.508)	1.305 (0.496, 3.433)	0.482 (0.174, 1.335)
	Co-chief nurse	1.606 (0.36, 7.168)	2.206 (0.548, 8.882)	0.649 (0.152, 2.761)
	Chief nurse	1.163 (0.075, 17.932)	2.737 (0.184, 40.796)	1.225 (0.073, 20.442)
Hospital level	Level II	Ref.	Ref.	Ref.
	Level III	1.374 (0.762, 2.478)	1.325 (0.791, 2.219)	0.851 (0.497, 1.458)
ICU style	Specialized ICU	Ref.	Ref.	Ref.
	General ICU	0.97 (0.541, 1.738)	0.773 (0.448, 1.333)	0.975 (0.544, 1.747)
Is it the manager of the ICU	No	Ref.	Ref.	Ref.
	Yes	1.924 (1.053, 3.515)*	0.906 (0.516, 1.591)	1.354 (0.748, 2.45)
Are you familiar with the term 'dysphagia after extubation'	No	Ref.	Ref.	Ref.
	Yes	1.107 (0.625, 1.959)	1.296 (0.771, 2.18)	1.199 (0.695, 2.067)
Have you ever been in contact with or cared for patients with swallowing disorders after extubation	No	Ref.	Ref.	Ref.
	Yes	1.118 (0.675, 1.852)	1.28 (0.806, 2.033)	1.429 (0.877, 2.329)
Have you received relevant training in the management of patients with swallowing disorders after extubation	No	Ref.	Ref.	Ref.
	Yes	1.071 (0.697, 1.646)	1.616 (1.092, 2.39)*	4.079 (2.692, 6.182)***

Note: "Ref." indicates the reference group.

Abbreviations: AOR, adjusted odds ratio; 95% CI, 95% confidence interval.

* $p < .05$; ** $p < .01$; *** $p < .001$.

practices and patient outcomes, emphasizing the role of the implementation of science strategies in bridging the evidence–practice gap.³⁰

The alignment of our findings with those of Yang,¹⁸ who also reported moderate to high knowledge and attitudes but lower levels of practice among nurses, underscores the need for enhanced training to bridge the gap between theoretical understanding and practical application. However, our study differs methodologically in two key aspects. First, although Yang's study assumed a normal distribution and reported means and standard deviations, we used medians and interquartile ranges to accurately represent our skewed data. Second, instead of Yang's three-level classification (low, medium and high), we

employed a median-based dichotomous classification for KAP scores to streamline the analysis. Despite this simplified interpretation, it may have reduced the granularity of the insights.¹⁹ Future studies could consider multilevel categorization to gain a more nuanced understanding of KAP levels. Our study revealed a positive relationship between knowledge and attitudes, which is consistent with expectations because higher knowledge levels tend to improve nurses' attitudes towards PED management.²¹ However, unlike Yang's study, which reported a positive correlation between knowledge, attitudes and behaviour, our analysis did not reveal a significant correlation between knowledge and behaviour.¹⁸ This difference may be the result of varying methods of data analysis or differences in sample

TABLE 6 Results of the binary logistic regression analysis for significant factors influencing ICU nurses' KAP regarding PED.

Dependent variables	Independent variables	Categories	Coefficient (β)	AOR (95% CI)	p-value
Knowledge	Years of ICU nursing experience (years)	<5		Ref.	
		5–10	−0.491	0.612 (0.339, 1.105)	.103
		>10	−0.754	0.471 (0.234, 0.947)	.035
	Educational level	Post-secondary Diploma		Ref.	
		Bachelor's degree	1.291	3.636 (1.587, 8.33)	.002
		Master's degree or above	2.047	7.742 (1.968, 30.465)	.003
	Is it the manager of the ICU	No		Ref.	
		Yes	0.654	1.924 (1.053, 3.515)	.033
Attitude	Have you received relevant training in the management of patients with swallowing disorders after extubation	No		Ref.	
		Yes	0.48	1.616 (1.092, 2.39)	.016
Practice	Have you received relevant training in the management of patients with swallowing disorders after extubation	No		Ref.	
		Yes	1.406	4.079 (2.692, 6.182)	<.001

TABLE 7 Correlations among nurses' KAP scores.

Items	r_b	p
Knowledge vs. attitude	0.196	<.001
Knowledge vs. practice	−0.031	.482
Attitude vs. practice	0.074	.095

populations. The lack of a significant correlation between knowledge and behaviour in our study suggests that although nurses may possess adequate theoretical knowledge, it does not necessarily translate into improved clinical behaviours without additional practical training and hands-on experience.²³

5.1 | Limitations

This study has several limitations. First, this study enrolled only participants from Yunnan Province, which limits the generalizability of the results to other regions in China. Therefore, further studies involving ICU nurses from other provinces are needed. Second, the use of self-reported data may introduce bias, as participants may overestimate or underestimate their knowledge, attitudes or practices. However, we minimized this bias by clearly explaining the survey process to the participants. Third, convenience sampling was used instead of random sampling, potentially introducing substantial sampling error. Future studies should broaden the scope and sample size to better understand ICU nurses' KAP regarding PED management in tracheal

intubation patients across 25 Chinese hospitals. Additionally, further investigations into nursing quality assessment methods and relevant interventional research are needed to enhance care quality and reduce complications associated with PED.

5.2 | Implications and recommendations for practice

This study underscores the need to bridge the gap between theoretical knowledge and clinical practice in PED management among ICU nurses. Although higher educational attainment and management roles enhance knowledge and targeted training improves both attitudes and clinical practices, these factors alone do not ensure consistent improvement across all areas. Relying exclusively on knowledge is insufficient to drive behaviour change. Thus, comprehensive, multi-faceted interventions are essential. Future research could leverage implementation science strategies to ensure these improvements are effectively integrated into clinical practice of ICU nurses.

6 | CONCLUSION

This study highlights the critical need to bridge the gap between theoretical knowledge and clinical practice in the management of PED among ICU nurses. Although factors such as higher educational attainment, managerial roles and specific training positively influence knowledge, attitudes and clinical practices, they do not necessarily

ensure consistent improvement across all domains. Specifically, although increased knowledge is associated with more favourable attitudes, it does not directly translate into improved clinical practices. These findings underscore the importance of comprehensive, multi-faceted interventions that go beyond knowledge acquisition. The future implementation of strategies informed by implementation strategies, such as targeted training, policy changes and continuous feedback, is essential to ensure that improvements in knowledge and attitudes are effectively translated into sustained behavioural change in clinical settings. Thus, a holistic approach that addresses both individual competencies and organizational processes is key to bridging the evidence–practice gap and enhancing the quality of patient care in critical care settings.

AUTHOR CONTRIBUTIONS

Yanmin Zheng and Ying Tian conceived this study; Yanmin Zheng, Nianqi Cui, Ruiqin Sha, Wenfan, Yapeng Tan and Ying Tian designed the questionnaire; Yanmin Zheng, Xueyan Guan, Yaru Huang, Rui Hu, Zexi Huang and Ying Tian participated in data collection; Yanmin Zheng, Nianqi Cui, Ruiqin Sha, Wenfan, Yapeng Tan and Ying Tian were involved in data analysis and interpretation; Yanmin Zheng drafted this manuscript; and Ying Tian supervised the design and critically revised the manuscript. All authors approved the final version of the manuscript.

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DATA AVAILABILITY STATEMENT

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

PATIENT CONSENT STATEMENT

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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