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Summary of the Best Evidence for Tube Feeding Intolerance in Critically Ill Children

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Abstract: *Objective:* To summarize the evidence of tube feeding intolerance in critically ill children, aiming to provide evidence-based information for clinical nursing staff. *Methods:* Evidence search was done in Chinese and English databases to guide network and professional associations at home and abroad. The search time limit was from January 2014 to January 2024, nearly 10 years of relevant literature, mainly including guidelines, consensus, expert advice, best practice, evidence summary, system evaluation, and meta-analysis. Literature quality evaluation and evidence extraction were independently performed by two researchers. *Results:* This paper included 13 articles, including three guidelines, three systematic evaluations, three expert opinions, and four expert consensus. Twenty-six pieces of evidence were summarized from 10 aspects of feeding intolerance definition, team building, nutritional assessment, nutritional preparation, feeding protocol, feeding route, feeding management, pipeline management, gastric residual volume, and drug application. *Conclusion:* This paper summarized the evidence of tube feeding intolerance in critically ill children, which can provide evidence-based information for clinical practice. The abdominal signs should be closely observed when evaluating feeding intolerance, focusing on the prevention and reduction of feeding interruption.

Keywords: Feeding intolerance; Tube feeding; Enteral nutrition; Summary of evidence

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1. Introduction

Most critically ill children are in a state of severe stress and are prone to malnutrition, which leads to a decline in the body's disease resistance and repair, thus aggravating their condition. It was also related to the incidence of death, the length of stay in pediatric intensive care unit, the use of mechanical ventilation, and the duration of mechanical ventilation [1]. A study found that the incidence of malnutrition at admission is 47% [2]. Nutritional support can improve the nutritional status of children and is beneficial to the prognosis of the disease. Guidelines published at home and abroad recommend that the preferred path of nutritional support is enteral nutrition [3-5]. The nutrition tube placed for enteral nutrition is collectively referred to as tube feeding; when enteral nutrition

cannot meet the energy consumption of children, parenteral nutrition will be supplemented. During tube feeding, feeding intolerance is one of the most common complications [6]. A multicenter survey of nurses revealed that during tube feeding [7], the absence of uniform standards often leads nurses to opt for stopping the feeding process, which results in feeding interruption and increases the risk of malnutrition. Therefore, it is essential to manage tube feeding intolerance. Currently, there is a comprehensive body of evidence on enteral nutrition feeding intolerance in adults both domestically and internationally [8,9]. However, in children, the focus is primarily on feeding interruptions [10], and the evidence remains scattered, with no clear, enforceable standards established. This paper systematically searched for relevant research on the prevention and management of tube feeding intolerance in critically ill children, evaluated and synthesized the findings using evidence-based nursing methods, and summarized the evidence to form relevant nursing interventions for feeding intolerance. The goal is to provide practical guidance for clinical nurses.

2. Materials and methods

2.1. Study model

In this study, the PIPOST model proposed by the evidence-based Nursing Center of Fudan University was used to construct the evidence-based problem [11]: the target population of evidence application (Population, P): critically ill children; intervention (Intervention, I): tube feeding or enteral nutrition; evidence application implementers (Professional, P): nurses; Outcome (Outcome, O): incidence of feeding intolerance, nursing measures related to feeding intolerance, the process of tube feeding, changes in nurses' knowledge, belief and behavior of feeding intolerance, etc.; place of application of evidence (Setting, S): hospital; type of evidence (Type, T): guidelines, clinical practice, expert consensus, expert opinion, systematic review, evidence summary, cut-related randomized controlled trials. This study was registered in the evidence-based Nursing Center of Fudan University (Registration No.: ES20233595).

2.2. Evidence retrieval

A search was conducted using the UpToDate clinical decision system, BMJ Best Practice, Joanna Briggs Institute (JBI) Evidence-Based Health Care Center Database, International Guidelines Library, UK National Institute for Health and Care Excellence (NICE), Scottish Intercollegiate Guidelines Network (SIGN), Medical Pulse Tong, Canadian Ontario Registered Nurses Association, American Society for Parenteral and Enteral Nutrition (ASPEN), European Society for Clinical Nutrition and Metabolism (ESPEN), following the 6S Pyramid Model of evidence. This study included searches from the American Association of Critical-Care Nurses, American Academy of Pediatrics, North American Society for Pediatric Gastroenterology, Hepatology and Nutrition, Chinese Society of Pediatrics, China National Knowledge Infrastructure (CNKI), Wanfang Data, VIP Database, Chinese Biomedical Literature Database (CBM), Cochrane Library, PubMed, EMBASE, ScienceDirect, Web of Science, Medline, and CINAHL.

Search terms in both Chinese and English were used, such as "tube feeding," "enteral nutrition," "nutrition support," "critical children," and "feeding intolerance." Comprehensive terms were searched including "critical children," "tube feeding," "enteral nutrition," "feeding intolerance," "vomiting," "diarrhea," "abdominal distention," and "gastric residual volume." The types of evidence included guidelines, consensus statements, recommendations, best practices, best evidence summaries, systematic reviews, and meta-analyses.

The search period was from January 2014 to January 2024. Taking PubMed as an example, the specific retrieval strategy is shown in **Figure 1**.

#1	"Enteral Nutrition"[Mesh]
#2	"nutrition enteral"[Title/Abstract] OR "enteral feeding"[Title/Abstract] OR "force feeding"[Title/Abstract] OR "tube feeding"[Title/Abstract] OR "gastric feeding tubes"[Title/Abstract] OR "tube gastric feeding"[Title/Abstract]
#3	#1 OR #2
#4	"Child"[Mesh] OR "Only Child"[Mesh])OR "Child, Hospitalized"[Mesh]
#5	"children"[Title/Abstract] OR "child only"[Title/Abstract] OR "only children"[Title/Abstract] OR "children only"[Title/Abstract] OR "children hospitalized"[Title/Abstract] OR "hospitalized children"[Title/Abstract] OR "hospitalized child"[Title/Abstract]
#6	#4 OR #5
#7	"feeding intolerance"[Mesh]OR"Vomiting"[Mesh]OR"Diarrhea"[Mesh]OR"abdominal distention"[Mesh]OR"gastric residual volume"[Mesh]
#8	"syndrome refeeding"[Title/Abstract] OR "Emesis"[Title/Abstract] OR "Diarrheas"[Title/Abstract] OR "abdominal distention"[Title/Abstract] OR "gastric residual volume"[Title/Abstract]
#9	#7 OR #8
#10	"guideline"[Title/Abstract] OR "consensus"[Title/Abstract] OR "recommendation"[Title/Abstract] OR "best practice"[Title/Abstract] OR "best evidence summary"[Title/Abstract] OR "systematic review"[Title/Abstract] OR "Meta-analysis"[Title/Abstract]
#11	#3 AND #6 AND #9 AND #10

Figure 1. PubMed search strategy

2.3. Inclusion and exclusion criteria

Inclusion criteria for this study were (1) critically ill children with tube feeding (aged > 28 days and < 18 years); (2) studies on nursing intervention and evaluation related to feeding intolerance; (3) types of research: guidelines, clinical practice, expert consensus, expert opinion, systematic evaluation, evidence summary, etc.; (4) Chinese and English languages.

Exclusion criteria for this study were (1) full-text literature; (2) old guidelines or translated versions that have been updated, documents repeatedly published with the same content; (3) documents of low quality.

2.4. Quality evaluation of the literature

The quality evaluation criteria of the guidelines were based on the 2017 update of AGREE II [12], including six areas, 23 items, plus two overall evaluation items, with a score of one to seven. The score for each domain is equal to the sum of the scores for each item in the field and is standardized as a percentage of the highest possible score in the field. Referring to the standardization percentage of the south 6 areas: < 60% is Class A (highly recommended); 30–60% is Class B (weakly recommended); < 30% is Class C (not recommended). The results were independently evaluated by four researchers, and the intra-group correlation coefficient was used to test the consistency of the evaluation results. The value of intra-group correlation coefficient (ICC) was between 0 and 1; less than 0.5 means poor consistency; 0.5–0.75 is average; 0.75–0.9 is good; > 0.9 is very good. The systematic review, expert opinion, and consensus were evaluated using the JBI evidence-based health care center evaluation tool [13]; the best clinical practice and evidence summary were traced back to the original literature, and the corresponding evaluation tools were selected according to the type of the original literature.

2.5. Evidence extraction and summary

Two researchers extracted and screened the evidence from the included literature, and summarized the evidence according to the subject. According to different sources, the conflicting evidence followed the principle of high grade, high quality, and newly published priority [14]. The evidence was graded while extracting the evidence. Using the JBI evidence grading system [15], the included evidence was divided into 1–5 levels, with 1a representing the highest level and 5c representing the lowest level. The researchers tabulated the extracted evidence, the source of evidence, and the level of evidence. Five experts with evidence-based methodology and clinical practice experience (one nutrition specialist, two intensive care experts, and two evidence-based care specialists) were invited to the expert meeting to discuss and evaluate the evidence according to the validity, feasibility, suitability, and clinical significance of the evidence [16]. To determine the recommendation intensity of the evidence, A-level recommendation is a strong recommendation, and B-level recommendation is a weak recommendation.

3. Results

3.1. Search results

A total of 2,507 articles were retrieved, and 15 articles were finally included after screening. The flow chart of the literature screening is shown in **Figure 2**. Among them, there are three guidelines [3-5], three systematic reviews [17-19], three expert opinions [20-22], and four expert consensus [23-26].

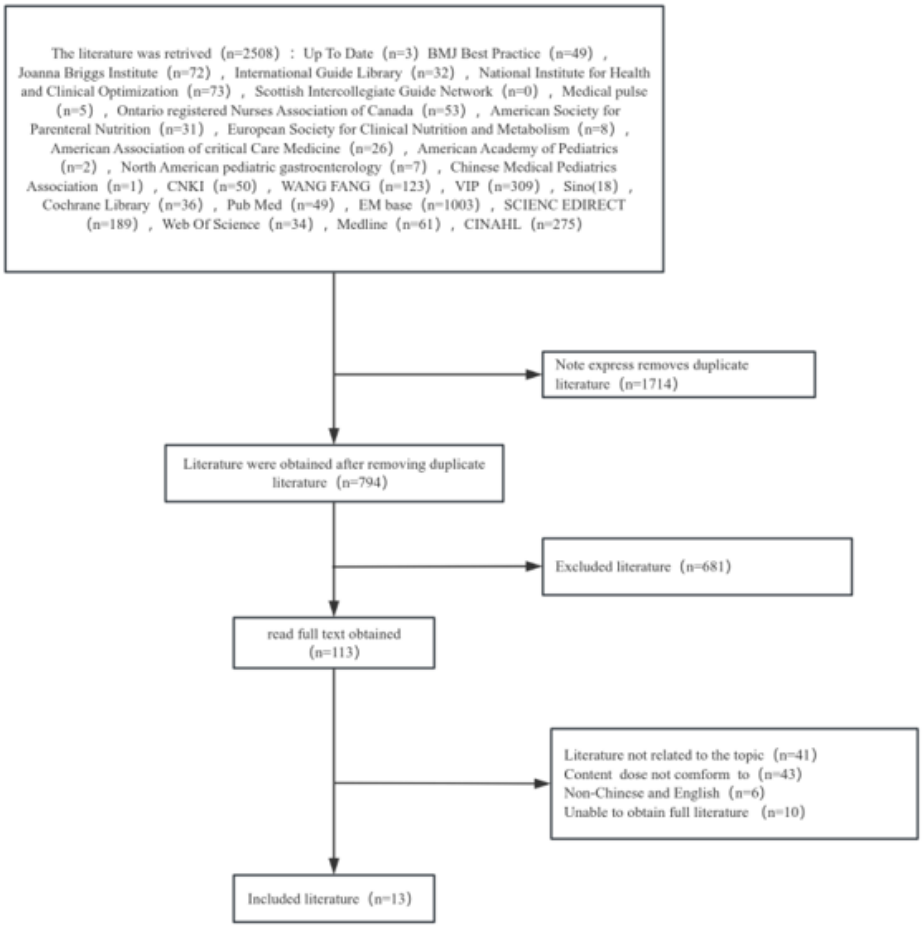

Figure 2. Flow chart of literature screening

3.2. General characteristics of the included literature

The general characteristics of the included literature are shown in **Table 1**.

Table 1. General characteristics of the included literature (n = 13)

Included literature	Publication year	Literature reference	Literature type	Literature theme
Mehta *et al.* [3]	2017	ASPEN	Guideline	Provision and evaluation of nutritional support treatment for critically ill pediatric patients
Qian *et al.* [4]	2018	Wangfang database	Guideline	Nutritional assessment and support for critically ill children
Tume *et al.* [5]	2020	Embase	Guideline	Nutritional support for critically ill children
Eveleens *et al.* [17]	2020	PubMed	Systematic review	Definition, predictors, and outcome of feeding intolerance in critically ill children
Theodoridis *et al.* [18]	2023	PubMed	Systematic review	Systematic review of continuous and intermittent enteral feeding in critically ill children
Brown *et al.* [19]	2020	PubMed	Systematic review	Comparison between intermittent and continuous gastric feeding in critically ill infants during mechanical ventilation
Broekaert *et al.* [20]	2019	PubMed	Expert opinion	Jejunal tube feeding in children
Rohani *et al.* [21]	2022	Embase	Expert opinion	Suggestions on clinical practice of children admitted to intensive care unit
Irving *et al.* [22]	2018	ASPEN	Expert opinion	Placement and verification of nasogastric tube in pediatrics
Boullata *et al.* [23]	2017	ASPEN	Expert consensus	Safety practice in enteral nutrition therapy
Group of Cardiothoracic surgery, Pediatric surgery Branch of Chinese Medical Association [24]	2016	Wangfang database	Expert consensus	Nutritional support for children with congenital heart disease
Lee *et al.* [25]	2016	PubMed	Expert consensus	Enteral nutrition support in pediatric intensive care unit in Asia-Pacific and Middle East
Zeng and Zhou [26]	2022	Guangdong Pharmaceutical Association	Expert consensus	Consensus on clinical pharmaceutical practice of parenteral nutrition

3.3. Quality evaluation results of the included literature

3.3.1. Quality evaluation results of guidelines

A total of three guidelines were included and evaluated independently by four researchers. The standardized percentage of scores in each field of the guidelines and the results of the comprehensive evaluation are shown in **Table 2**. Four areas in the guidelines by Mehta *et al.* [3] show adherence rates of ≥ 60%, with two areas at ≥ 30%, and the strength of the recommendations is rated as B-level. Similarly, the China

guidelines published by Qian *et al.* [4] have five areas with ≥ 60% adherence, one area at ≥ 30%, and a B-level recommendation strength. The guidelines by Tume *et al.* [5] also feature four areas with ≥ 60% adherence and two areas at ≥ 30%, with B-level recommendation strength. The ICC values for all three guidelines are above 0.9, indicating good consistency.

Table 2. Quality evaluation results of guidelines

Guideline	Standardized scores in various domains (%)						≥ 60%	≥ 30%	ICC	Quality evaluation
	Scope and purpose	Stakeholder involvement	Rigor of development	Clarity of presentation	Applicability	Editorial independence				
Mehta *et al.* [3]	88.8%	69.4%	56.7%	91.6%	59.3%	100%	4	6	0.967	B
Qian *et al.* [4]	100%	70.8%	95.3%	100%	59.3%	100%	5	6	0.981	B
Tume *et al.* [5]	88.8%	58.3%	71.8%	70.8%	47.9%	100%	4	6	0.967	B

3.3.2. Quality evaluation results of systematic reviews

A total of three systematic reviews were included, which were evaluated independently by two researchers (**Table 3**). If there are differences, the third researcher is asked to evaluate. In the two systematic reviews published by Eveleens *et al.* [17] and Theodoridis *et al.* [18], all the entries were "yes"; in the systematic reviews published by Brown *et al.* [19], except the second item was "unclear," the rest were "yes."

Table 3. Quality evaluation results of systematic reviews

Items	Eveleens *et al.* [17]	Theodoridis *et al.* [18]	Brown *et al.* [19]
	A/B	A/B	A/B
1. Is the review question clearly and explicitly stated?	Yes/Yes	Yes/Yes	Yes/Yes
2. Were the inclusion criteria appropriate for the review question?	Yes/Yes	Yes/Yes	Unclear/Unclear
3. Was the search strategy appropriate?	Yes/Yes	Yes/Yes	Yes/Yes
4. Were the sources and resources used to search for studies adequate?	Yes/Yes	Yes/Yes	Yes/Yes
5. Were the criteria for appraising studies appropriate?	Yes/Yes	Yes/Yes	Yes/Yes
6. Was critical appraisal conducted by two or more reviewers independently?	Yes/Yes	Yes/Yes	Yes/Yes
7. Were there methods to minimize errors in data extraction?	Yes/Yes	Yes/Yes	Yes/Yes
8. Were the methods used to combine studies appropriate?	Yes/Yes	Yes/Yes	Yes/Yes
9. Was the likelihood of publication bias assessed?	Yes/Yes	Yes/Yes	Yes/Yes
10. Were recommendations for policy and/or practice supported by the reported data?	Yes/Yes	Yes/Yes	Yes/Yes
11. Were the specific directives for new research appropriate?	Yes/Yes	Yes/Yes	Yes/Yes

3.3.3. Quality evaluation results of expert consensus and opinion

A total of three expert opinions [20-22] and four expert consensus [23-26] were included, and all the other items were "yes" except item 6. The results of quality evaluation are shown in **Table 4**.

Table 4. Quality evaluation results of expert consensus and opinion

Items	Broekaert *et al.* [20]	Rohani *et al.* [21]	Irving *et al.* [22]	Boullata *et al.* [23]	Group of Cardiothoracic surgery, Pediatric surgery Branch of Chinese Medical Association [24]	Lee *et al.* [25]	Zeng and Zhou [26]
	A/B	A/B	A/B	A/B	A/B	A/B	A/B
1. Is the source of the opinion clearly identified?	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
2. Does the source of opinion have standing in the field of expertise?	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
3. Are the interests of the relevant population the central focus of the opinion?	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
4. Does the opinion demonstrate a logically defended argument to support the conclusions drawn?	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
5. Is there reference to the extant literature?	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
6. Is any incongruence with the literature/ sources logically defended?	No/No	No/No	No/No	No/No	No/No	No/No	No/No

3.4. Summary and description of evidence

Table 5 shows the summary of the best evidence included in this study.

Table 5. Summary of the best evidence of tube feeding intolerance in critically ill children

Category	Content of evidence	Level	Recommendation level
Definition	1. The definition of FI should include gastrointestinal symptoms that fail to meet enteral nutrition target intake and are accompanied by gastrointestinal dysfunction [17].	1a	A
MDT team	2. Set up a nutrition support team, including doctors, nurses, dietitians, pharmacists, etc. [3,4,20,21,23,25,26].	2d	A
Nutrition assessment	3. Nutritional risk screening was conducted with STAMP scale [4], the nutritional assessment was conducted within 48 hours after admission, and the nutritional status of children was reassessed weekly [3,5,21,23-25].	2a	A
	4. Daily assessment of gastrointestinal tolerance, abdominal status, and monitoring of intestinal status [23].	5b	A
	5. Nursing records the situation of patients with tube feeding, and nutrition management should be part of the daily management of children with PICU [23,25].	5b	A
	6. IC calorimetry is used to determine energy requirements. If the IC method is not feasible, we recommend using the Schofield formula [3-5,21,25,26].	3c	B

Table 1 (Continued)

Category	Content of evidence	Level	Recommendation level
Nutritional preparation	7. Standard polymer milk powder is preferred for enteral nutrition; if it cannot be tolerated, hydrolyzed formula or peptide formula is used instead [5,21].	5b	A
	8. It is recommended not to pack milk powder separately to minimize microbial contamination. It is recommended to use potable water mixed with milk powder, medicine, and flushing pipe [20,23].	5b	A
	9. Record the opening time of nutritional preparations, put unused nutritional preparations in the refrigerator, valid for 24 hours, and no more than 4 hours at room temperature [23].	5b	A
Feeding scheme	10. Develop a standardized feeding process for enteral nutrition [23].	5b	A
	11. Nurse-driven feeding programs are developed according to institutional policies, and capacity-based feeding programs can provide nurses with the freedom to modify enteral nutrition management [3-5,23,25].	2b	A
Feeding route	12. EN is the first choice for nutritional support [3,4,21,25].	2d	A
	13. EN is the first choice of gastric approach. For patients who cannot tolerate gastric feeding or have a high risk of aspiration, they can be fed behind the door or through the small intestine [3-5,20,21,23,25].	1a	A
	14. The choice of specific infusion mode depends on the nature of the nutrient solution, the type and size of the feeding tube, the position of the tube end, and the nutrient requirement [26].	5b	B
	15. Children who cannot accept any EN in the first week of PICU are given PN; EN energy that does not reach the target, and PN is supplemented [3,4,25].	1c	A
Feeding management	16. Intermittent feeding is the first choice [18,19].	1a	A
	17. It is recommended that the rate of jejunal feeding should be gradually increased until the target amount of milk is reached [20].	5b	B
	18. The temperature of nutritional preparation is maintained at 37℃ [26].	1c	B
	19. Unless there is a contraindication, raise the head of the bed 30–45° [26] in the left supine position; babies under 1 year old sleep on their back; the right lying position does not change within half an hour after feeding [23,24].	1c	A
Pipeline management	20. Pay attention to hand hygiene in all aspects of preparation and management of enteral nutrition [23].	5b	A
	21. Make sure the feeding tube is in the correct position before each feeding [23].	5b	A
	22. Measurement of nasogastric tube insertion length by using the midline of the umbilical cord of the nasal “earlobe” and “xiphoid process” [22].	5b	A
	23.. Evaluate the intubation position using accurate measurement of gastric tube insertion length, gastric pH value detection, or visual observation of gastric aspiration [23].	5b	B
GRV	24. Routine measurement of gastric residue in critically ill children is not recommended [5].	3d	B
Drug application	25. All drugs should be administered in liquid form with a 20ml syringe, and the mode of administration should be selected according to the absorption characteristics of the drug [20,23].	3e	A
	26. There is not enough evidence to support the use of gastric motility agents to improve gastric emptying and feeding tolerance in critically ill children [5].	1c	A

4. Discussion

4.1. Establishing a nutritional support team to provide nutritional support to critically ill children

Children, being in a stage of rapid growth and development, have higher nutritional needs than adults. The prevalence of malnutrition among critically ill children varies significantly depending on the population studied, the type of hospital, and the method used to assess nutritional status [27]. Establishing a Nutritional Support Team (NST) is essential for providing comprehensive nutritional care. A unified assessment scale should be employed to fully evaluate the nutritional status of children. The NST should consist of doctors, nurses, dietitians, pharmacists, and other relevant professionals. For calculating children's resting energy expenditure (REE), many studies have indicated that using an Indirect Calorimeter (IC) is the gold standard [3-5,21,25]. However, when IC is not available, the Schofield formula should be used to coordinate with dietitians for nutrition prescription, with the necessary doctor's orders. NST nurses should monitor any discomfort or changes in a child's condition during tube feeding, record this in the nursing notes, and evaluate gastrointestinal tolerance daily, making nutrition management part of their routine care. NST dietitians are responsible for regularly assessing nutritional status, formulating optimal nutrition plans, ensuring the safety of nutritional preparations, and monitoring ongoing support. NST pharmacists oversee drug compatibility, advise on drug-nutrient interactions, and assist in the development of individualized nutritional support programs. Research has demonstrated that a diverse NST strategy can significantly reduce the prevalence of malnutrition [28]. However, due to limitations in staffing and resources, only large hospitals typically have such specialized teams. Therefore, the establishment of NSTs should be adapted to the local hospital's resources and needs.

4.2. Effect of changing the feeding mode on feeding intolerance of critically ill children

Enteral nutrition is the first choice for nutritional support [29]. At present, tube feeding is commonly used to give enteral nutrition, including continuous feeding and intermittent feeding. Whether continuous feeding or intermittent feeding, the best feeding method is still a controversial topic [30]. The intermittent feeding method is more in line with the physiological condition and similar to the normal diet pattern [31] and can achieve the energy target more quickly. In terms of actual nursing procedures and clinical procedures, intermittent feeding is more suitable for the possible frequent feeding interruptions needed in the clinic. A continuous feeding pump for 24 hours is suitable for patients who are fed through the pylorus or cannot tolerate intermittent feeding. In clinical nursing practice, due to convenient operation, time-saving, and other reasons, nurses often use direct injection feeding to inject a large amount of fluid into the stomach in a short time, which can easily lead to intolerant reactions such as aspiration or vomiting, which will result in feeding interruption. Intermittent feeding has less feeding interruption due to feeding intolerance, and can reach the target energy earlier [32]. The choice of a specific infusion mode depends on the nature of the nutrient solution, the type and size of the feeding tube, the position of the tube end, and the nutrient requirement [26].

4.3. Different methods to verify the correct positioning of the feeding tube

Currently, auscultation is often used to verify the correct placement of a gastric tube before each feeding. However, studies have shown that auscultation carries a risk of displacement and is not reliable. Warnings have been issued years ago against using auscultation as a method to confirm the correct location of a feeding tube, yet nurses' subjective reliance on it persists. Therefore, leadership-level decisions are needed to guide nurses

in discontinuing the use of auscultation [33]. The guidelines point out that X-ray imaging is the gold standard for verifying the tube's position, but due to its high cost and the risk of cumulative radiation exposure, pH test strips are recommended as a simple, affordable, first-line method to verify nasogastric tube placement. Studies also suggest that at least two methods should be used to confirm gastric tube placement. Besides pH testing, accurately measuring the tube's length or assessing gastric residual volume (GRV) is also recommended. In clinical practice, the traditional method for measuring gastric tube length—using the distance from the nose to the earlobe and then to the xiphoid process—is often too short, leading to shallow placement and the risk of aspiration in children. Current guidelines recommend the more accurate method of measuring gastric tube length based on the midline of the nasal lobe, xiphoid process, and navel [22]. Additionally, the latest guidelines advise against routinely withdrawing GRV, as changes in a child's posture can lead to inaccurate GRV measurements. Despite this, the method remains common due to its ease of use and low cost. While bedside ultrasound can measure GRV, its clinical use has not been widely adopted because many nurses lack the necessary qualifications and knowledge to accurately measure GRV with ultrasound. Therefore, although GRV does not precisely represent feeding intolerance, it is still widely used internationally to guide feeding [34].

4.4. Emphasizing the key role of nurses as the implementers of tube feeding and formulating a feeding plan guided by nurses in accordance with the process

Studies have shown that the formulation of standardized feeding programs based on institutional policies can effectively promote the nutritional goals of various intensive care patients. These programs have been proven to optimize feeding procedures and shorten the time required to initiate feeding [35-37]. Nurses, as the primary caregivers of children, are the ones responsible for implementing tube feeding. However, when feeding intolerance occurs, nurses often first consult a doctor about whether to stop feeding. A standardized approach, such as the volume-based feeding (VBF) plan, which targets completing the required infusion based on daily energy needs within a 24-hour period, can help standardize enteral nutrition processes and reduce the incidence of feeding intolerance [38]. By assigning primary responsibility for initiating and adjusting feeding to nurses, these programs can improve the overall quality of enteral nutrition for critically ill patients. Research has shown that VBF allows for earlier initiation of enteral nutrition [39] and significantly increases caloric intake over time. VBF not only gives nurses greater flexibility in managing enteral nutrition but also makes feeding programs more scientific and individualized. Additionally, non-pharmacological methods can be employed to reduce feeding intolerance in children. These include adjusting the child's posture, modifying the feeding speed, or warming the nutritional preparation. Such strategies play a crucial role in optimizing nutritional outcomes by ensuring that patients receive appropriate and timely nutritional support [40].

5. Conclusion

This study summarized the relevant evidence on the management of tube feeding intolerance in critically ill children, which can help to develop the best evidence of tube feeding intolerance in these children. Since most of the included documents are in foreign languages, in the process of clinical transformation of evidence, expert meetings should be held to analyze the obstacles or promoting factors, and the corresponding localization reform strategies should be worked out according to the specific conditions of the department. It is important to apply the evidence to the clinic to find a clinical evidence-based practice that is more suitable for tube feeding

intolerance of critically ill children in China.

Disclosure statement

The authors declare no conflict of interest.

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