

Barriers, Facilitators, and Implementation Strategies of Enteral Nutrition in Critically Ill Children in Pediatric Intensive Care Units: A Scoping Review

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Abstract

Enteral nutrition (EN) is the preferred route of nutritional support for critically ill children, yet its implementation in pediatric intensive care unit (PICU) remains challenging. Clinical instability, feeding interruptions, workforce-related issues, and variability in local practices may contribute to optimal EN delivery. This scoping review aimed to map the available evidence on barriers, facilitators, and implementation strategies for EN delivery in critically ill children in PICU and other critical care settings. This review followed the Joanna Briggs Institute methodological framework and was reported in accordance with PRISMA-ScR. Literature searches were conducted in PubMed, Scopus, EBSCOHost, and ScienceDirect for studies published between 2021 and 2026. Eligible studies included primary empirical research involving critically ill infants, children, or adolescents in PICU or pediatric critical care settings that addressed barriers, facilitators, implementation strategies, interruptions, or adequacy of EN delivery. Data were extracted using a structured charting form and synthesised narratively. Ten studies were included. Findings were grouped into three themes: barriers, facilitators, and implementation strategies. Barriers included patient instability, feeding interruptions, limited clinician confidence, inadequate dietitian support, limited feeding resources, and inconsistent documentation. Facilitators included feeding protocols, multidisciplinary collaboration, nursing competency, dietitian involvement, and routine monitoring of nutrition goals. Implementation strategies included standardised EN protocols, quality improvement initiatives, documentation-based interventions, and guideline uptake. EN delivery in critically ill children is influenced by clinical, professional, and organisational factors. The findings suggest that pediatric critical care nursing should prioritise routine monitoring of nutritional goals, early identification of feeding interruptions, adherence to EN protocols, and multidisciplinary collaboration to support more consistent and effective nutritional care in critically ill children. Further PICU specific research is needed to evaluate EN implementation strategies and their clinical outcomes.

Keywords: barriers; critically ill children; enteral nutrition; implementation strategies; pediatric intensive care unit

Introduction

Nutritional support is a fundamental component of care for critically ill children admitted to the pediatric intensive care unit (PICU). During critical illness, children are exposed to systemic inflammation, metabolic stress, altered energy expenditure, protein catabolism, gastrointestinal dysfunction, fluid restriction, and repeated interruptions related to diagnostic and therapeutic procedures, all of which may compromise adequate nutrient delivery and increase the risk of malnutrition (Alberto et al., 2022; Mehta et al., 2017; Tume et al., 2020). Inadequate nutritional intake during this period may contribute to the loss of lean body mass, an impaired immune response, delayed recovery, prolonged mechanical ventilation, a longer PICU stay, and poorer clinical outcomes (Mehta et al., 2015, 2017). Consequently, nutrition therapy in pediatric critical care should be regarded as an essential therapeutic component rather than merely supportive treatment.

Enteral nutrition (EN) is generally recommended as the preferred route of nutrition support in critically ill children with a functional gastrointestinal tract because it is more physiological, may preserve gut integrity, and can reduce complications associated with parenteral nutrition (Mehta et al., 2017; Tume et al., 2020). The Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition recommend early nutritional assessment and timely initiation of enteral nutrition in eligible critically ill children who are expected to require intensive care for more than 2–3 days (Mehta et al., 2017). Similarly, the European Society of Pediatric and Neonatal Intensive Care highlights the importance of individualised nutrition support and early enteral feeding when clinically feasible (Tume et al., 2020). Beyond guideline recommendations, observational evidence suggests that improved enteral energy and protein delivery is associated with better outcomes. In an international multicenter cohort study, greater delivery of prescribed enteral nutrition was associated with improved clinical outcomes in mechanically ventilated children (Mehta et al., 2012), and adequate enteral protein intake was inversely

associated with 60-day mortality (Mehta et al., 2015).

Despite these recommendations, optimal implementation of enteral nutrition in routine PICU practice remains challenging. EN may be delayed, repeatedly interrupted, or delivered below prescribed energy and protein targets because of hemodynamic instability, vasoactive support, gastrointestinal intolerance, fluid restriction, delayed enteral access, and concerns regarding aspiration or feeding safety (Alsohime et al., 2021; Irving et al., 2022). Feeding interruptions may also occur because of diagnostic or therapeutic procedures, perioperative fasting, emesis, diarrhea, or problems with feeding devices, and repeated interruptions can substantially reduce cumulative nutrient delivery (Irving et al., 2022; Solana et al., 2023). These challenges are particularly important in critically ill children because failure to maintain feeding continuity may contribute to inadequate energy and protein intake during the course of critical illness (Mehta et al., 2012; Tume et al., 2020). In a national survey of pediatric intensive care healthcare professionals, major barriers to initiating enteral nutrition included hemodynamic instability, difficulty obtaining small-bowel access, and severe fluid restriction (Alsohime et al., 2021). Similarly, Solana et al. (2023) found that nutrition interruptions were common in critically ill children and were associated with lower caloric intake, highlighting the impact of potentially avoidable interruptions on nutritional adequacy. Brown et al. (2015) also emphasised that challenges in enteral nutrition delivery extend beyond the decision to feed and include accurate assessment of nutritional requirements, advancing feeds, feeding intolerance, and frequent interruptions in daily PICU care.

The complexity of enteral nutrition delivery in PICU is therefore shaped not only by patient-related instability but also by professional, organisational, and system-level factors. These may include the absence of standardised feeding protocols, inconsistent prescribing and advancement practices, uncertainty regarding the recognition and management of feeding intolerance, and communication gaps among physicians, nurses, and dietitians (Brown et al., 2015;

Irving et al., 2022). Feeding intolerance remains particularly challenging because definitions and assessment criteria vary across studies and institutions, potentially influencing clinicians' decisions to interrupt or withhold feeds (Solana et al., 2023). In practice, such variability can widen the gap between evidence-based recommendations and the delivery of bedside nutrition, ultimately contributing to underfeeding and delayed achievement of nutritional goals.

To address these challenges, several implementation-focused approaches have been proposed, including standardised enteral feeding protocols, nurse-driven feeding algorithms, multidisciplinary nutrition rounds, structured assessment of feeding tolerance, and quality improvement initiatives (Irving et al., 2022). These approaches are especially relevant to nursing practice because nurses play a central role in assessing readiness for feeding, administering and advancing feeds, monitoring tolerance, documenting interruptions, and communicating changes in patient condition to the multidisciplinary team (Zaher et al., 2024). As a result, understanding the barriers and facilitators of enteral nutrition implementation is essential not only for improving nutritional adequacy but also for strengthening interdisciplinary collaboration, protocol adherence, and quality of care in pediatric critical care settings (Alsohime et al., 2021; Zaher et al., 2024).

Although pediatric critical care nutrition has been addressed in clinical guidelines and a growing body of empirical research, evidence on the barriers, facilitators, and implementation strategies of enteral nutrition in critically ill children remains fragmented. Existing literature has largely focused on nutritional adequacy, timing of initiation, route of feeding, and associations with clinical outcomes (Mehta et al., 2012, 2015, 2017; Tume et al., 2020), whereas less attention has been given to how enteral nutrition is implemented in everyday PICU practice and which factors hinder or support its successful delivery across different settings. This leaves a clear gap in understanding of the practical implementation of enteral nutrition in critically ill children, warranting a scoping review to map the available evidence,

clarify key implementation-related concepts, identify reported barriers and facilitators, and summarise strategies used to improve enteral nutrition practice in this population.

Accordingly, this scoping review aims to map the available evidence on barriers, facilitators, and implementation strategies of enteral nutrition in critically ill children admitted to pediatric intensive care units. Specifically, this review seeks to identify barriers affecting the implementation of enteral nutrition, describe facilitators that support successful delivery, summarise implementation strategies and protocols used to improve practice, and map the nutritional and clinical outcomes reported in the literature. The findings are expected to inform nursing practice, interdisciplinary collaboration, protocol development, and future research in pediatric critical care nutrition.

Research Methods

Study Design

This study used a scoping review design to map available evidence on barriers, facilitators, and implementation strategies of enteral nutrition in critically ill children admitted to pediatric intensive care unit (PICU). The review was guided by the Joanna Briggs Institute (JBI) methodology and reported in accordance with PRISMA-ScR (Peters et al., 2024; Tricco et al., 2018). This approach was selected because the topic includes diverse types of evidence and aims to map the scope of literature rather than estimate intervention effects.

Review Question

The primary review question was: What evidence is available regarding the barriers, facilitators, and implementation strategies related to enteral nutrition delivery in critically ill children admitted to PICUs? The primary focus of this review was on implementation-related factors, including barriers to EN delivery, facilitators supporting its implementation, and strategies or protocols used to improve EN practice. Nutritional and clinical outcomes were considered secondary and were extracted only to describe the

reported consequences or effects associated with EN implementation; the review was not designed to evaluate the effectiveness of EN interventions.

Eligibility Criteria

Eligibility criteria were developed using the Population Concept Context (PCC) framework. The population included critically ill infants, children, and adolescents admitted to PICU or pediatric critical care settings. The concept focused on the implementation of enteral nutrition, including barriers and facilitators, feeding interruptions, protocol adherence, quality improvement initiatives, and strategies to improve enteral nutrition delivery. The context was limited to PICU or pediatric critical care settings. Studies conducted exclusively in neonatal intensive care units were excluded to maintain focus on PICU populations.

Types of Sources

This review included primary empirical studies, such as observational, cohort, cross-sectional, and prospective or retrospective studies; implementation studies; and quality improvement projects. Review articles, editorials, commentaries, letters, guidelines, and conference abstracts without sufficient data were excluded from the final synthesis. Studies published from January 2021 to June 2026 were included to capture recent evidence on current pediatric critical care nutrition practices. Only studies published in English were considered.

Information Sources and Search Strategy

A literature search was conducted in PubMed, Scopus, EBSCOhost, and ScienceDirect. These databases were selected to ensure broad coverage of nursing and allied health, pediatric critical care, and clinical nutrition literature. Reference lists of included articles were also screened manually. The search combined terms related to three key concepts: critically ill children or PICU, enteral nutrition, and barriers, facilitators, implementation, protocols, or interruptions. The search strategy was adapted for each

database.

Based on the PCC framework, the search strategy combined terms related to the population and context (“critically ill child” OR “pediatric intensive care” OR “paediatric intensive care” OR “PICU” OR “pediatric critical care”), enteral nutrition (“enteral nutrition” OR “enteral feeding” OR “tube feeding”), and implementation related concepts (“barrier” OR “facilitator” OR “implement” OR “protocol” OR “interruption” OR “quality improvement” OR “adherence” OR “adequacy”). The terms were combined using the Boolean operators AND and OR and adapted to the syntax and indexing terms of each database.

Study Selection

All retrieved records were exported to reference management software, and duplicates were removed. Screening was conducted in two stages: title and abstract screening, followed by full-text review. Studies were included if they involved critically ill children in PICU or pediatric critical care settings, addressed enteral nutrition delivery or implementation, and reported original empirical findings. Reasons for exclusion at the full-text stage were recorded, and the selection process was summarised using a PRISMA-ScR flow diagram (Peters et al., 2024; Tricco et al., 2018).

Data Extraction

Data were extracted using a structured charting form. Extracted information included author and title, purpose, research method, population and sample, focus of the study, review domain (barriers, facilitators, implementation strategies), main findings. The charting form was refined during the extraction process to ensure that relevant findings were captured consistently.

Data Analysis and Synthesis

Data were synthesised descriptively and narratively. Study characteristics were summarised in tables, while findings were grouped thematically according to four domains: barriers to enteral nutrition

implementation, facilitators of enteral nutrition delivery, implementation strategies, and reported nutritional or clinical outcomes. Where possible, findings were mapped to show how barriers and facilitators related to strategies and outcomes.

Quality Appraisal

In accordance with JBI guidance, formal critical appraisal was not conducted because it is not mandatory for scoping reviews. The aim of this review was to map the breadth and characteristics of available evidence rather than assess intervention effectiveness or certainty of evidence. However, the study design and methodological characteristics of each included study were extracted and described to support interpretation of the findings (Peters et al., 2024).

Results

A total of 1,246 records were identified from four electronic databases, including PubMed

(n = 34), Scopus (n = 699), EBSCOHost (n = 312), and ScienceDirect (n = 201). After removing 41 duplicate records, 1,205 records remained for further screening. Of these, 651 records were excluded based on publication year and availability criteria, leaving 554 records for title and abstract screening. Following title and abstract screening, 497 records were excluded because they were not relevant to the review topic, resulting in 57 full-text articles assessed for eligibility. After full-text review, 47 articles were excluded for the following reasons: the study population or setting was not consistent with pediatric intensive care or pediatric critical care, the article did not focus on enteral nutrition, the study did not address barriers, facilitators, or implementation-related aspects of enteral nutrition, or the article was not an eligible empirical study design (e.g., review, commentary, or guideline). Ultimately, 10 studies met the inclusion criteria and were included in this scoping review. The study selection process is presented in Figure 1.

Figure 1. PRISMA-ScR flow diagram of study selection

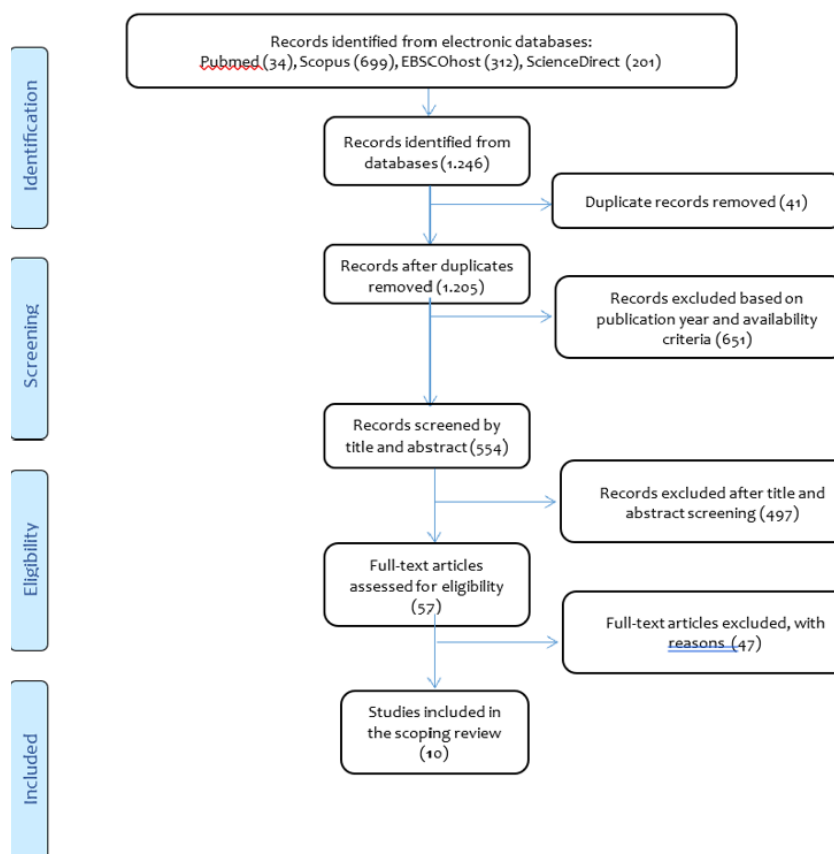


Table 1. Characteristics, Domains, and Main Findings of Included Studies

No.	Author and Title	Purpose	Research Method	Population and Sample	Focus of the Study	Review Domain	Main Findings
1.	Barriers to the delivery of enteral nutrition in pediatric intensive care units: A national survey (Alsohime et al., 2021)	To identify perceived barriers to EN delivery in pediatric intensive care units	National cross-sectional survey	Healthcare professionals working in PICU Country/ Setting: Saudi Arabia	Barriers to EN initiation and delivery in PICU practice	Barrier	Major barriers included hemodynamic instability, fluid restriction, and difficulty obtaining post-pyloric/small bowel access. The study shows that EN delivery in PICUs is strongly affected by patient-related and organizational barriers.
2.	Challenges Encountered in the Provision of Enteral Nutrition in Pediatric Intensive Care Unit: An Observational Study (Haseeb et al., 2023)	To examine practical challenges encountered during EN provision in critically ill children in the PICU	Observational study	Critically ill children admitted to PICU and receiving EN Conducted in the PICU of MGM Medical College and Hospital, Aurangabad, India	EN provision challenges, interruptions, and adequacy of delivery	Barrier and Nutrition adequacy	EN delivery was affected by delayed initiation, repeated interruptions, and difficulty achieving nutritional targets, contributing to optimal nutrition delivery in critically ill children.
3.	Prevalence, Risk Factors and Impact of Nutrition Interruptions in Critically Ill Children (Solana et al., 2023)	To determine the prevalence, risk factors, and impact of nutrition interruptions in critically ill children	Prospective observational study	Critically ill children in PICU Country/ Setting: Hospital General Universitario Gregorio Marañón, Madrid, and other Spanish centres	Nutrition interruption and its impact on caloric delivery	Barrier and Nutrition interruption/ adequacy	Nutrition interruptions were common and associated with reduced caloric intake. Procedures and clinical instability were major causes of interruption, highlighting the importance of interruption management to improve EN adequacy.
4.	Energy goal documentation and early initiation of enteral nutrition in critically ill children: A retrospective evaluation of a quality improvement project (Parikh et al., 2026)	To evaluate a quality improvement initiative aimed at improving energy-goal documentation and early EN initiation	Quality improvement evaluation	Critically ill children in pediatric critical care Country/ Setting: Conducted in a US PICU	Documentation and early initiation of EN	Implementation strategy and Facilitator	Standardized documentation and clearer energy-goal setting were associated with improved process measures, including earlier EN initiation and better visibility of nutrition targets in practice.
5.	Factors influencing adequate protein and energy delivery among critically ill children with heart disease in pediatric intensive care unit (Sundar et al., 2021)	To identify factors associated with adequate protein and energy delivery in critically ill children with heart disease	Observational study	Critically ill children with heart disease in PICU Country/ Setting: India	Nutritional adequacy and factors influencing energy/protein delivery	Barrier and Nutrition adequacy	Adequate protein and energy delivery were influenced by disease complexity, clinical instability, and feeding-related challenges. Nutritional adequacy was closely linked to both patient condition and feeding management.
6.	Nutritional Support Practices in Pediatric Intensive Care Unit (Ceci et al., 2026)	To describe nutritional support practices in pediatric intensive care	Descriptive/ observational study	Pediatric intensive care patients receiving nutritional support	Current EN/ nutritional support practices in PICU	Nutrition practice and Facilitator	The study showed variation in nutritional support practices, including timing and route of nutrition delivery, and highlighted the need for more standardized approaches to pediatric critical care nutrition.
7.	Uptake of the 2020 ESPNIC nutrition recommendations across European pediatric intensive care units (Tume et al., 2025)	To examine the uptake of ESPNIC nutrition recommendations across European PICU	Multicenter implementation uptake study	European PICU/ PICU clinicians or units Country/ Setting: Europe	Guideline uptake and implementation of pediatric critical care nutrition recommendations	Implementation strategy and Facilitator	Uptake of nutrition recommendations varied across PICU. Some recommendations were implemented consistently, while others showed only partial uptake, reflecting differences in local implementation capacity, resources, and practice readiness.
8.	Understanding nursing perspective towards barriers to the optimal delivery of enteral nutrition in intensive care settings (Zaher et al., 2024)	To explore nurses' perspectives on barriers to optimal EN delivery in intensive care	Cross-sectional survey	Nurses working in intensive care settings Conducted among ICU nurses in Saudi Arabia	Nursing perspectives on EN barriers and delivery	Barrier and Facilitator	Barriers to EN delivery included knowledge-related, practice-related, and organizational factors. The findings emphasize the importance of nursing competency, education, and professional support in optimizing EN implementation.

9.	Enteral feeding barriers in the intensive care unit of a tertiary hospital in Ghana (Anku et al., 2026)	To evaluate perceived barriers to the provision of enteral nutrition among ICU healthcare professionals in a resource-limited setting, as a basis for tailored quality improvement interventions	Cross-sectional survey using the Revised Barriers to Feeding Critically Ill Patients questionnaire	21 ICU healthcare professionals (17 nurses, 4 doctors) in a tertiary hospital ICU in Ghana	Perceived EN barriers in a resource-limited ICU, including dietitian support, ICU resources, and EN delivery processes	Barrier and Implementation implication	The main barriers were insufficient dietitian coverage outside routine working hours, delays in dietitian assessment, lack of feeding pumps, unavailability of enteral formulas, and delays in initiating motility agents. The study highlights that systemic and operational barriers, rather than provider attitude alone, hinder optimal EN delivery and supports the need for context-specific quality improvement strategies such as nurse-driven EN protocols and improved resource allocation.
10.	Nutritional goals in mechanically ventilated children: Impact of a standardized enteral protocol in a tertiary pediatric intensive care unit (Ceci et al., 2026)	To evaluate the impact of implementing a standardized enteral nutrition protocol on nutritional practices in mechanically ventilated children and to identify predictors of early enteral feeding shortfalls	Retrospective cohort study comparing pre-protocol and post-protocol periods	141 mechanically ventilated children aged <18 years and weighing ≥ 10 kg in a tertiary PICU	Standardized EN protocol, early EN delivery, caloric target achievement, and predictors of optimal EN intake	Implementation strategy; Barrier; Nutrition adequacy	Implementation of a standardized EN protocol did not substantially change overall enteral or total caloric intake, suggesting pre-existing alignment with guidelines. However, EN targets remained difficult to achieve in critically ill subgroups, especially children receiving vasoactive agents and those with atypical diagnoses. Protein targets were infrequently met, indicating persistent gaps in nutritional adequacy despite protocol implementation.

Characteristics of Included Studies

The ten included studies explored enteral nutrition (EN) delivery in critically ill children and related critical care settings from multiple perspectives, including perceived barriers to feeding delivery, feeding interruptions, nutritional adequacy, nursing and clinician perceptions, guideline uptake, and protocol implementation. Most studies used observational designs, including cross-sectional surveys, prospective or retrospective observational studies, and quality improvement or protocol evaluation studies (Alsohime et al., 2021; Haseeb et al., 2023; Solana et al., 2023; Sundar et al., 2021). The included studies represented diverse clinical and organisational contexts, ranging from national and multicentre surveys to single-centre tertiary PICUs and specialised pediatric critical care units across Saudi Arabia, Pakistan, Spain, India, Peru, Ghana, and European settings. These settings differed not only geographically but also in organisational characteristics, including access to dietitian services, availability of enteral feeding equipment and formulas, use of standardised feeding protocols, multidisciplinary nutrition support, and nutrition monitoring and documentation practices. Such contextual variation is important because differences in staffing,

resources, and organisational infrastructure may influence both the barriers encountered and the feasibility of implementing EN-related strategies (Alsohime et al., 2021; Anku et al., 2026; Ceci et al., 2026; Tume et al., 2025). Overall, the included studies suggest that EN delivery in critically ill children is influenced by a complex interplay among patient instability, feeding processes, workforce competence, and organisational support.

Barriers to Enteral Nutrition Delivery

Barriers to EN delivery were the most consistently reported findings across the included studies. These barriers were grouped into patient-related, procedure-related, clinician-related, and organisational or system-related factors. Patient-related barriers were primarily associated with the physiological instability of critically ill children. Hemodynamic instability, vasoactive drug use, fluid restriction, gastrointestinal intolerance, and underlying disease severity were repeatedly reported as reasons for delayed initiation, withholding, or interruption of EN (Alsohime et al., 2021; Ceci et al., 2026; Sundar et al., 2021). Alsohime et al. (2021) identified hemodynamic instability and severe fluid restriction as major perceived barriers in PICU practice, while Sundar et al.

(2021) found that disease complexity and instability among children with heart disease influenced the achievement of energy and protein targets. Ceci et al. (2026) reported that early EN shortfalls were more likely among mechanically ventilated children with greater illness severity and those receiving vasoactive support, suggesting that even protocolized care remains challenged by clinical instability.

Procedure-related barriers were evident in studies focusing on feeding interruption. Solana et al. (2023) reported that nutrition interruptions were common in critically ill children and were often associated with diagnostic or therapeutic procedures, fasting requirements, and routine clinical management events. These interruptions were linked to lower caloric intake and cumulative nutritional deficits. Haseeb et al. (2023) also described repeated interruptions and delayed progression of EN as common barriers in daily PICU practice, indicating that interruption-related losses are a major contributor to optimal nutrition delivery.

Clinician-related barriers included inconsistent knowledge, uncertainty in feeding decisions, and concerns about feeding safety in unstable children. Zaher et al. (2024) reported that nurses perceived barriers related to knowledge, practice, and confidence in delivering EN optimally. Anku et al. (2026) highlighted provider concerns and operational delays as contributors to inadequate EN delivery, suggesting that feeding decisions are shaped not only by clinical status but also by the confidence and preparedness of healthcare professionals.

Organisational and system-related barriers were also prominent across the included studies. These included inadequate dietitian availability, limited feeding pumps or enteral formulas, delayed nutrition review, lack of standardised feeding pathways, and inconsistent documentation of nutrition goals (Alsohime et al., 2021; Anku et al., 2026; Parikh et al., 2026). In the Ghanaian ICU study, Anku et al. (2026) identified insufficient dietitian coverage, lack of feeding pumps, delayed dietitian assessment, and delayed initiation of motility agents as major barriers to EN provision. Likewise, Alsohime et al. (2021) highlighted logistical

issues, including difficulty obtaining small-bowel access and variability in local unit practices. Together, these findings indicate that EN barriers in critically ill children extend beyond patient physiology and are closely related to staffing models, workflow, documentation, and resource availability.

Facilitators of Enteral Nutrition Delivery

Despite the substantial barriers reported, several studies also identified factors that facilitated more effective EN delivery. These facilitators were grouped into structured clinical guidance, professional competency and multidisciplinary support, and routine nutrition monitoring and goal-setting.

A major facilitator was the availability of clear feeding protocols or evidence-based nutrition guidance. Studies examining protocol implementation or guideline uptake have shown that structured approaches support more consistent feeding practices, clearer decision-making, and better organisation of EN delivery (Ceci et al., 2026; Parikh et al., 2026; Tume et al., 2025). Tume et al. (2025) demonstrated variation in the uptake of ESPNIC nutrition recommendations across European PICU, but their findings also suggest that the existence of recognised guidance provides an important framework for strengthening local nutrition practice. Similarly, Ceci et al. (2026) showed that a standardised EN protocol helped structure nutritional care in mechanically ventilated children, even though it did not fully eliminate deficits in energy or protein delivery. These findings indicate that protocols and guidelines can function as facilitators by reducing ambiguity in feeding decisions and supporting shared standards of care.

Another important facilitator was multidisciplinary and professional support, particularly through nursing competency, dietitian involvement, interdisciplinary communication, and shared responsibility for nutrition care. Zaher et al. (2024) emphasised that nursing knowledge, competency, and professional support were essential to optimising EN delivery, indicating that the same factors identified as barriers can become facilitators when adequately strengthened. Likewise, Anku et al. (2026) underscored

the importance of dietitian involvement and ICU resource support in enabling timely delivery of feeding. Across studies, stronger collaboration between nurses, physicians, and dietitians appeared to enhance the implementation of EN in critically ill children. Routine monitoring of nutrition goals and feeding progress was also identified as a facilitator. Parikh et al. (2026) found that clearer documentation of energy goals and attention to early EN initiation improved process measures in pediatric critical care. This suggests that visible nutrition targets, structured documentation, and regular review of feeding progress can help translate nutritional plans into actual bedside practice. Studies on nutritional adequacy and interruption also imply that closer monitoring of energy and protein delivery may help teams detect shortfalls earlier and initiate corrective action before deficits accumulate (Solana et al., 2023; Sundar et al., 2021).

Implementation Strategies to Improve Enteral Nutrition Practice

Three broad implementation strategies emerged from the included studies: standardised EN protocols, quality improvement and documentation-based interventions, and guideline implementation or practice harmonisation efforts. The most prominent strategy was the use of standardised enteral nutrition protocols. Ceci et al. (2026) evaluated the impact of a standardised EN protocol in a tertiary PICU and found that it supported a more structured feeding process and facilitated identification of children at risk of early feeding shortfalls. Although the protocol did not substantially improve all nutritional outcomes, it provided an important framework for standardising feeding practice and evaluating persistent gaps in energy and protein delivery. Similar implications can be drawn from Tume et al. (2025), whose study of guideline uptake suggests that recommendation-based practice may improve consistency in EN delivery across PICU.

A second strategy involved quality improvement initiatives and documentation-focused interventions. Parikh et al. (2026) reported that a quality improvement approach

centred on energy-goal documentation and early EN initiation improved the visibility of nutritional targets and supported more timely initiation of feeding. This finding is important because it suggests that implementation does not always require a complex clinical intervention; improvements in documentation systems, workflow, and accountability may also strengthen EN delivery. In resource-constrained settings, Anku et al. (2026) further highlighted the potential value of context-specific quality improvement strategies, such as nurse-driven feeding protocols, improved access to nutrition resources, and stronger dietitian involvement.

A third implementation approach involved practice standardisation through guideline uptake and system-level alignment. Tume et al. (2025) showed that although uptake of ESPNIC recommendations varied across European PICU, efforts to align local practice with international pediatric critical care nutrition guidance are an important strategy for strengthening EN implementation. However, the variability in uptake also indicates that guideline dissemination alone is insufficient; successful implementation likely depends on local adaptation, staff engagement, and adequate organisational support.

Synthesis of Findings

In relation to the review objectives, the included studies identified three main areas influencing

EN delivery in critically ill children: barriers, facilitators, and implementation strategies. Barriers were reported at multiple levels, including patient-related clinical instability, procedure-related feeding interruptions, clinician-related factors, and organisational or resource limitations (Alsohime et al., 2021; Anku et al., 2026; Solana et al., 2023; Sundar et al., 2021). Facilitators included clear feeding protocols, multidisciplinary collaboration, nursing competency, dietitian involvement, and structured monitoring and documentation of nutritional goals. Implementation strategies primarily involved standardised EN protocols, quality improvement initiatives, and guideline-informed approaches aimed at

improving the consistency and timeliness of feeding practices (Ceci et al., 2026; Parikh et al., 2026; Tume et al., 2025).

Across these three areas, the evidence suggests that successful EN implementation depends on both clinical and organisational conditions. Although implementation strategies may strengthen feeding processes, they do not consistently eliminate nutritional deficits, particularly among clinically unstable children or in settings with limited staffing and resources (Anku et al., 2026; Ceci et al., 2026; Sundar et al., 2021). Overall, the findings address the review objective by showing that improving EN delivery in PICUs requires a multifaceted approach that combines management of clinical and procedural barriers with multidisciplinary support, structured monitoring, staff competency, and context-appropriate implementation strategies.

Discussion

This scoping review identified barriers, facilitators, and implementation strategies that influence enteral nutrition (EN) delivery in critically ill children. Beyond the individual barriers identified across studies, the overall findings suggest an important gap between recommended nutrition practices and their operational delivery at the bedside. This interpretation is consistent with recent reviews showing substantial variation in the timing, delivery, monitoring, and outcomes of nutrition support across PICUs, despite the availability of international recommendations (Gunst et al., 2025; Maffeo et al., 2026; Purosky et al., 2026). Thus, optimising EN delivery requires attention not only to the child's clinical condition but also to how nutrition recommendations are translated into daily clinical workflows.

Barriers to Enteral Nutrition Delivery

Patient-related barriers identified in this review, particularly hemodynamic instability, vasoactive support, gastrointestinal intolerance, fluid restriction, and illness severity, reflect the complexity of feeding decisions in critically ill children (Alsohime et al., 2021; Ceci et al., 2026; Sundar et al., 2021). However, previous evidence suggests that vasoactive support itself should not necessarily be considered an absolute contraindication to EN. ESPNIC recommendations support EN in appropriately selected, hemodynamically stable children receiving vasoactive medications, with careful assessment and monitoring of tolerance (Tume et al., 2025). Similarly, Irving et al. (2022) reported that EN may be safe and well tolerated in selected critically ill children receiving vasoactive support. These findings suggest that the challenge may lie less in the use of vasoactive medication itself than in uncertainty regarding how clinicians define feeding readiness and hemodynamic stability. Consequently, clearer criteria for initiation, advancement, and reassessment of EN may help reduce unnecessarily conservative feeding practices.

Procedure-related interruptions were another important barrier in the included studies (Haseeb et al., 2023). This finding is supported by the ESPNIC recommendations, which identify prolonged fasting around procedures and interruptions due to perceived intolerance as common barriers and recommend minimising unnecessary EN interruptions (Tume et al., 2025). A recent systematic review of 26 ICU studies similarly found that diagnostic and surgical procedures, gastrointestinal intolerance, and feeding-tube problems were major causes of EN interruption and contributed to inadequate nutrient delivery (Pouwels et al., 2025). More recently, Maffeo et al. (2026) also identified procedural interruptions as a barrier to early EN in critically ill children. Therefore, the clinical challenge extends beyond initiating EN early to maintaining feeding continuity and promptly resuming feeds when interruptions are no longer clinically required.

Clinician-related and organisational barriers identified in this review further indicate that inadequate EN delivery cannot be attributed solely to patient instability. Limited knowledge, uncertainty in feeding decisions, inadequate dietitian support, insufficient feeding resources, and inconsistent documentation suggest that the organisational environment strongly influences

bedside practice (Alsohime et al., 2021; Anku et al., 2026; Zaher et al., 2024). This interpretation is supported by a recent mixed-methods systematic review of EN guideline implementation in intensive care, which identified healthcare professionals' knowledge, beliefs, self-efficacy, professional roles, collaboration, resources, and organisational norms as major determinants of guideline implementation (Li et al., 2025). Although that review focused primarily on adult ICUs, the similarity of these determinants to those identified in the present review suggests that EN delivery represents a broader implementation challenge in critical care. Accordingly, improving practice may require simultaneous attention to staff competency, interdisciplinary communication, resource availability, and organisational processes rather than focusing on individual clinicians alone.

Facilitators of Enteral Nutrition Delivery

The facilitators identified in this review provide insight into how these barriers may be addressed. Clear feeding protocols and evidence-based guidance were consistently associated with more structured EN practice (Ceci et al., 2026; Parikh et al., 2026; Tume et al., 2025). This finding is consistent with ESPNIC recommendations supporting a stepwise algorithmic approach to EN initiation and advancement, including explicit criteria for detecting and managing feeding intolerance (Tume et al., 2025). Irving et al. (2022) similarly highlighted feeding protocols as a strategy for earlier initiation, reduction of avoidable interruptions, and improved achievement of nutritional targets. Nevertheless, the persistence of nutritional deficits following protocol implementation in some included studies, particularly Ceci et al. (2026), suggests that protocol availability alone may be insufficient. Effective protocols require integration into workflow, clinician adherence, ongoing monitoring, and adaptation to the characteristics of individual patients and local PICU resources.

Multidisciplinary collaboration and professional competency also emerged as important facilitators. This finding is supported by previous literature emphasising

collaboration with critical care-trained dietitians and coordinated assessment, prescription, and monitoring of nutrition therapy (Irving et al., 2022). More recent pediatric evidence further strengthens the nursing implications of this finding. Maffeo et al. (2026) identified multidisciplinary teamwork and nurse-led feeding protocols as facilitators of early EN and emphasised the pivotal role of pediatric critical care nurses in initiating and monitoring feeding. Thus, strengthening nurses' knowledge and decision-making capacity may contribute not only to safe feed administration but also to earlier recognition of feeding intolerance, unnecessary interruptions, and failure to achieve nutrition goals.

Routine monitoring and documentation of nutritional goals may further reinforce these facilitators. In the present review, structured documentation and monitoring made nutritional targets more visible within daily PICU care (Parikh et al., 2026; Sundar et al., 2021). This is particularly relevant because recent evidence continues to show substantial heterogeneity in nutrition practices and outcome measurement across PICU studies (Puroskey et al., 2026). Standardised monitoring may therefore serve two functions: supporting early clinical recognition of nutritional deficits and improving consistency in evaluating the effectiveness of EN practice across settings.

Implementation Strategies to Improve Enteral Nutrition Practice

The implementation strategies identified in this review, including standardised EN protocols, quality improvement initiatives, and guideline-informed practice, are best viewed as complementary rather than standalone approaches. Standardised protocols can clarify clinical decisions, while quality improvement processes can support adherence through documentation, monitoring, feedback, and workflow integration. The broader ICU implementation literature similarly indicates that successful EN guideline implementation depends on healthcare provider knowledge and confidence, interprofessional collaboration, organisational resources, and supportive

practice environments (Li et al., 2025). Consequently, simply introducing a protocol is unlikely to produce sustained improvement unless barriers to its actual use are simultaneously addressed.

Variation in guideline uptake across PICUs also illustrates the importance of contextual adaptation (Tume et al., 2025). International guidance provides an evidence-based framework, but individual PICUs differ in patient populations, staffing, dietitian availability, equipment, and organisational processes. Recent pediatric reviews similarly emphasise heterogeneity in nutrition practices and the continuing need to tailor nutritional approaches to illness severity and phase of critical illness (Gunst et al., 2025; Purosky et al., 2026). Therefore, implementation strategies may be more effective when standardised recommendations are combined with local assessment, staff engagement, and continuous evaluation rather than applied as uniform protocols without consideration of context.

Implications for Practice and Future Research

The findings of this review have several implications for pediatric critical care nursing and multidisciplinary PICU practice. EN delivery should be recognised as a shared clinical responsibility involving nurses, physicians, and dietitians, rather than a task delegated to a single profession, because effective nutrition support in critically ill children depends on coordinated decision-making, bedside monitoring, and timely adjustment of feeding plans (Briassoulis et al., 2024; Gunst et al., 2025; Latten, 2025). The high frequency of feeding interruptions suggests that PICUs may benefit from strategies to minimise avoidable fasting, improve review of interruptions, and strengthen post-interruption compensation where clinically appropriate, given the growing evidence that interruptions remain a major contributor to inadequate nutrient delivery in critically ill children (Gunst et al., 2025; Maffeo et al., 2026; Solana et al., 2023). The findings highlight the importance of clinician education, structured nutrition monitoring, and accessible dietitian support as part of routine critical care practice, particularly because guideline-informed and protocol-supported nutrition care appears more

feasible when supported by multidisciplinary expertise and clear monitoring systems (Ha, 2024; Purosky et al., 2026; Tume et al., 2020).

This review also highlights important evidence gaps. The included studies were methodologically heterogeneous and predominantly observational, and some were conducted in broader critical care settings rather than exclusively in PICUs. In addition, much of the literature focused on barriers and process outcomes rather than patient-centred clinical outcomes. The current evidence indicates a need for further PICU-specific implementation studies evaluating EN protocols, quality improvement interventions, and nurse-led or multidisciplinary feeding strategies in relation to nutritional adequacy, feeding interruptions, and clinical outcomes (Maffeo et al., 2026; Purosky et al., 2026). The identified evidence gaps also highlight the need for further studies in resource-limited settings to examine how staffing, equipment availability, and specialist support influence EN delivery and the implementation of context-sensitive strategies (Gunst et al., 2025).

Conclusion

This scoping review mapped the current evidence on barriers, facilitators, and implementation strategies for the delivery of enteral nutrition (EN) in critically ill children admitted to pediatric intensive care units (PICU) and related critical care settings. The findings show that EN delivery is influenced by a complex interplay of patient instability, feeding interruptions, clinician-related challenges, and organisational or system-level limitations. The most prominent barriers included hemodynamic instability, vasoactive drug use, gastrointestinal intolerance, procedure-related interruptions, limited dietitian support, inadequate feeding resources, and inconsistent nutrition documentation. At the same time, several facilitators were identified, particularly the presence of clear feeding protocols, multidisciplinary collaboration, nursing competency, dietitian involvement, and structured monitoring of nutritional goals. This review also identified several implementation strategies that may strengthen EN practice in critically ill children, including standardised EN protocols, quality improvement initiatives, documentation-based interventions, and guideline-informed practice harmonisation.

However, the available evidence suggests that these strategies may not fully eliminate nutritional deficits, especially in children with severe clinical instability or in resource-limited settings. Overall, improving EN delivery in PICU likely requires a multifaceted and context-sensitive approach that combines protocol development, interruption management, clinician training, multidisciplinary nutrition support, and stronger organisational readiness.

For pediatric critical care nursing practice, the findings highlight nurses' central role in supporting timely initiation of EN, monitoring feeding tolerance, identifying and minimising avoidable interruptions, documenting nutritional progress, and collaborating closely with physicians and dietitians to optimise nutritional care. Strengthening nursing competency in EN management and integrating nutrition monitoring into routine PICU care may help improve the consistency and adequacy of EN delivery in critically ill children. These findings support targeted nursing actions in PICU practice, and future PICU specific implementation research is needed to determine which strategies are most effective in improving nutritional adequacy and clinical outcomes. Future PICU specific research should evaluate standardised EN protocols, quality improvement interventions, and nurse-led or multidisciplinary feeding strategies, with particular attention to nutritional adequacy, feeding interruptions, and patient-centred outcomes in clinically unstable children and resource-limited settings.

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