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INTERVENTIONS IN POST-EXTUBATION DYSPHAGIA: A SCOPING REVIEW

INTERVENÇÕES NA DISFAGIA PÓS-EXTUBAÇÃO: UMA SCOPING REVIEW

INTERVENCIONES EN LA DISFAGIA POSTEXTUBACIÓN: UNA REVISIÓN DE ALCANCE

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RESUMO

Introdução: A disfagia pós-extubação (DPE) impacta negativamente na recuperação dos doentes críticos. No entanto, há pouca evidência sobre as intervenções para recuperar a função da deglutição, pelo que é essencial mapear as intervenções para abordagem da DPE relevantes para apoiar os cuidados de enfermagem.

Metodologia: Scoping review seguindo a metodologia do Joanna Briggs Institute. Em outubro de 2023, foi realizada uma pesquisa nas bases de dados MEDLINE (Via PubMed), Cochrane, Scielo, ScienceDirect e a CINAHL. Realizada pesquisa adicional para literatura cinzenta. A extração de dados foi guiada pelos critérios: doentes adultos em cuidados intensivos, extubados após ventilação mecânica invasiva por mais de 48 horas (população), DPE (conceito) e unidades de cuidados intensivos (contexto).

Resultados: Identificados 1892 artigos, aos quais se juntaram 59 encontrados na literatura cinzenta. Incluídos 14 artigos para análise. Exercícios de fortalecimento muscular e ajustes posturais são as estratégias de reabilitação e compensatórias mais referidas.

Discussão: A DPE tem vindo a tornar-se foco de atenção devido à elevada incidência e prevalência. Da análise realizada, não foi possível determinar quando as intervenções devem ser iniciadas após a extubação, que dose, frequência e duração devem ser usadas, ou que acompanhamento é necessário para estes doentes.

Conclusão: Esta revisão identificou as intervenções compensatórias e de reabilitação para a DPE em doentes internados em cuidados intensivos. A evidência continua a ser insuficiente para definir o momento ideal, a dose, a frequência, a duração ou o acompanhamento, o que reforça a necessidade de protocolos estruturados e de estudos de intervenção.

Descritores: Enfermagem, Cuidados Críticos, Transtornos de Deglutição, Ventilação Mecânica, Extubação Traqueal.

ABSTRACT

Introduction: Post-extubation dysphagia (PED) has a negative impact on the recovery of critically ill patients. However, evidence for interventions to restore swallowing function is scarce, therefore, mapping relevant interventions is essential to support nursing care.

Methodology: Scoping review following the Joanna Briggs Institute methodology. A search of MEDLINE (via PubMed), Cochrane, Scielo, ScienceDirect and CINAHL databases was carried out in October 2023. An additional search was conducted in the grey literature. Data extraction was based on the following criteria: adult patients in intensive care, extubated after more than 48 hours of

invasive mechanical ventilation (population), PED (concept) and intensive care units (context).

Results: 1892 articles were retrieved, plus 59 found in the grey literature. 14 articles were included for analysis. Muscle strengthening exercises and postural adjustments are the most reported rehabilitation and compensatory strategies.

Discussion: PED has become a focus of attention due to its high incidence and prevalence. From the analysis, it was not possible to determine when interventions should be started after extubation, what dose, frequency and duration should be used, or what follow-up is required for these patients.

Conclusion: This review mapped compensatory and rehabilitation interventions for PED in critical care patients. Evidence remains insufficient to define optimal timing, dose, frequency, duration, or follow-up, supporting the need for structured protocols and further intervention studies.

Descriptors: Nursing, Critical Care, Deglutition disorders, Mechanical ventilation, Airway Extubation.

RESUMEN

Introducción: La disfagia postextubación (DPE) afecta negativamente a la recuperación de los pacientes críticos. Sin embargo, la evidencia de las intervenciones para restaurar la función de deglución es limitada, por lo tanto, lo mapeo de las intervenciones pertinentes es esencial para apoyar la atención de enfermería.

Metodología: Siguiendo la metodología del Instituto Joanna Briggs se desarrolló una revisión de alcance. Se realizaron búsquedas en MEDLINE (a través de PubMed), Cochrane, Scielo, ScienceDirect y CINAHL en octubre de 2023. Se realizó búsqueda adicional de literatura gris. La extracción de datos se guió por los criterios: pacientes adultos en cuidados críticos, extubados tras ventilación mecánica invasiva durante más de 48 horas (población), DPE (concepto) y unidades de cuidados intensivos (contexto).

Resultados: Se recuperaron 1892 artículos, 59 más en literatura gris. Se incluyeron 14 artículos para su revisión. Los ejercicios de fortalecimiento muscular y los ajustes posturales son las estrategias de rehabilitación y compensación más referenciadas.

Discusión: La DPE se ha convertido en un foco de atención debido a su elevada incidencia y prevalencia. Del análisis, no fue posible determinar cuándo deben iniciarse las intervenciones tras la extubación, qué dosis, frecuencia y duración deben utilizarse, ni qué seguimiento es necesario en estos pacientes.

Conclusión: Esta revisión recopiló intervenciones compensatorias y rehabilitadoras para la disfagia posextubación en pacientes de cuidados intensivos. La evidencia sigue siendo insuficiente para definir el momento óptimo, la dosis, la frecuencia,

la duración o el seguimiento, por lo que se necesitan protocolos estructurados y más estudios de intervención.

Descriptor: Enfermería, Cuidados Críticos, Trastornos de la deglución, Ventilación mecánica, Extubación Traqueal.

INTRODUCTION

The need for invasive mechanical ventilation (IMV) is one of the main reasons for admission to intensive care units (ICUs), usually requiring endotracheal intubation. Post-extubation dysphagia (PED) is increasingly recognized as a clinically relevant problem in critically ill adults across different diagnostic groups(1). Although the COVID-19 pandemic increased attention to dysphagia in ICU patients because of the high number of patients requiring prolonged IMV(2,3), PED is not restricted to this population. It affects 41% of critically ill patients, and a significant percentage of these patients have silent aspiration(4). There is also a correlation between the length of IMV and the occurrence of PED(5), which means that this is a problem that affects a population of patients with a wide range of clinical conditions.

The development of dysphagia can occur after extubation, which, due to its consequences, specifically aspiration pneumonia, is a cause for concern in ICUs. This condition may persist until hospital discharge and is an independent predictor of death(6). It may even persist for long periods after discharge, with recovery extending up to five years in some cases(7).

PED should be distinguished from pre-existing neurogenic dysphagia. While neurogenic dysphagia is primarily related to central or peripheral neurological impairment, PED in critically ill patients is usually multifactorial and may involve laryngeal trauma, reduced laryngeal sensation, ICU-acquired weakness, impaired sensorium, gastroesophageal reflux, and impaired breathing-swallowing coordination(1). This distinction is clinically relevant because prognosis, intervention targets, and rehabilitation pathways may differ according to the underlying mechanism.

In the acute phase after extubation, swallowing impairment may be driven by airway trauma, oedema, altered laryngeal sensitivity, reduced alertness, and disrupted breathing-swallowing coordination. During the subacute phase, persistent dysphagia may be influenced by ICU-acquired weakness, respiratory muscle dysfunction, physical deconditioning, and delayed recovery of sensorimotor swallowing control(1,8). This progression supports the need to map both compensatory strategies aimed at immediate safety and rehabilitation interventions aimed at functional recovery.

Given the associated complications, PED negatively affects patient outcomes. However, evidence

on interventions to improve or recover swallowing function is scarce(6,9). Therefore, it is relevant to map the relevant interventions to support nursing care and guide further research on dysphagia treatment in PED.

A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis was conducted. No current or underway systematic or scoping reviews aimed at mapping reported interventions to address PED in critical care patients were identified.

REVIEW QUESTION

What interventions have been reported to address PED in critical care patients?

METHODOLOGY

A scoping review was developed following the Joanna Briggs Institute comprehensive framework and reported in accordance with the Preferred Reporting Items for Systematic Reviews—Scoping Reviews (PRISMA-ScR)(10–12). The protocol for this scoping review has been previously published in the Open Science Framework Registries(13). For eligibility criteria, the Participants, Concept, and Context (PCC) guided the search. For participants, adult critical care patients who were successfully extubated after IMV for more than 48 hours were included. Patients with head and neck disease/surgery were excluded because dysphagia in these patients may result primarily from structural, oncological, or surgical mechanisms rather than from IMV and endotracheal extubation. This criterion was used to preserve conceptual consistency with PED in critically ill adults(8). The concept considered was PED, an oropharyngeal swallowing disorder following the liberation from an endotracheal tube(4), and the context was ICUs.

This scoping review included experimental and quasi-experimental study designs, including randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies. In addition, analytical or descriptive observational studies, including prospective and retrospective cohort studies, case-control studies, analytical cross-sectional studies, case series, individual case reports, and descriptive cross-sectional studies, were also considered for inclusion.

The search strategy aimed to locate published and unpublished studies, and an initial limited search of MEDLINE was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles and the index terms used to describe the articles were used to develop a complete search strategy for MEDLINE (via PubMed), Cochrane Library, Scielo, Science Direct, and CINAHL (via EBSCO). The reference list of the retrieved articles was manually searched for more

records of potential interest for this review. Additional searches for grey literature were conducted in OpenGrey, Google Scholar, and the Portuguese Open Access Scientific Repository (RCAAP). The search strategy, including all identified keywords and index terms, was adapted for each included database and information source. Table 1 shows the full search strategy for PubMed. The reference list of all included sources of evidence was screened for additional studies. Studies published in Portuguese, English, and Spanish, with no time limit, were considered eligible. The search was conducted in October 2023, in accordance with the *a priori* protocol

registered in the Open Science Framework (13). In accordance with the registered protocol, the formal search was conducted in October 2023 and was not fully updated. References published after this date were used only to contextualise the background and discussion. A limited confirmatory check in PubMed covering the period from November 2023 to December 2025 did not suggest the emergence of additional primary intervention studies likely to alter the intervention categories mapped. However, because this was not a full updated search, the findings should be interpreted within the temporal limits of the original search.

Table 1 - Complete search strategy used in PubMed

Component	Content
Conceptual block 1 - Population/ Context	“critical care” OR “intensive care” OR “artificial respiration” OR ventilat* OR “mechanical ventilation” OR wean* OR post-extubation OR “mechanical ventilators” OR (endotracheal AND extubation)
Conceptual block 2 - Concept (dysphagia)	dysphagia OR “deglutition disorders” OR swallow* OR aspirat* OR (deglutition AND disorders) OR aspirant* OR aspire*
Conceptual block 3 - Interventions	intervention* OR treat* OR manag*
Full Boolean string (as executed in PubMed)	(Block 1) AND (Block 2) AND (Block 3)
Filters applied	Humans; Languages: English, Portuguese, Spanish; Age: Adult (19+ years)
Date of search	October 2023
Records retrieved	1109
Full MeSH-expanded string	
“(((“critical care” OR “intensive care” OR “artificial respiration” OR ventilat* OR mechanical ventilation OR wean* OR post-extubation OR “mechanical ventilators” OR (endotracheal AND extubation)) AND (dysphagia OR “deglutition disorders” OR swallow* OR aspirat* OR (deglutition AND disorders) OR aspirant* OR aspire*)) AND (intervention* OR treat* OR manag*)), “Humans, English, Portuguese, Spanish, Adult: 19+ years”, (“critical care”[All Fields] OR “intensive care”[All Fields] OR “artificial respiration”[All Fields] OR “ventilat*”[All Fields] OR (“respiration, artificial”[MeSH Terms] OR (“respiration”[All Fields] AND “artificial”[All Fields]) OR “artificial respiration”[All Fields] OR (“mechanical”[All Fields] AND “ventilation”[All Fields]) OR “mechanical ventilation”[All Fields] OR “wean*”[All Fields] OR “post-extubation”[All Fields] OR “mechanical ventilators”[All Fields] OR (“endotracheal”[All Fields] OR “endotracheally”[All Fields]) AND (“airway extubation”[MeSH Terms] OR (“airway”[All Fields] AND “extubation”[All Fields]) OR “airway extubation”[All Fields] OR “extubated”[All Fields] OR “extubation”[All Fields] OR “extubations”[All Fields] OR “extubate”[All Fields] OR “extubating”[All Fields])))) AND (“deglutition disorders”[MeSH Terms] OR (“deglutition”[All Fields] AND “disorders”[All Fields]) OR “deglutition disorders”[All Fields] OR “dysphagia”[All Fields] OR “dysphagias”[All Fields] OR “deglutition disorders”[All Fields] OR “swallow*”[All Fields] OR “aspirat*”[All Fields] OR (“deglutition”[MeSH Terms] OR “deglutition”[All Fields] OR “deglutitions”[All Fields] OR “deglutitive”[All Fields]) AND (“disease”[MeSH Terms] OR “disease”[All Fields] OR “disorder”[All Fields] OR “disorders”[All Fields] OR “disorder s”[All Fields] OR “disordes”[All Fields])) OR “aspirant*”[All Fields] OR “aspire*”[All Fields]) AND (“intervention*”[All Fields] OR “treat*”[All Fields] OR “manag*”[All Fields])) AND (humans[Filter]) AND (english[Filter] OR portuguese[Filter] OR spanish[Filter]) AND (alladult[Filter]))”	

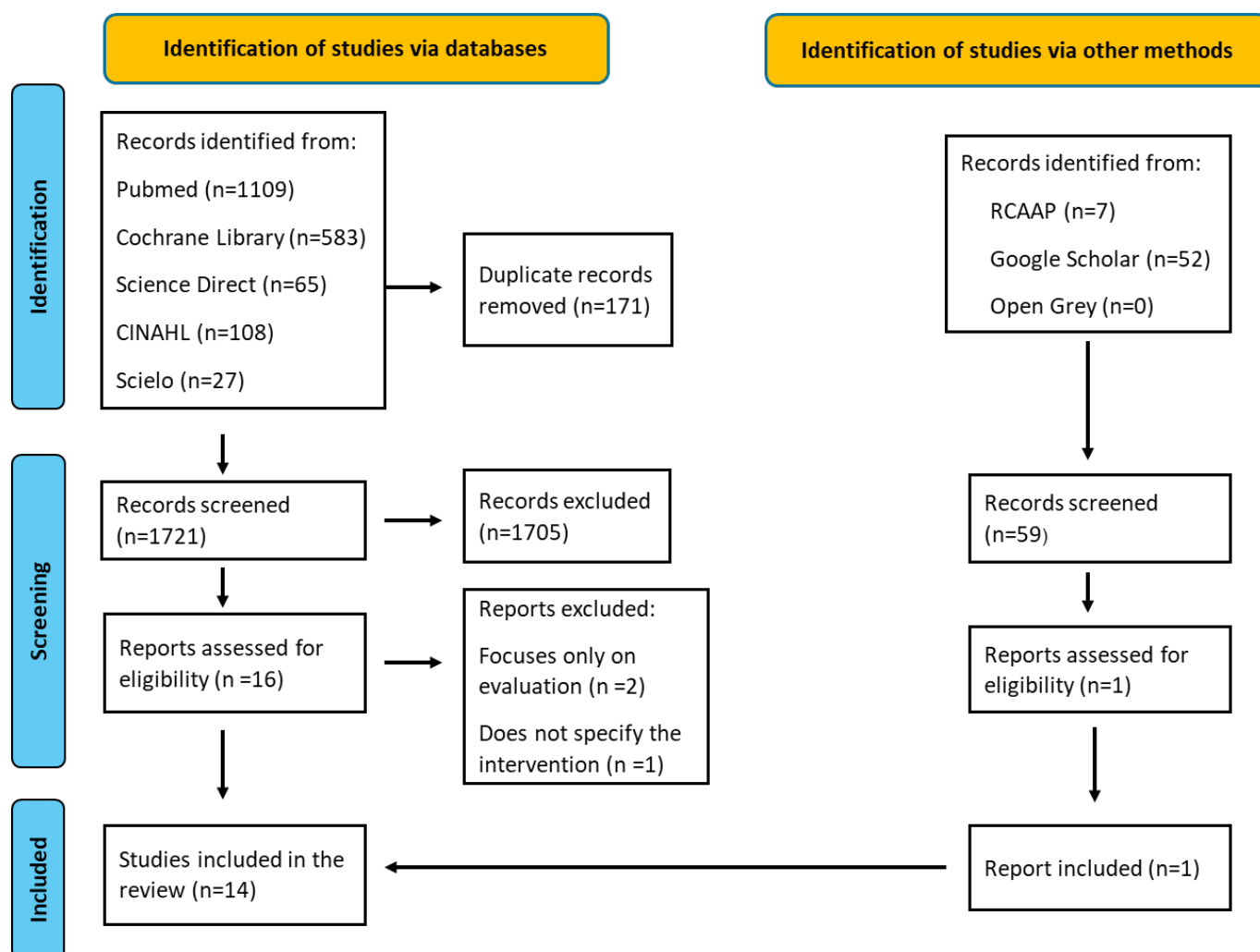
Following the search, all identified citations were collated and uploaded into the Rayyan© web tool, and duplicates were removed. Two independent reviewers performed the first screening of titles and abstracts for assessment against the inclusion criteria. Potentially relevant sources were retrieved in full. Two independent reviewers assessed the full text of selected citations in detail against the inclusion criteria. Reasons for excluding sources of evidence that did not meet the inclusion criteria at the full-text stage were recorded and reported. Disagreements between the reviewers at each stage of the selection process were resolved by consensus discussion with an additional reviewer. The search results and the study inclusion process are reported in full in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram(10,11).

Data were extracted from included papers by two independent reviewers using a data extraction tool developed by the reviewers. The data extracted include two tables with specific details about authors, country and year of publication, study methods, and key findings (interventions addressing PED in critical care patients) relevant to the review question. The classification of the interventions was defined a priori, following the approach presented by Bath(14).

RESULTS

Data search resulted in 1892 records, adding 59 found in grey literature. After duplicate removal, screening, and selection, 14 studies were included for review. Figure 1 details the identification, screening, and selection process:

Figure 1 – Flowchart adapted from Page et al. (2021) and Tricco et al. (2018)



Of the studies included, two were conducted with healthcare professionals to identify (survey) and explore (focus group) interventions used to address PED. The remaining studies, which used

different methodologies, included a total of 449 patients who received different interventions. The reasons for admission and the need for IMV varied, but in 40% of cases (178 patients) the reason for

admission was COVID-19 and in 13% (60 patients) it was post-stroke. The proportion of COVID-19 patients should be interpreted in light of the period in which several included studies were published, rather than as an indication that PED is specific to COVID-19. There were also several patients with comorbidities predisposing to the development of dysphagia, although it was not reported whether dysphagia was present prior to hospitalisation.

The reported mean age ranged from 48.6 to 67.4 years and the duration of intubation and IMV ranged from 6.8 to 14 days, but in one study (S1) the duration of mechanical ventilation was not reported and several studies only mentioned that the interventions were performed in patients with

IMV for more than 48 hours. None of the studies reported the duration of sedation or whether patients received neuromuscular blockade. Only in one study the diameter of the orotracheal tubes used was reported.

The time elapsed between extubation and the start of interventions was only reported in one study (S8), in which electrical stimulation of the pharynx was started four hours after extubation. Dose, frequency, duration, and follow-up procedures were generally not reported. Most studies included in this review were published in the last five years (n=10). Table 2 summarizes the data from each selected study, including the methodological design.

Table 2 - Title and origin of included studies

Study	Author	Title	Country	Methods
S1	Clayton et al. (2022)(15)	The addition of respiratory muscle strength training to facilitate swallow and pulmonary rehabilitation following massive tissue loss and severe deconditioning: A case series	Australia	Case series
S2	El Gharib et al. (2019)(16)	Effectiveness of Therapy on Post-Extubation Dysphagia: Clinical and Electromyographic Findings	Brazil	Pre-post study
S3	Lima et al. (2020)(17)	Functional development of swallowing in ICU patients with COVID-19	Brazil	Pre-post study
S4	Macht et al. (2012)(18)	Diagnosis and treatment of post-extubation dysphagia: Results from a National Survey	United States of America	Survey
S5	Nielsen et al. (2023)(19)	Intensive care professionals' perspectives on dysphagia management: A focus group study	Denmark	Focus group
S6	Regan et al. (2021)(20)	Post-extubation dysphagia and dysphonia amongst adults with COVID-19 in the Republic of Ireland: A prospective multi-site observational cohort study	Ireland	Prospective observational cohort study
S7	Soyama et al. (2022)(21)	Oropharyngeal dysphagia telerehabilitation in the Intensive Care Unit for COVID-19: a case report	Japan	Case report
S8	Suntrup-Krueger et al. (2023)(22)	Pharyngeal electrical stimulation for postextubation dysphagia in acute stroke: a randomized controlled pilot trial	Germany	Randomized controlled trial

Study	Author	Title	Country	Methods
S9	Traugott et al. (2021)(23)	Successful treatment of intubation-induced severe neurogenic post-extubation dysphagia using pharyngeal electrical stimulation in a COVID-19 survivor: a case report	Austria	Case report
S10	Turra et al. (2021)(24)	Efficacy of speech therapy in postintubation patients with oropharyngeal dysphagia: a randomized controlled trial	Brazil	Randomized controlled trial
S11	Wu et al. (2019)(25)	Effects of a swallowing and oral care intervention for patients following endotracheal extubation: a pre- and postintervention study	China	Pre-post study
S12	Algendy & Bahgat (2021) (26)	Effect of Oral Care Intervention and Safe-Swallowing Education on Dysphagia among ICU Patients Post Endotracheal Extubation	Egypt	Quasi-experimental
S13	Siao et al., (2023)(27)	Effects of a swallowing and oral-care program on resuming oral feeding and reducing pneumonia in patients following endotracheal extubation: a randomized, open-label, controlled trial	Taiwan	Randomized controlled trial
S14	Hwang et al., (2007)(28)	Pre-emptive swallowing stimulation in long-term intubated patients	Korea	Randomized controlled trial

The interventions aimed at PED were classified according to the approach proposed by Bath(14), which divides them into compensatory and rehabilitation strategies. Compensatory strategies aim at airway safety and providing adequate hydration/

nutrition. Rehabilitation strategies intend to recover swallowing function. Muscle strengthening exercises and postural adjustments are the most frequently referenced strategies for rehabilitation and compensation (Table 3).

Table 3 - Interventions addressing PED

Purpose	Intervention	Study	Description
Rehabilitation	Muscle strengthening exercises	S1, S6	Inspiratory and expiratory respiratory muscle strength training assisted with training devices
		S3, S6, S10, S11, S13	Orofacial exercises
		S4, S6	Masako maneuver
		S6	Chin tuck against resistance
	Vocal exercises	S3, S6, S10	Vocal cord adduction exercises
		S3, S6, S10	Vocal function exercises
	Neurostimulation	S4	Neuromuscular electrical stimulation
		S4	Deep nerve stimulation
		S8, S9	Pharyngeal electrical stimulation
	Sensory stimulation	S5, S11, S13	Therapeutic tooth brushing
		S13, S14	Thermo-tactile stimulation
		S6	Not described
	Other interventions	S5, S14	Facio-oral tract therapy: posture and facilitation are therapeutically used to improve motor control and perception
		S5	Bobath's method of stroke rehabilitation
		S7	Telerehabilitation
		S11, S13	Salivary gland massage
		S14	Cervical motion range exercises

Purpose	Intervention	Study	Description
Compensation	Postural adjustments	S4	Chin down posture
		S5, S6, S10, S11	Upright position
	Swallowing maneuvers	S4	Small sips/small amounts
		S4	Multiple swallows
		S4, S10	Clearing cough
		S2, S4, S6	Effortful swallow
		S2, S4	Mendelsohn maneuver
		S4	Head turn to one side
		S4	Supraglottic swallow
	Modification of food consistencies	S4, S5, S10, S11	Solid food texture and liquid thickness modifications
	Other interventions	S6	Vocal hygiene
		S10	Environmental factors adjustments
		S12, S13	Safe-swallowing education

When the interventions mapped in Table 3 are considered in light of the study designs reported in Table 2, a heterogeneous evidence base emerges. Rehabilitation interventions are predominantly supported by case reports and case series (S1, S7, S9), pre-post studies (S2, S3, S11), and a small number of randomised controlled trials (S8, S10, S13, S14). Compensatory strategies are largely derived from a national survey of clinical practice (S4), a focus group with intensive care professionals (S5), and an observational cohort study (S6). The category with the most consistent experimental support is oral-care-based programmes combined with safe-swallowing education, which are addressed in a pre-post study (S11), a quasi-experimental study (S12), and a randomised controlled trial (S13). Neurostimulation techniques, particularly pharyngeal electrical stimulation, are supported by one randomised controlled pilot trial (S8) and one case report (S9). This distribution should be read descriptively, in line with the scoping review methodology, and not as an appraisal of effectiveness.

DISCUSSION

The main findings from this scoping review show that most evidence published concerning PED interventions is recent, mainly from the last five years. Muscle strengthening exercises (seven studies) and postural adjustments (five studies) are the most frequently referenced rehabilitation and

compensation strategies. Muscle strengthening and postural adjustments are consensual strategies to address dysphagia(14,29,30), despite the lack of evidence on the effectiveness of these strategies in recovering swallowing function(14).

It is widely acknowledged in the literature that a significant part of dysphagia research has focused on stroke patients, with findings often extrapolated to other populations with varying clinical conditions(31). This focus stems from the high incidence of dysphagia in stroke survivors(32), which serves as a primary model for understanding swallowing disorders across different aetiologies, reflecting the general trend of applying insights from stroke-related dysphagia research to other clinical conditions. Nevertheless, PED and post-stroke dysphagia differ primarily in their aetiology, pathophysiology, and clinical management. In critically ill patients, PED is considered multifactorial.

Mechanisms proposed for the development of PED include direct trauma from intubation or tracheostomy tubes, neuromyopathy leading to muscular weakness, diminished laryngeal sensory function, impaired sensorium, gastroesophageal reflux, and dyssynchronous breathing and swallowing(1,8). By contrast, post-stroke dysphagia primarily results from neurological impairment due to stroke, affecting the brain areas responsible for coordinating the swallowing process. Stroke can lead to disruptions in the voluntary and reflexive phases of swallowing, often necessitating different

therapeutic approaches focused on neurological rehabilitation and compensation techniques(33). Moreover, interventions and management strategies for PED might address risk factors, which include minimizing the duration of intubation, carefully monitoring swallowing function post-extubation, and possibly using therapies to reduce inflammation and promote healing of the airway and pharyngeal structures(8). In contrast, management of post-stroke dysphagia may involve more specialized rehabilitation techniques focused on improving neurological function and compensating for deficits, such as speech and language therapy, exercises to strengthen swallowing muscles, and strategies to modify food textures and swallowing techniques to ensure safety(34).

A clear example of such differences is when comparing guidelines to resume oral intake and medical nutrition therapy for ICU and stroke patients(35,36). For ICU patients admitted for more than 48 hours, there is strong consensus supporting early enteral nutrition when oral intake is not possible and there are no contraindications, whereas in stroke patients, oral intake and enteral nutrition should be considered within seven days of admission after stroke. These differences highlight the importance of tailored assessment and intervention strategies for each condition, recognizing the unique pathophysiological mechanisms and clinical presentations involved. It reinforces the need for broader research encompassing diverse clinical backgrounds to tailor dysphagia management strategies effectively.

The results from this scoping review suggest that PED has become increasingly recognised as clinically relevant, partly because of its high incidence and prevalence. PED has multiple causes and significant risk factors, such as the disease's severity and the tracheal intubation duration(37), which are not easily modifiable during critical care hospitalization. Recently, it has also been found to be associated with increased mortality up to one year after ICU admission(38). Therefore, PED may be considered within the broader spectrum of post-intensive care sequelae, with a need for interventions immediately after extubation to prevent swallowing dysfunction and impairment of swallowing structures(39). Nevertheless, decision-making on interventions aimed at preventing complications and rehabilitating swallowing function is hampered in clinical practice, given the limited knowledge of professionals(19,40), especially nurses(41,42). Furthermore, most ICUs do not provide guidelines, resources, and training for dysphagia management(43), which highlights the emerging need to ascertain which interventions could help minimize or treat PED, making it urgent to carry out research focusing on interventions targeted at swallowing disorders in critically ill patients(44).

Despite the different clinical presentations, and although the work of Bath and colleagues (14) was

carried out in the context of post-stroke dysphagia, the proposed classification of interventions is relevant to PED. A recent expert panel(44) used a similar distinction, distinguishing between compensatory techniques (designed to minimize the risks of dysphagia) and targeted rehabilitation interventions (designed to improve swallowing physiology) for the management of swallowing disorders in ICU patients, reinforcing its usefulness to provide guidance for how to classify the interventions in the context of swallowing following artificial airway use.

PED is a complex clinical condition, so a multidisciplinary approach is needed to understand its pathophysiological mechanisms. Furthermore, its persistence at discharge and its interdependence with breathing and muscle strength are also associated with physical dysfunction(39), which can aggravate an already complex clinical condition. The most often used strategies to address PED have focused mainly on preventing aspiration pneumonia and less on swallowing rehabilitation(19,40). Considering the gap in robust evidence to support practice, a clinical management algorithm has recently been proposed to improve the quality of care by listing compensatory strategies and rehabilitation interventions (44). In their position paper, the nutrition in the ICU European Society for Clinical Nutrition and Metabolism special interest group highlights the urgent need for solid evidence to guide ICU healthcare professionals(45), considering the impact of malnutrition on these patients' outcomes.

From a Rehabilitation Nursing perspective, these findings are relevant because several mapped interventions are compatible with the scope of structured functional rehabilitation programs. In Portugal, the Rehabilitation Nurse Specialist has regulated competencies for designing, implementing, and monitoring differentiated rehabilitation nursing plans aimed at preventing complications, maximizing functional potential, and promoting autonomy (46). To support clinical translation, the interventions mapped in this review may be operationally grouped into three categories according to their level of integration into the Rehabilitation Nurse Specialist's scope of practice. The first category includes interventions that may be directly integrated into an autonomous rehabilitation nursing care plan, namely postural adjustments, oral care and therapeutic toothbrushing, salivary gland massage, safe-swallowing education, cervical range-of-motion exercises, respiratory muscle conditioning and cough effectiveness training within respiratory rehabilitation programs, monitoring of fatigue and respiratory-swallowing coordination, and support for progressive oral intake when clinically appropriate. The second category includes interventions that require multidisciplinary decision-making, such as modification of food consistencies and liquid thickness, swallowing manoeuvres that depend on instrumental swallowing

assessment, and decisions on the resumption of oral feeding. The third category includes interventions that require specific advanced training or specialized equipment, namely pharyngeal electrical stimulation, neuromuscular electrical stimulation, facio-oral tract therapy, Bobath-based approaches, and structured telerehabilitation programs.

This operational classification highlights that, while the Rehabilitation Nurse Specialist cannot independently deliver the full spectrum of mapped interventions, a substantial part of the compensatory and rehabilitation care for PED falls within the autonomous nursing scope, particularly in the transition from acute stabilization to functional recovery. This positions Rehabilitation Nursing as a central element in articulating PED care across the multidisciplinary team.

Around 13% of the patients studied were admitted as a result of a stroke and in other cases several patients had comorbidities predisposing to the development of dysphagia, so it is unclear whether this problem was due to intubation or to their clinical condition.

Several factors that may influence the development of swallowing disorders after extubation remain to be clarified. Although in theory intubation time and duration of IMV may influence the development of PED, this relationship remains uncertain as it was not demonstrated in the studies reviewed, as well as the relationship between sedation time and the use of neuromuscular blockers or the influence of the diameter of the orotracheal tubes used. As increasing age is a factor that predisposes to the onset of swallowing disorders, its influence has not been studied.

Based on the analysis of the included studies, it was not possible to determine when interventions should be started after extubation, what dose, frequency and duration should be used, or what follow-up is required for these patients.

More research is, therefore, essential to understand risk factors, causal relationships and to develop evidence-based strategies to meet the needs of these patients and reduce their complications. The impact of dysphagia on people's quality of life and health outcomes is already well documented in the literature for different clinical conditions, including intensive care patients (8). In this context, these results make it possible to advance research, specifically into the effectiveness of these interventions on health outcomes, considering the scarcity of evidence in ICUs (9).

This scoping review has limitations, such as selection bias, which is inherent to review processes and should be acknowledged. Language limitations in selected studies may have also hindered the identification of potentially relevant studies for this review. Another consideration is that the database search was completed in October 2023, in accordance with the registered protocol. A confirmatory

scoping check covering the period up to December 2025 did not identify new primary intervention studies that would alter the evidence map presented. Nonetheless, this temporal scope should be considered when interpreting the results.

CONCLUSION

This scoping review mapped compensatory and rehabilitation interventions reported for PED in critical care patients, mainly muscle strengthening exercises, postural adjustments, swallowing manoeuvres, sensory stimulation, oral care, safe-swallowing education, and neurostimulation.

The findings show that PED management in critical care remains insufficiently standardized. The available studies do not provide enough evidence to determine the optimal timing, dose, frequency, duration, or follow-up of interventions. This absence of detailed intervention parameters is itself a relevant finding, as it limits the development of evidence-based protocols.

Given the clinical impact of PED, systematic screening and structured intervention pathways should be considered in critical care settings. Future research should include well-designed controlled studies evaluating swallowing recovery, feasibility, safety, adverse events, oral intake, aspiration pneumonia, nutritional outcomes, length of stay, and patient-centred outcomes.

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