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Artigo Original

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Development of the Pediatric Dysphagia Risk Screening Instrument (PDRSI)

Desenvolvimento do Instrumento de Rastreio para o Risco de Disfagia Pediátrica (IRRD-Ped)

Keywords

Deglutition
Deglutition Disorders
Mass Screening
Child
Child Health.

ABSTRACT

Purpose: Develop a screening tool to identify children at risk of dysphagia within hospitals. **Method:** The Pediatric Dysphagia Risk Screening Instrument (PDRSI), which consists of 23 questions, was developed by speech therapists, based on a review of academic articles and was intended to be answered by those responsible for the children in the hospital. The PDRSI was sent for expert review, in addition to realizing a pilot study. To check the validity criteria, PDRSI was answered by those responsible for the hospitalized children. Subsequently, the children went through a clinical evaluation of deglutition applying the Pediatric Dysphagia Assessment Protocol (PDAP). Each child's guardian signed a consent form. The subjects were divided into two groups (with dysphagia and those with normal swallowing). A relation between PDRSI questions and the PDAP outcome was observed, using the Person chi-square test or Fisher's exact test. The cutoff point for the presence of risk was defined for dysphagia through the ROC curve. The reliability of PDRSI was verified by the Cronbach α coefficient. **Results:** The sample consisted of 40 children with a median age of 3.7 months. There was a statistically significant association in eight items of the questionnaire. The internal consistency of PDRSI was 0.828. The cutoff point for risk for dysphagia was five points (sensitivity = 100% and specificity = 80%). **Conclusion:** Due to the satisfactory results found, the validation process of PDRSI should continue

Descritores

Deglutição
Transtornos de Deglutição
Programas de Rastreamento
Criança
Saúde da Criança

RESUMO

Objetivo: Desenvolver um instrumento de rastreio para a identificação de crianças com risco para disfagia, em ambiente hospitalar. **Método:** O Instrumento de Rastreio para o Risco de Disfagia Pediátrica (IRRD-Ped), constituído por 23 questões, foi desenvolvido por fonoaudiólogos, após revisão da literatura. Ele foi proposto para ser aplicado aos responsáveis por crianças em internação hospitalar. O IRRD-Ped foi enviado a juízes para análise, tendo sido também realizado um estudo piloto. Para verificar a validade de critério, aplicou-se o IRRD-Ped aos responsáveis por crianças internadas e, posteriormente, realizou-se, com estas crianças, avaliação clínica da deglutição, através do Protocolo de Avaliação da Disfagia Pediátrica (PAD-PED). Os responsáveis assinaram o Termo de Consentimento Livre e Esclarecido. Os sujeitos foram separados em dois grupos (com disfagia e com deglutição normal), sendo verificada a associação entre as questões do IRRD-Ped e o resultado do PAD-PED, através do teste qui-quadrado de Person ou exato de Fisher. Definiu-se o ponto de corte para presença de risco para disfagia através da Curva ROC. A confiabilidade do IRRD-Ped foi verificada pelo coeficiente α de Cronbach. **Resultados:** A amostra foi constituída por 40 crianças com mediana de idade de 3,7 meses. Verificou-se associação estatisticamente significativa em oito itens do instrumento. A consistência interna do IRRD-Ped foi de 0,828. O ponto de corte para o risco de disfagia foi de cinco pontos (sensibilidade = 100% e especificidade = 80%). **Conclusão:** Devido aos satisfatórios resultados encontrados, deve-se dar prosseguimento ao processo de validação do IRRD-Ped.

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INTRODUCTION

Speech-language therapy in the pediatric hospital environment aims to identify children with eating and swallowing disorders; the evaluation and management of the swallowing process; the prevention of complications resulting from dysphagia, such as aspiration pneumonia and malnutrition; a reduction in hospitalization time and costs; and an improvement in patient quality of life.

The clinical signs and symptoms of eating and swallowing disorders vary according to the child's age but may include bowing of the body during feeding, coughing, choking, altered breathing pattern, pneumonia or recurrent respiratory infections, refusal to eat, prolonged feeding period, asphyxia, wheezing, congestion, tachypnea, bradycardia, apnea, cyanosis during feeding, oxygen desaturation, respiratory noise, vocal changes, weight loss and/or difficulty gaining weight, dehydration, and malnutrition[1-3].

The incidence of dysphagia in the pediatric population is increasing, probably due to the growth in the survival rate of children with a history of prematurity, low birth weight, and complex medical conditions[3].

The assessment and early rehabilitation of dysphagia by a trained speech-language therapist is essential to prevent future medical complications and should have a high priority in health care practices[4].

The first step in identifying the risk of oropharyngeal dysphagia and aspiration is the application of a screening instrument[5]. The use of systematic screening for dysphagia accelerates referral for speech-language therapy assessment and treatment, resulting in a significant decrease in cases of aspiration pneumonia and in improvements to the patient's general condition[5,6].

When dysphagic children are in a hospital environment, they should be identified quickly to avoid both negative consequences associated with swallowing problems such as failure to thrive, dehydration, food aversion, pneumonia, as well as to avoid unnecessary treatments or that fail to correctly resolve the problem[7,8]. Such identification is equally important for the management of decisions, prognoses, and proposed treatments.

According to the American Speech-Language-Hearing Association (ASHA), the screening instrument for swallowing is a minimally invasive assessment procedure that provides a fast determination of the possibility of dysphagia being present; the need for referral for swallowing assessment; the safety of oral feeding (for purposes of nutrition, hydration and medication administration); and the need to refer the patient for nutritional or hydration support[9].

In general, screening instruments for dysphagia should be fast (15 to 20 minutes), low-cost, reliable, relatively non-invasive, and with little risk to the patient[10,11].

Therefore, this study aims to develop a screening instrument for the identification of children at risk of dysphagia in a hospital environment. This is the initial stage of the validation process.

METHODS

Ethical Issues

This is an observational, cross-sectional, and quantitative study. The Ethics and Research Committees of the Irmandade Santa Casa de Misericórdia of Porto Alegre and the Universidade Federal de Ciências da Saúde de Porto Alegre approved this research under the number 218,872 and we developed it from January 2015 to May 2016.

Instrument Development

After analyzing articles from a systematic review of the literature on screening instruments in dysphagia, we Initially produced a screening instrument12. We also relied on the researchers' clinical experience to elaborate on the questions present in the instrument. We consulted the online databases: PubMed and Virtual Health Library (VHL), which includes LILACS, IBECS, MEDLINE, Cochrane Library and SciELO, through the following descriptors: '*questionários*', 'questionnaires', '*transtornos de deglutição*', 'deglutition disorders', '*programas de rastreamento*' and 'mass screening'. The research generated a total of 1,012 articles. We selected 20 studies after the analysis applying inclusion and exclusion criteria.

After elaborating the instrument with twenty-two questions to be presented to parents and/or guardians of children in a hospital environment, we sent it to three reviewers – speech-language therapy professionals with experience in the pediatric dysphagia area - for consideration and content analysis. In this procedure, each reviewer agreed or disagreed regarding the presence of the items in the questionnaire, with the possibility of suggesting new questions or modifying existing ones.

After the analysis of each specialist, we modified the instrument according to the three suggestions received, which involved the addition of a question; the indication of the use of lay terms in one of the questions to facilitate understanding; and the division of the category previously classified as 'prematurity' into 'moderate prematurity' and 'extreme prematurity'. After this stage, we sent the screening instrument to the reviewers once again, who informed us that they agreed with the final version.

Pilot Study

After the structuring stage of the screening instrument, we carried out a pilot study, applying it with individuals responsible for ten children admitted to the ward of a specialist pediatric hospital in the city of Porto Alegre, to verify its viability and make changes if necessary. These individuals agreed to participate in the research and signed the Informed Consent Form (ICF). As a result of this stage, the questionnaire underwent further modifications, especially related to the phrasing of each question.

After the modifications, the screening instrument was sent back to the reviewers, who agreed with the final version.

The Pediatric Dysphagia Risk Screening Instrument (PDRSI) has twenty-three questions, eight related to risk factors for dysphagia, six related to clinical history, and nine related to alimentation (Table 1).

Table 1. Pediatric Dysphagia Risk Screening Instrument (PDRSI).

Name:	Date of Birth: / /	
Caregiver´s name:	Date: / /	
The questions below are related to your child's history and information:		
Nº	**QUESTIONS**	**Score**
RISK FACTORS		
1	After how many weeks of gestation was your child born?	
	Moderate prematurity 31 - 36 weeks	1
	Extreme prematurity 24 - 30 weeks	2
	To term (37 to 42 weeks)	0
	I do not know	0
2	Does he/she have any respiratory disease?	
	No	0
	Yes	1
3	Does he/she have a gastrointestinal disease?	
	No	0
	Yes	1
4	Does he/she have any neurological disease?	
	No	0
	Yes	1
5	Does he/she have any genetic disease (syndrome)?	
	No	0
	Yes	1
6	Does he/ she have any heart disease?	
	No	0
	Yes	1
7	Does he/she have any anatomical changes (malformation) in the head and neck?	
	No	0
	Yes	1
8	Does he/she often get a cold?	
	No	0
	Yes	1
CLINICAL HISTORY		
9	Has he/she ever had pneumonia?	
	No	0
	Yes	1
10	Has he/she been intubated for 48 hours or more?	
	No	0
	Yes	1
11	Has he/she used or does he/she use a tracheostomy?	
	No	0
	Yes	1
12	Has he/she used or uses a probe for feeding?	
	No	0
	Yes	1
13	Has he/she lost weight?	
	No	0
	Yes	1
14	Does he/she have difficulty gaining weight?	
	No	0
	Yes	1
DATA ABOUT FOOD		
15	Does he/she have difficulties feeding?	
	No	0
	Yes	1
16	Does he/she have a cough when eating or drinking any food?	
	No	0
	Sometimes	1
	Always	2
17	Does he/she choke when eating or drinking food?	
	No	0
	Sometimes	1
	Always	2
18	Do you notice food scraps inside the mouth or parts of them outside the mouth when he/she eats?	
	No	0
	Sometimes	1
	Always	2
19	Do you notice that the saliva is stuck inside the mouth or escapes out of your child's mouth?	
	No	0
	Sometimes	1
	Always	2
20	Do you see food coming out of his/her nose when your child is eating or drinking?	
	No	0
	Sometimes	1
	Always	2
21	Do you notice changes in his/her voice or crying during or after eating?	
	No	0
	Sometimes	1
	Always	2
22	Do you notice changes in breathing, such as exertion, tiredness, or respiratory noise, during or after eating?	
	No	0
	Sometimes	1
	Always	2
23	Does your child's meal last more than 30 minutes?	
	No	0
	Sometimes	1
	Always	2
	TOTAL	

Regarding the answers, 15 questions (2 to 15 and 23) could be answered by 'yes' or 'no' and 7 (16 to 22) by 'no', 'sometimes' or 'always'. Each answer was scored from 0 to 2, with 0 for 'no' and 'I don't know', 1 for 'yes' and 2 for 'always', with a total of 31 points. Question number one was related to gestational age and has three options: 'moderate prematurity', 'extreme prematurity', and 'full-term birth', which was marked according

to the information provided by the interviewee. These options were scored with 1, 2, and 0, respectively.

We intended this material to be used by health professionals (speech-language therapists, doctors, nurses, nutritionists, physiotherapists, nursing technicians, among others) who are in contact with children in a hospital environment.

After the construction stage of the instrument, we began its application with those responsible for children admitted to a specialist pediatric hospital in the city of Porto Alegre, in the state of Rio Grande do Sul, Brazil.

Sample

The study sample consisted of children admitted to a pediatric hospital ward and their guardians, who signed the informed consent form. This instrument was proposed for children up to 5 years and 11 months old; however, we only selected children up to 3 years and 8 months old in this research, who received exclusively oral or complemented feeding by alternative means, who were in a medical air room or with respiratory support (invasive or non-invasive mechanical ventilation), regardless of their underlying pathology, and who were not undergoing speech-language therapy during hospitalization.

Data Analysis

A collaborating speech-language therapist performed the application of the PDRSI with those responsible for the children. She was trained to apply the questionnaire and blinded regarding the reason for hospitalization and the pathologies of the individuals involved in the study. The questions were read by her and the answers were marked as informed by the individuals. One of the researchers carried out a clinical evaluation of swallowing for the children participating in the study, through the Pediatric Dysphagia Assessment Protocol (PDAP)[13] to verify the criterion validity of the proposed screening instrument. Pearson's chi-square test or Fisher's exact test assessed the association between the results of the two instruments.

The clinical evaluation of swallowing carried out within 24 hours after the application of the PDRSI, occurred during the child's feeding schedule, considering the offer of maternal breast or nutritional formula in a bottle with conventional or orthodontic medium flow nipple, available at the hospital and according to the individual's typical use. The liquid consistency was evaluated for all the research participants and the homogeneous or heterogeneous and solid pasty consistencies were included in the evaluation according to the development of the oral motor skills of each patient. Based on the protocol, we observed oral and pharyngeal phase patterns during breastfeeding or bottle-feeding, such as lip sealing, oral escape through the labial commissures, holding the mother's breast and holding the bottle nipple, frequency of suction/swallowing ratio, the occurrence of pauses, coordination between sucking-breathing-swallowing, oral transit time and laryngeal elevation. Regarding the pharyngeal phase, we observed the adequacy or change in cervical auscultation, vocal quality, vital signs, and the occurrence of signs such as cough, choking, cyanosis, pallor, respiratory distress, nausea, vomiting, nasal reflux, and food refusal. Additionally, feeding time was classified as normal, increased, or decreased. For the evaluation of pasty and solid consistencies, we also observed characteristics of the oral and pharyngeal phases of swallowing. In the oral phase, there were items related to spoon holding, grasping and breaking of food, chewing pattern, tongue movement, frequency of swallowing by bolus , coordination between breathing-swallowing, coordination between chewing-breathing-swallowing, time of oral transit, laryngeal elevation, and residue in the oral cavity. For the pharyngeal phase of swallowing and feeding time, we analyzed the same items reported above when the evaluation with liquid consistency was described. After the assessment and based on the dysphagia severity scale[13], the child was classified into: 'oropharyngeal dysphagia' (mild, moderate to severe and severe) or 'normal swallowing'. When we detected the presence of oropharyngeal dysphagia, we informed the medical team about the diagnosis and suggested the start of speech-language therapy for its management.

After the two procedures, we grouped the protocols (PDAP and PDRSI) of each individual. We then divided the participants into two groups (with dysphagia and those with normal swallowing), according to the PDAP result. From this, we performed data analysis, checking the association between each of the questions and the result of the PDAP with the research being carried out to define the cutoff point for risk of dysphagia, through the Receiver Operating Characteristic curve (ROC), including sensitivity and specificity analysis for this cutoff point. We also verified the reliability of the instrument using Cronbach's α coefficient. Data were analyzed using the SPSS 20.0 program, with $p < 0.05$ being considered significant.

RESULTS

The sample had 40 children with a median age of 3.7 months old (25-75 percentiles: 1.7-8.6) and a predominance of males (65%), with no statistically significant difference between the groups with dysphagia and with normal swallowing by the PDAP, as shown in Table 2.

Table 2. Sample characterization in the groups With Dysphagia and Normal Swallowing

Variables	Total sample	Com Disfagia (n=20)	Deglutição Normal (n=20)	P
Age (months) – md (P25 – P75)	3.7 (1.7 – 8.6)	4.4 (2.4 – 8.5)	3 (1.2 – 8.6)	0.301
Gender – n(%)				0.320
Male	26 (65.0)	11 (55.0)	15 (75.0)	
Female	14 (35.0)	9 (45.0)	5 (25.0)	

Significant value for $p < 0.05$

Table 3 shows the association between each item of the PDRSI with the results of the PDAP. There were statistically significant associations with eight items in the questionnaire: 4 (neurological disease, $p = 0.020$); 9 (pneumonia episode, $p = 0.001$); 13 (weight loss, $p = 0.027$); 14 (difficulty gaining weight, $p = 0.043$); 15 (feeding difficulty, $p < 0.001$); 16 (coughing during

feeding, p = 0.001); 17 (choking during feeding, p <0.001); 19 (difficulty in managing saliva, p = 0.011). Among the items that did not present statistically significant associations, we excluded questions 3 (gastrointestinal disease, p = 0.661) and 21 (change in vocal quality during or after feeding, p = 0.605) because the descriptive level was high and the value increased internal consistency with their withdrawal.

Table 3. Association of PDRSI issues with PDAP results

Questions	Score	With Dysphagia (n=20)(%)	Normal Swallowing (n=20)(%)	p
1. After how many weeks of gestation was your child born?				0.740
At term	0	12 (60.0)	14 (70.0)	
Moderate Prematurity	1	8 (40.0)	6 (30.0)	
Extreme Prematurity	2	0 (0.0)	0 (0.0)	
Does he/she have any respiratory disease?				0.084
Yes	1	9 (45.0)	3 (15.0)	
No	0	11 (55.0)	17 (85.0)	
3. Does he/she have a gastrointestinal disease?				0.661
Yes	1	2 (10.0)	4 (20.0)	
No	0	18 (90.0)	16 (80.0)	
4. Does he/she have any neurological disease?				0.020*
Yes	1	6 (30.0)	0 (0.0)	
No	0	14 (70.0)	20 (100)	
5. Does he/she have any genetic disease?				0.231
Yes	1	3 (15.0)	0 (0.0)	
No	0	17 (85.0)	20 (100)	
6. Does he/she have any heart disease?				0.231
Yes	1	3 (15.0)	0 (0.0)	
No	0	17 (85.0)	20 (100)	
7. Does he/she have any anatomical changes (malformation) in the head and neck?				0.231
Yes	1	3 (15.0)	0 (0.0)	
No	0	17 (85.0)	20 (100)	
8. Does he/she often get a cold?				0.451
Yes	1	6 (30.0)	3 (15.0)	
No	0	14 (70.0)	17 (85.0)	
9. Has he/she ever had pneumonia?				0.001*
Yes	1	9 (45.0)	0 (0.0)	
No	0	11 (55.0)	20 (100)	
10. Has he/she been intubated for 48 hours or more?				0.127
Yes	1	7 (35.0)	2 (10.0)	
No	0	13 (65.0)	18 (90.0)	
11. Has he/she used or does he/she use a tracheostomy?				-
Yes	1	0 (0.0)	0 (0.0)	
No	0	20 (100)	20 (100.0)	
12. Has he/she used or uses a probe for feeding?				0.057
Yes	1	13 (65.0)	6 (30.0)	
No	0	7 (35.0)	14 (70.0)	
13. Has he/she lost weight?				0.027*
Yes	1	14 (70.0)	6 (30.0)	
No	0	6 (30.0)	14 (70.0)	
14. Does he/she have difficulty gaining weight?				0.043*
Yes	1	10 (50.0)	3 (15.0)	
No	0	10 (50.0)	17 (85.0)	
15. Does he/she have difficulties feeding?				<0.001*
Yes	1	14 (70.0)	2 (10.0)	
No	0	6 (30.0)	18 (90.0)	
16. Does he/she have a cough when eating or drinking any food?				0.001*
No	0	5 (25.0)	16 (80.0)	
Sometimes	1	10 (50.0)	4 (20.0)	
Always	2	5 (25.0)	0 (0.0)	
17. Does he/she choke when eating or drinking food?				<0.001*
No	0	5 (25.0)	18 (90.0)	
Sometimes	1	10 (50.0)	2 (10.0)	
Always	2	5 (25.0)	0 (0.0)	
18. Do you notice food scraps inside the mouth or parts of them outside the mouth when he/she eats?				0.108
No	0	11 (55.0)	14 (70.0)	
Sometimes	1	5 (25.0)	6 (30.0)	
Always	2	4 (20.0)	0 (0.0)	
19. Do you notice that the saliva is stuck inside the mouth or escapes from your child's mouth?				0.011*
No	0	6 (30.0)	12 (60.0)	
Sometimes	1	7 (35.0)	8 (40.0)	
Always	2	7 (35.0)	0 (0.0)	
20. Do you see food coming out of his/her nose when your child is eating or drinking?				0.058
No	0	13 (65.0)	19 (95.0)	
Sometimes	1	6 (30.0)	1 (5.0)	
Always	2	1 (5.0)	0 (0.0)	
21. Do you notice changes in his/her voice or crying during or after eating?				0.605
No	0	17 (85.0)	19 (95.0)	
Sometimes	1	3 (15.0)	1 (5.0)	
Always	2	0 (0.0)	0 (0.0)	

Table 3. Continuation...

Questions	Score	With Dysphagia (n=20)(%)	Normal Swallowing (n=20)(%)	p
22. Do you notice changes in breathing, such as exertion, tiredness, or respiratory noise, during or after eating?				**0.054**
No	0	4 (20.0)	11 (55.0)	
Sometimes	1	8 (40.0)	6 (30.0)	
Always	2	8 (40.0)	3 (15.0)	
23. Does your child's meal last more than 30 minutes?				**0.127**
Yes	1	7 (35.0)	2 (10.0)	
No	0	13 (65.0)	18 (90.0)	

* Statistically significant values (p <0.05) - Pearson's chi-square test or Fisher's exact test

Despite being non-significant, the other questions were maintained because they are considered risk factors or are related to important signs and symptoms for dysphagia and because a reduction in the value of Cronbach's alpha was observed when it was removed. Question number 11, related to the use of tracheostomy, was maintained because it is considered a risk factor for dysphagia; however, no patient presented this condition in this study.

The internal consistency of the Pediatric Dysphagia Risk Screening Instrument (PDRSI), without questions 3 and 21, assessed by Cronbach's alpha, was 0.828, indicating good internal consistency of the instrument. Considering the 23 questions, Cronbach's alpha value would be 0.826, demonstrating that there was no loss of information when removing the two items in this sample.

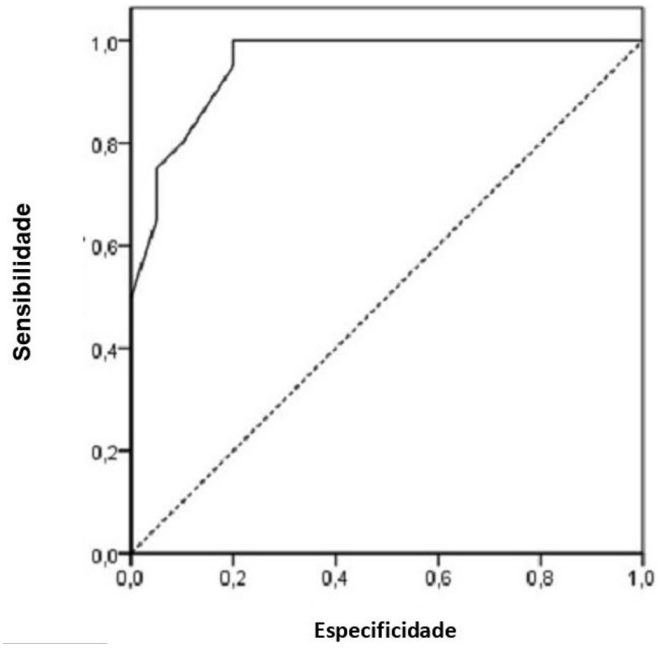

Figura 1. Curva ROC para definição do ponto de corte para o risco de disfagia

Área sob curva: 0,95; p<0,001

To determine the best cutoff point for the PDRSI, we evaluated the ROC curve shown in Figure 1. The cutoff point with the best balance between sensitivity and specificity was five points (sensitivity = 100%; specificity = 80 %; positive predictive value (PPV) = 83.3%; negative predictive value (NPV) = 100%), with an area under the curve of 0.95 (p <0.001).

Therefore, children who score five or more points on the PDRSI are at risk of dysphagia and should be referred for swallowing assessment with a speech-language therapist.

DISCUSSION

This study aims to develop a screening instrument that identifies children who are at risk of dysphagia, using a simple method, such as a questionnaire, to be applied to the caregivers of these children. We know that it is not always possible to count on the active participation of these people in certain procedures due to the characteristics of this age group, which involve limitations related to mood, hunger, satiety, and shyness, among others. Therefore, an instrument that guides the observation of clinical signs and symptoms of dysphagia brings benefits for the early detection of the disorder[15].Due to living with and monitoring child development, family members/caregivers can provide information and collaborate in the process of screening children at risk of dysphagia.

Children are hospitalized for numerous reasons. The concept of dysphagia, as well as its causes and consequences, is not yet widespread in Brazilian medical and health specialties, making it very important to use a screening instrument that identifies children with suspected dysphagia so that they can be referred to a speech-language therapist for swallowing assessment.

The early identification of pediatric patients with dysphagia is essential as they are in a critical period of growth and development. Aspiration, malnutrition, and dehydration - possible consequences of dysphagia -, can generate lung, neurological, gastrointestinal, and even emotional harm, with possible lifelong consequences.

Little is known about the impact of dysphagia in pediatrics, as well as the effectiveness of interventions overtime on the health and quality of life of affected children[15]. The age at which the child has or the duration of exposure to swallowing disorders maybe the most critical factors that differentiate the outcome of dysphagia on the pediatric and adult population[16].

The data available in the literature related to the development and application of screening instruments in pediatric dysphagia are limited. We highlight the "Infantile Oropharyngeal Dysphagia Risk Screening Protocol[14]" developed for children up to one year old and composed of two stages: one related to clinical history data and the other obtained through the observation of the child's food. However, this protocol has not yet undergone all the validation processes. We also highlight the 3-ounce (90-cc) water swallow challenge[17], which is a water swallowing test, that can, according to the authors, be applied to children from two years old. This instrument considers the inability to drink the entire amount, coughing; and choking during or up to one minute after drinking liquid, which constitute 'failures' in the water swallowing test.

The screening instrument called 3-ounce (90-cc) water swallow challenge considers the presence of clinical signs of aspiration (coughing and choking) as one of the criteria that define the failure in screening. However, when the child has a silent aspiration, these clinical signs are not present and may generate a false-negative result. Thus, the inclusion of data related to the history of health and alimentation in the screening instrument helps to identify if the child is at risk of dysphagia, even without showing clinical signs suggestive of penetration and/or aspiration during feeding.

Regarding the signs and symptoms of oropharyngeal dysphagia reported by the parents/caregivers of the children participating in this research, those related to the occurrence of pneumonia, weight loss or difficulty gaining weight, coughing and choking during meals and changes in the management of the saliva - extraoral escape or accumulation in the oral cavity had a significant statistical value. These signs and symptoms are described and established in the literature in a very consistent way[16,3,18,19], but they can vary according to the child's age[20,21].

In a study on clinical signs of oropharyngeal aspiration in children, the authors found that the only statistically significant clinical sign, associated with aspiration in children aged one year or less, was a wet voice, and, in older children, wet breathing[1]. In this research, we excluded the question related to changes in vocal quality during food as this change was not perceived by caregivers.

Due to the limited number of instruments developed specifically for the pediatric population, the speech-language therapy professionals often adapt materials developed for the adult population or do not use instruments capable of demarcating or quantifying data in pediatrics. Therefore, designing and validating specific screening instruments that are reliable, accurate, easy to apply and which do not put the patient at risk, is very important for this population.

When checking the reliability of an instrument, a diagnostic test is usually applied to compare the results. In this study, we used the clinical evaluation of swallowing, using the PDAP, a protocol developed specifically for the area of infantile dysphagia, which considers all stages of the development of stomatognathic functions and the process of food transition, from one month to seven years and eleven months old. Its conclusion is the severity scale of pediatric dysphagia, specific to this population, provides the speech-language therapist with more objective parameters for determining the severity of dysphagia in each case[13].

The clinical evaluation of swallowing is subjective and aims to identify the possible causes of dysphagia; to assess the safety of swallowing or the risk of aspiration; to decide on the route for feeding (oral versus alternative), and to clarify the need for an objective assessment (endoscopic swallowing assessment or swallowing videofluoroscopy)[22].

In developing countries, in which objective tests are not always available, the non-instrumental clinical assessment of dysphagia is important in the diagnosis of dysphagic patients. Objective exams have some disadvantages, such as radiation exposure and limited exam time as in swallowing videofluoroscopy, the fact that they do not simulate a real meal and the need to obtain cooperation from the patient, which can often be difficult in the pediatric population[23-25].

The value of Cronbach's α found for the PDRSI was 0.826. In general, a research instrument that obtains $\alpha \geq 0.7026$ is considered satisfactory. Based on some screening instruments available in the literature[27-30], we obtained an internal consistency value between 0.8030 and 0.9627.28, considered satisfactory for the proposal to identify dysphagic patients.

The PDRSI presented a cutoff point of five points and the ROC curve showed high sensitivity (100%) and specificity (80%), demonstrating it to be an efficient and effective instrument for the identification of children at risk of dysphagia in a hospital environment. Another important dimension for this instrument is the VPN, which was 100%, demonstrating that all patients who were not selected on the PDRSI, that is, who had scores lower than five points, did not present dysphagia by the PDAP.

The limitation of the study is related to the small number of participants and the use of an instrument for clinical assessment of swallowing which, although it is easy to access, has a subjective character. However, the results achieved at this moment are favorable for the continuation of studies with the PDRSI.

CONCLUSION

From the proposal of this study, the Pediatric Dysphagia Risk Screening Instrument (PDRSI) was developed to be used in a hospital environment. This instrument showed high sensitivity, specificity, and internal consistency, therefore proving to be reliable. Considering the results achieved at this moment and the fact that the literature lacks material in this area, we will follow the validation stages.

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Authors' contributions

CLE performed the research, tabulation and analysis of the data, as well as the writing of the manuscript; LRB performed the review of the manuscript and MCAFC performed the orientation of the work and the review of the manuscript.