



Tele-education and teleconsultation in oropharyngeal dysphagia: literature review

Tele-educação e teleatendimento em disfagia orofaríngea: revisão de literatura

Teleducação y tele-servicio em la disfagia orofaríngea: revisión de la literatura

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Abstract

The new technologies available to attend the population with oropharyngeal dysphagia using telehealth have shown numerous advantages. Thus, the aim of this study was to survey the scientific works in telehealth area in oropharyngeal dysphagia, seeking to understand the scientific evidence in tele-education and telerehabilitation. Data research was made in PubMed/MEDLINE, LILACS and SciELO, on unbounded period, with the terms: telehealth and dysphagia, teleconsultation and dysphagia, telehealth and swallowing disorders, remote consultation and dysphagia. There were included online original works, literature reviews and case reports of dysphagia in telecare and tele-education. Thirty four studies were found only in PubMed/MEDLINE database. The analysis included information about the subject of the article, type of publication, aim of the study, methodological characteristics, results, conclusions and the evidence level. The exclusion/inclusion criteria were applied and fifteen articles were analyzed, most from the United States and Australia, in the last five years. Eleven of the fifteen studies reviewed were experimental studies, four were reviews of the literature and one was a case report. Twelve of these articles were about teleconsultation, two were about tele-education and one of them reviewing on both. The aim of most researchers was to verify the viability of teleconsultation, pursuing promising results and conclusions. The level of evidence found was two in most studies, demonstrating lack of articles in this area. Thus, it was concluded that the literature in the oropharyngeal dysphagia tele-health has approached predominantly the teleconsultation. However, there is a lack of clinical studies on this area.

Keywords: Telemedicine; Deglutition Disorders; Distance Education; Remote Consultation.

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Authors' contributions: BC data collection, resources, data analysis, article sketch, data visualization. GRL methodology, critical review, data visualization. GBF study conception, methodology, formal analysis, critical review supervision, project management.

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Resumo

As novas tecnologias disponíveis para atender a população com disfagia orofaríngea à distância têm demonstrado inúmeras vantagens. Assim, o objetivo deste estudo foi realizar um levantamento na literatura sobre os trabalhos científicos na área de telessaúde em disfagia orofaríngea, buscando compreender a evidência científica em tele-educação e telerreabilitação. A busca de dados foi feita nas bases PubMed/MEDLINE, LILACS e SciELO, sem delimitação de período, com os termos: telehealth e dysphagia, teleconsultation e dysphagia, telehealth e swallowing disorders, remote consultation e dysphagia. Foram incluídos artigos disponíveis online na íntegra gratuitamente, sendo trabalhos originais, revisões de literatura e relatos de casos sobre a disfagia em teleassistência ou tele-educação. Foram encontrados 34 estudos, somente na base de dados PubMed/MEDLINE e analisadas informações quanto à identificação do artigo, tipo de publicação, objetivo do estudo, características metodológicas, resultados, conclusões e nível de evidência. Os critérios de exclusão/inclusão foram aplicados e foram analisados 15 artigos, sendo a maioria de origem dos Estados Unidos e Austrália nos últimos cinco anos. Dos 15 estudos analisados, 11 são experimentais, quatro revisões de literatura e um estudo de caso; sendo 12 artigos em teleatendimento, dois em tele-educação e um revisando ambos. O objetivo da maioria era verificar a viabilidade do teleatendimento, tendo resultados promissores. O nível de evidência encontrado foi dois na maioria dos estudos, demonstrando carência de artigos nessa área. Assim, pode-se concluir que a literatura em telessaúde na área de disfagia orofaríngea tem abordado, predominantemente, o teleatendimento. Porém, observa-se a falta de estudos sobre essas técnicas.

Palavras-chave: Telemedicina; Transtornos de Deglutição; Educação à Distância; Consulta Remota.

Resumen

Las nuevas tecnologías disponibles para atender a la población con disfagia orofaríngea a distancia han demostrado numerosas ventajas. Se realizó una investigación científica con el fin de analizar los artículos científicos en el área de tele-salud en disfagia oro-faríngea en tele-educación y tele-servicio. La búsqueda de datos se realizó en PubMed/MEDLINE, LILACS y SciELO, sin límites de período, de acuerdo con los terminos: telehealth e dysphagia, teleconsultation e dysphagia, telehealth e swallowing disorders, remote consultation e dysphagia. Se encontraron 34 estudios, en la base de datos PubMed / MEDLINE y analizadas esas informaciones sobre la identificación del artículo, tipo de publicación, objetivo del estudio, características metodológicas, resultados, conclusiones y grado de comprobación. Criterios de exclusión/inclusión se aplicaron y se analizó 15 artículos, gran parte fueron originarios en los Estados Unidos y Australia en los últimos cinco años. De los 15 estudios revisados, 11 son experimentales, 4 revisiones de literatura y un estudio de caso; siendo 12 artículos en tele-servicio, 2 en tele-educación y 1 revisando ambos. El objetivo de la mayoría fue verificar la viabilidad del tele-servicio, habiendo resultados y conclusiones prometedoras. El nivel de evidencia encontrado fueron dos en la mayoría de los estudios, lo que demuestra la falta de artículos en este campo. Por lo tanto, se puede concluir que la literatura en tele-salud en el área de la disfagia oro-faríngea se ha ocupado principalmente del tele-servicio. Sin embargo, hay una falta de estudios clínicos sobre estas técnicas.

Palabras clave: Telemedicina; Trastornos de Deglución; Educación a Distancia; Consulta Remota.

Introduction

According to the World Health Organization – WHO, the term telehealth can be set as the provision of services performed by health professionals using information and communication technologies (ICTs) as a way to replace direct contact with the patient, exchange of necessary data for prevention, diagnosis or treatment, as well as to assist the continuing education of these professionals and conducting research in which distance is a critical factor¹. Both in telerehabilitation and tele-education areas, telehealth has shown great advantages, such as reduced time and costs of services, reaching health professionals in remote areas, better understanding of cases by discussions with other professionals, the potential of patient rehabilitation, among other advantages².

Medicine and nursing have shown large number of telehealth studies, both in tele-education and telerehabilitation. The success of tele-education in medicine is evidenced by the Virtual Man Project (www.projeto homem virtual.com.br), developed by Wen, in which computer graphic models were created with realistic human body movements to facilitate the spread of health understanding. In telerehabilitation, we highlight the researchers Bodner *et al.*, who described a thoracoscopic surgery assisted by robots for benign and malignant esophageal tumors³. In nursing, the Tele-Nursing Project was created by the Nursing School/UFMG for extension and research⁴, besides the remote assistance project in Tele-breastfeeding by Prado *et al.*⁵ along with the national telehealth project in Brazil.

Regarding the field of Speech Language Pathology and Audiology, telehealth has been analyzed in its various areas, being included in the American Speech and Hearing Association (ASHA) code of ethics in 2005, in order to ensure that speech-language and audiology services prioritize the well-being of patients and offer all services appropriately. It is necessary to perform professional telepractice training (remote service/therapy), be careful about patient privacy, evaluation of service effectiveness, provision of patient information about the differences between telepractice and on-site therapy, as well as awareness of the risks, limitations and benefits⁶. Among the speech language pathology and audiology areas, the most explored in telehealth scope is audiology, followed

by language, with description of effective procedures for synchronous teleconsultation, interactive tele-education and telerehabilitation

In audiology, Givens *et al.* and Krumm performed pure tone audiometry⁸⁻¹⁰; Wesendahl adapted personal hearing amplification device¹¹; VanLue *et al.* effectuated otoscopy and nasoendoscopy examinations¹²; and Lieberth and Martin evaluated the effectiveness of an audiometry simulator for speech-language pathology and audiology students¹³. Lastly, Ferrari *et al.* created and developed a course, with elaboration of an application, in order to instruct students, via internet and remotely, as a way to enable the monitoring of each student by the tutor, being the project inserted in the Brazilian Teleaudiology Program¹⁴.

In the speech area, Karnell and contributors created a website to enable the communication between non-specialist speech therapists and audiologists who performed therapy for individuals with speech disorders due to cleft lip and palate or craniofacial anomalies, and speech therapists specialized in this area¹⁵; Reeves *et al.* verified the application of the SoundHelper software, which demonstrates the correct sound pronunciation, used in aphasic patients treatment¹⁶. There was, also in the field of language, the evaluation and teleassistance results on disfluent patients by Sicotte *et al.* in 2003¹⁷; Mortley *et al.* did the same, demonstrating the improvement of aphasic patients who underwent telerehabilitation¹⁸; Brennan *et al.* compared on-site and distance assessments in brain damage subjects¹⁹. Theodoros and colleagues performed oral motor assessment in dysarthritic patients by two methods: traditional (face-to-face) and videoconference²⁰. Finally, Mashima and researchers compared face-to-face and internet voice assessment, identifying vocal nodules, vocal fold edema, vocal fold paralysis, and vocal hyperfunction without pathology²¹.

An important area of speech therapy is dysphagia, which consists in a symptom of some underlying disease in which there is difficulty or discomfort during passage of the food bolus from the mouth to the stomach, and may be related to oropharyngeal or esophageal dysfunction or even to some change in the structure or function of a particular organ from the digestive system to the stomach²². The mortality of elderly hospitalized patients with pneumonia due to food aspiration is 43%; in addition, Feinberg *et al.* reported that many

elderly chronic aspirators have frequent fevers that lasts from 24 to 76 hours, impairing the pneumonia diagnosis, thus the presence of trained professionals is essential in a multidisciplinary approach, involving nurses, physicians, speech therapists, as well as nutritionists for a good diagnosis and treatment²³.

In cases of dysphagia, it is fundamental to perform a detailed clinical history, in addition to clinical evaluation to evaluate the oral, cognitive and language functions, as well as to train the required behavior for oral food consumption²⁴. Accordingly, the therapy developed by Kay Coombes approaches nutrition, oral hygiene, nonverbal communication and speech, evidencing the importance of the speech therapist in this context²⁵; however, there are many barriers to access to services, caused by distance, unavailability of professionals and small number of speech pathologists specialized in dysphagia in certain localities²⁶.

The literature demonstrated evidences that telehealth is a viable, effective and adequate model for the provision of speech and hearing services to a wide range of patients²⁶. Therefore, it is important to know the productions on telehealth in the area of dysphagia, since this is a condition that causes significant impacts on the patients' quality of life. Thereby, the objective of this study was to carry out a survey about the scientific works in telehealth area in oropharyngeal dysphagia, seeking to understand the scientific evidence in tele-education and telerehabilitation.

Methods

The method used was integrative literature review, in which six stages were listed for production, including: definition of the theme and guiding question; search strategies in the literature; data selection and collection; articles included evaluation, results analysis and, finally, presentation of the integrative literature review²⁷.

In the first stage of this production the theme "Telehealth in oropharyngeal dysphagia" was determined, with the following guiding question: "Is there scientific evidence regarding tele-education and teleconsultation in oropharyngeal dysphagia area?"

The following keywords were used to select and collect the data: (1) *telehealth and dysphagia*, (2) *teleconsultation and dysphagia*, (3) *telehealth and swallowing disorders*, (4) *remote consultation and dysphagia*.

The search and collection of scientific articles was done by online access in the databases PubMed/MEDLINE, LILACS and SciELO in the period between March and April of 2015.

The inclusion criteria were: completely available online articles, free of charge and with no time limit, including original papers, literature reviews and case reports of dysphagia on telehealth, both in teleconsultation or teleassistance as well as in distance education. There was no temporal limitation in years for the selection of studies.

Articles that were not limited to the subject of dysphagia on telehealth and those that did not meet the objective of this literature review were excluded. Articles that were in more than one database were counted only once.

The exclusion criteria were applied in the title and abstracts of the articles found in the databases. Afterwards, the chosen articles that were not discarded were read in full, applying the inclusion criteria.

In view of the included articles, data were analyzed to standardize the evaluation, as follows: identification, constituted by the article's title, authors, country where it was conducted, language in which it was produced, as well as the publication year; study's host institution; publication type, showing in which health area the study is inserted; study purpose; study methodological characteristics, stating the type of research approach; sample (in experimental design cases); processing of data; interventions/methods, in which the technique used in that study was described, either assistance or distance training; results; conclusions and, finally, the level of evidence of each research.

Results

The present research aimed to study the scientific productions about oropharyngeal dysphagia on telehealth. After the selection and analysis of studies on the subject, it was possible to verify that there is a shortage of scientific articles with this approach.

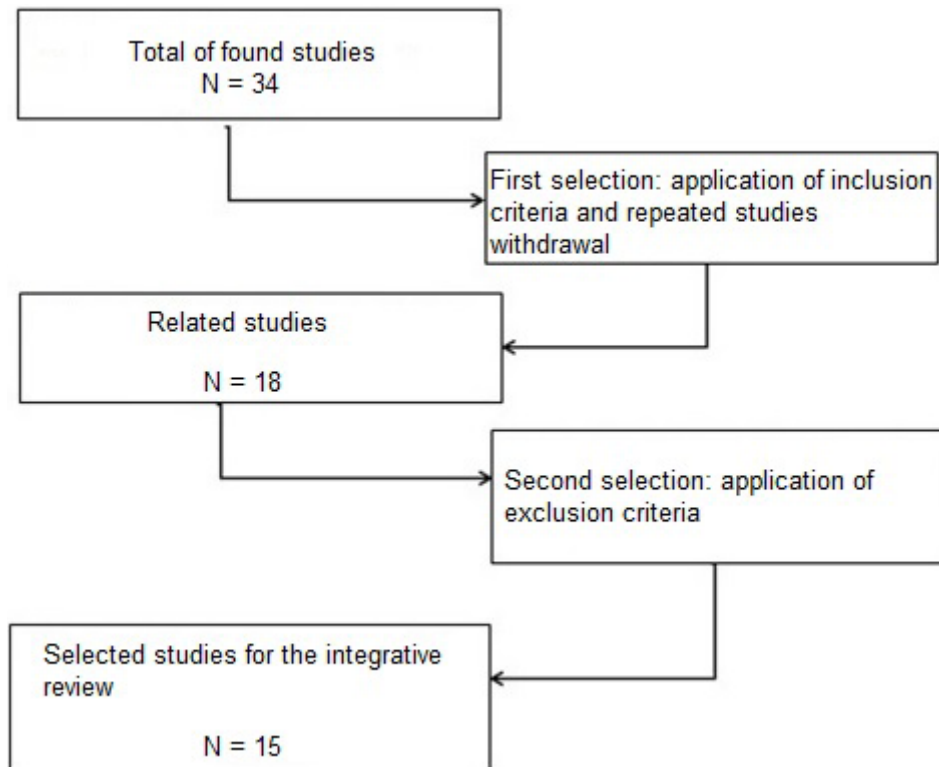
In total, 34 studies were identified only in the PubMed/MEDLINE database. The descriptors that provided the highest number of accessed researches were: telehealth and swallowing disorders, followed by telehealth and dysphagia. Such information is presented in Figure 1.

Descriptors	PubMed/MEDLINE	Lilacs	SciELO
Telehealth + Dysphagia	10	0	0
Teleconsultation + Dysphagia	6	0	0
Telehealth + swallowing disorders	12	0	0
Remote consultation + dysphagia	6	0	0

Figure 1. Number of articles found according to the databases consulted and descriptors used.

The exclusion criteria were applied in the title and summaries of the 34 articles found, as well as removal of repeated articles, with selection of 18. Finally, the inclusion criteria applied to the

articles allowed the selection of 15 papers for the study (Flowchart 1), which were carefully analyzed (Figure 2).



Flowchart 1. Steps of the selection process of scientific articles for the integrative review of the literature.

Articles	Study Objective	Methodological characteristics of the study	Sample / Casuistry/ Methods	Results	Conclusions	Level of Evidence
1	Conduct a data survey on telehealth applications in dysphagia and voice areas, professional issues involved and clinical and operational aspects of the equipments used.	Literature Review	Data were collected about the remote assistance procedure.	Few publications on dysphagia in the telehealth field. Remote videofluoroscopy examination: three papers, in which a system was developed that allowed the examination to be viewed online in real time, comparing it with face-to-face examination. In addition, studies have shown the problems faced by telehealth professionals, especially the license and reimbursement.	Further research is needed to investigate clinical and operational aspects of remote management of voice and swallowing disorders. There is potential to address the lack of specialized professionals in certain locations and to break down barriers to assess the service.	4
2	Evaluate a short-term trial of a telerehabilitation service, defining the challenges and strengths involved in implementing this new service using a simulation model.	Research with quantitative approach of experimental design.	Remote Assistance Procedure. Sample selection: Convenience. Casuistic: n = 100 Gender: M: 54% F: 46%. Inclusion/Exclusion Criteria: patients with normal, mild, moderate or severe dysphagia. Independent variable: telerehabilitation simulation model. Dependent variable: successful utilization of the system. Evaluation of efficacy: Pre- and post-consultation questionnaires where the patients judged being satisfied or not with the system, considering the audio, image, patient and clinical relationship, among others.	There was great satisfaction from the patients and clinicians felt that they developed a good relationship, found the system easy to use and were satisfied with the service in more than 90% of evaluations conducted.	Patient satisfaction was high and clinicians were satisfied with the service in more than 90% of evaluations performed.	2
3	Develop an internet system that allows interactive, remote and real-time evaluation of swallowing functions of patients who live in distant areas and do not receive adequate attention for their swallowing dysfunction.	Research with quantitative approach of experimental design.	Remote Assistance Procedure. Evaluation of effectiveness: Video signal, conversion of data from analogue into digital video for transmission, simultaneous transmission through the internet while examination is being performed and local storage of data as a file for later retrieval.	The three-step approach (obtaining, transferring and analyzing the videos) while performing the swallowing function via the internet, remote and in real time was successful.	It can benefit areas devoid of professionals, where there is worse quality of care compared to hospitals with large financial bases in metropolitan regions. It may also allow creation of the Dysphagia Portal and Database, which will provide worldwide secure access to research and education while maintaining patient confidentiality.	4
4	To determine if a safe swallowing module using a computer can produce changes in the knowledge levels of the nursing team.	Research with quantitative approach of experimental design.	Distance training procedure. Selection: Convenience. Casuistic: n = 123 (60 in the control group and 63 in the experimental group). Schooling: Nursing assistant, nursing technician and nurses. Inclusion/Exclusion Criteria: All participants should be technicians, nursing assistants or nurses. Independent variable: Computer training. Dependent variable: Increased level of knowledge in dysphagia by the nursing team. Control group: Yes. Evaluation of effectiveness: Tests before and after training of the nursing team of the experimental group and the control group.	Participants in the experimental group demonstrated an increase of points in the tests, while the points of the control group did not change significantly.	This study indicates that computer training for nursing staff related to safe swallowing and dysphagia is effective.	2
5	To determine the level of agreement between online and face-to-face speech therapist, regarding oral food safety (totally oral, modified or not oral), and if in an oral modified diet, the recommended food/fluids were safe, in addition to the individual components of the clinical examination of swallowing.	Research with quantitative approach of experimental design.	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 40. Age: 25 to 94 years Gender: M: 23 F: 17. Ethnicity: diverse. Inclusion/Exclusion Criteria: individuals with high medical dependence, moderate to severe levels of cognitive impairment, and severe hearing or visual impairment were excluded. People with mild (28%), moderate (55%), moderate-severe (7%) and severe (10%) dysphagia were included. Independent variable: agreement between online and face-to-face speech therapist. Dependent variable: diagnostic limitations to identify risk of aspiration. Evaluation of effectiveness: After the evaluation, speech-language pathologists who answered via telerehabilitation answered a questionnaire of satisfaction and were instructed to provide answers based on the session that had been just concluded.	The results of this trial provide initial evidence to validate the use of telerehabilitation for swallowing function assessment and establish that dysphagia assessments are feasible using the current system design. However, there are diagnostic limitations to identify the risk of aspiration.	This research provided evidence that using a system made for telerehabilitation, system-specific changes and a patient-side wizard, allows comparing clinical accuracy with face-to-face assessment of dysphagia.	2

Articles	Study Objective	Methodological characteristics of the study	Sample / Casuistry/ Methods	Results	Conclusions	Level of Evidence
6	To analyze the evaluation and management of dysphagia via telerehabilitation and discuss current technology, evidence in the clinical examination of swallowing, remotely performed instrumental procedures, current management options and patient perception data.	Literature Review	Data about the remote assistance procedure were collected.	With simple modifications, the clinical examination of swallowing can be conducted and evaluated confidently with the use of telerehabilitation in real time. Its use with instrumental swallowing assessments is also increasing, demonstrating the ability to be remotely addressed and assessed asynchronously, using telerehabilitation	With patients and clinicians' perceptions of this model being generally positive, the confirmation of potential cost-benefit and increasing access to low-cost mobile technology, telerehabilitation services will become increasingly popular. In a time of rapid technological advancement, the challenge for researchers is to continue to evaluate the equivalence of dysphagia analyzed on telerehabilitation models across this range of new devices and technology platforms.	4
7	To explore the effect of dysphagia-specific training on perceived knowledge, competence and comfort of an experienced health professional who served as assistant during a series of dysphagia telerehabilitation assessments.	Research with quantitative approach of experimental design.	Distance training procedure. Selection: Convenience. Casuistic: n = 1. Gender: female. Schooling: health assistant. Inclusion/Exclusion Criteria: Allied Health Assistants Independent variable: dysphagia training in health workers. Dependent variable: competence and overall performance satisfactory for assistance in assessing dysphagia via telerehabilitation. Efficacy evaluation process: two speech therapists interviewed the health assistant at every 5 patients to discuss competence and skills in task performance and overall performance, in addition to written knowledge tests for health workers before and after training.	The overall assistant competence and performance, judged by the evaluators, showed that she was competent in performing the specific tasks required for her position. The assistant was evaluated by both speech therapists as competent throughout the five evaluations.	It is not only necessary to form a new model of assistance, but also the formation of new professional roles, such as the telerehabilitation assistant. Such new roles deserve careful consideration and adequate training in the breadth, depth, and complexity of skills needed to provide safe and competent practice.	2
8	Investigating whether consulting a specialist provided via telemedicine can improve the quality of care for patients with dysphagia.	Research with quantitative approach of experimental design	Remote Assistance Procedure. Selection: Convenience. Age: 35 to 76 years. Gender: M: 12 F: 5. Inclusion/Exclusion Criteria: patients with some type of tumor, disease or vascular accident or neurodegenerative disease. Independent variable: telemedicine specialist consultation improves quality of care in patients with dysphagia. Dependent variable: in places without a dysphagia specialist, the best option would be tele assistance for quality of care. Effectiveness evaluation process: professionals compared the treatment recommendations of on-site evaluation with those ones performed by telemedicine.	Good and better levels of quality of care would have been achieved without telemedicine in 8 of 17 cases, moderate level of care in 7 of 17 cases, and poor quality of care in 2 of 17 cases.	In conclusion, the present study showed that the use of telemedicine to consult a specialist will improve the quality of care for patients with dysphagia in places where a specialist is not available.	2
9	To provide experimental information on the basic viability and basis of the performance of assessments of dysphagia via telerehabilitation.	Research with quantitative approach of experimental design.	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 2. Schooling: Speech-language pathologists specialized in dysphagia. Inclusion/Exclusion Criteria: two speech therapists with more than 5 years of experience with dysphagia were treated as standard patients with specific oromotor and swallowing disorders in order to eliminate the risk of an undetected aspiration in an actual patient during the tests. Independent variable: feasibility and rationale for assessments of dysphagia via telerehabilitation. Dependent variable: high viability. Effectiveness evaluation process: comparing the decisions made by the audiologist through telerehabilitation and by the speech therapist face to face with the patient.	The results showed high outcomes, with excellent levels of agreement between the audiologist via telerehabilitation and the speech therapist face to face in all parameters of the clinical examination of swallowing. The agreement for the risk of aspiration was excellent.	The pilot data indicate that the current model of administration of a clinical examination of swallowing via telerehabilitation has the potential to be a viable and valid method for the remote evaluation of swallowing disorders.	2
10	To examine how the severity of dysphagia impacted on: (a) the clinical decision for the safety of oral intake or (b) the clinical perceptions of clinical swallowing examinations performed via telerehabilitation.	Research with quantitative approach of experimental design.	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 100. Age: 62 to 71 years. Inclusion/Exclusion Criteria: For inclusion, participants should be considered fit for evaluation for their medical treatment and able to remain in a semi-erect or upright position for the duration of the evaluation. Independent variable: clinical decisions among speech therapists via telerehabilitation concerning the dysphagia severity. Dependent variable: Acceptable levels of agreement among speech therapists that the evaluation via telerehabilitation would be viable in most cases. Evaluation of effectiveness: The online speech therapist completed a satisfaction questionnaire. The responses were around a 5-point scale (1 = strongly disagree to 3 = unsafe to 5 = strongly agree).	Acceptable levels of agreement between evaluators in more than 90% of the items of clinical examination of swallowing. Clinicians agreed that they could develop good affinity with most patients in all groups. However, for the severe oropharyngeal dysphagia group, clinicians disagreed that they would be able to assess satisfactorily and competently using the telerehabilitation system.	Clinical decisions made during and as a total result of the clinical examination of swallowing were considered to be comparable to those made on site, regardless of the severity of dysphagia. The physicians noticed some difficulty in evaluating patients with greater complexity, which occurred in greater numbers in the group with severe dysphagia.	2

Articles	Study Objective	Methodological characteristics of the study	Sample / Casuistry/ Methods	Results	Conclusions	Level of Evidence
11	To describe a new configurable instrument that can be used in outpatient and telemedicine applications and to evaluate the performance of this device in the description of physiological and abnormal events during water swallowing.	Research with quantitative approach of experimental design	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 11. Age: average of 26 years. Gender: M: 7 F: 4. Inclusion/Exclusion Criteria: Patients with no history of respiratory, neurological or digestive disease were included to test the instrument in normal subjects. Independent variable: an instrument to be used in outpatient and telemedicine applications evaluating the description of normal and abnormal swallowing events. Dependent variable: the description of swallowing events when used in outpatient and telemedicine applications. Evaluation of efficacy: evaluations of physiological and clinical conditions confirmed the good performance of this instrument.	The software under this study provided a detailed description of the physiological and abnormal events of both clinical and telemonitored swallowing.	It was concluded that the developed system could be a useful tool for the outpatient evaluation of respiratory and feeding events and for the accomplishment of telemedicine services, contributing to reduce the costs of care offered to patients with dysphagia.	2
12	To test the feasibility and clinical utility of the protocol based on the Tele-dynamic Software Evaluation System (TESS), created by Perlman & Witthawaskul, 2002	Research with quantitative approach of experimental design	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 32. Age: 50 to 75 years. Inclusion/Exclusion Criteria: Individuals with neurodevelopmental or congenital anatomical changes, moderate or advanced stage dementia, diabetes, progressive neurological disease, or traumatic brain injury were excluded. Independent variable: viability test of the software created by Perlman & Witthawaskul, 2002. Dependent variable: good agreement between local and online clinicians. Efficacy assessment process: compare on-site and online clinical recommendations.	The results showed good overall agreement on subjective severity ratings and penetration - aspiration assessments between on-site and online clinicians. The agreement in the treatment recommendations was moderate to high, ranging from 69.3% to 100%.	The present study supports the viability and clinical usefulness of a telemedicine system for the evaluation of oropharyngeal swallowing. Given the difficulty and knowledge required to complete these assessments, this study offers promising clinical possibilities for patients in underserved and remote communities and countries, where swallowing specialists are not available.	2
13	To analyze issues that affected the provision of clinical evaluation services for dysphagia by the telerehabilitation system used by Ward et al, in the article: "Validity of Conducting Clinical Dysphagia Assessments for Patients with Normal to Mild Cognitive Impairment via Telerehabilitation".	Research with quantitative approach of experimental design	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 10. Age: 50 to 93 years. Gender: M: 4 F: 6. Inclusion/Exclusion Criteria: the study included 10 people from the original research group of Ward et. al (2011), in which 6 received score 3, indicating that the speech-language pathologist was unsure about telerehabilitation treatment and 4 received 2, in which the speech-language pathologist disagrees that telerehabilitation treatment would be the best for that patient. Independent variable: to analyze issues that affected the provision of services in the system used by Ward et. al, 2012. Dependent variable: impact and administration of speech and speech disorders, hearing impairment, presence of dyskinesia, and behavioral/emotional problems. Evaluation of effectiveness: analysis at the end of each evaluation	Four key factors of the patients were identified that could influence the telerehabilitation session and the strategies used to compensate and adapt these issues: the impact and administration of speech and speech disorders, hearing impairment, the presence of movement disorders (dyskinesia) and behavioral/emotional problems.	The study demonstrates that, despite the range of challenges posed by the altered capacities of these 10 participants, all evaluations were successfully completed by modifications of the current equipment and assistance. It is recognized, however, that this is a small group and the system resources to accommodate all possible patient factors cannot be considered complete. As new systems are proposed and technology advances, the ongoing research on how these systems perform and can adjust to compensate the patient several factors will emerge.	2
14	To analyze the viability of dysphagia treatment via telepractice in this pediatric patient; secondarily, to analyze whether this treatment program was effective for this child.	Qualitative research	Remote Assistance Procedure. Selection: Convenience. Casuistic: n = 1. Age: 6 years and 6 months. Gender: Male. Inclusion/Exclusion Criteria: patient totally dependent on gastrostomy tube for feeding and hydration for four years and up to two weeks before program onset. Independent variable: efficacy of telerehabilitation for dysphagia care in the pediatric patient. Dependent variable: viable treatment for this specific patient. Evaluation of effectiveness: behavior, swallowing and feeding outcomes, quality of life and satisfaction before and after distance treatment were compared.	Preliminary results from the present case study are promising for pediatric assessment and treatment. However, more studies are needed to determine if this option can be generalized and whether it is valid and reliable.	The present case report shows the efficacy and preliminary feasibility of an intensive telepractice program in the treatment of pediatric dysphagia. To our knowledge, this is the first study to report the viability of telepractice in the rehabilitation of pediatric dysphagia.	4
15	Describe the advantages and opportunities present in the use of tele-dysphagia.	Literature Review	Analysis of distance assistance procedures, as well as distance education.	Teleconsultation reduces the likelihood of aspiration pneumonia; the number of dysphagia specialists is small, especially in rural areas; patients would be better served by collaboration of the primary clinician and the remote specialist.	Tele-dysphagia has annual cost savings. Stakeholders include: patients, physicians, insurance companies, health systems, university training programs, post-graduate providers, professional associations and boards of expertise. The consultations of dysphagia via telepractice are viable and accessible from a technological point of view.	4

Figure 2. Analysis of selected articles regarding the purpose of the study, its methodological characteristics, sample, casuistic, methods, results, conclusions and level of evidence.

Among the authors, five of them were responsible for more than one work in this area (Elizabeth C. Ward, Clare L. Burns, Deborah G. Theodoros, Trevor G. Russell and Shobha Sharma). Among the 15 articles, seven were developed in the United States (1, 3, 4, 8, 12, 14 and 15), seven in Australia (2, 5, 6, 7, 9, 10 and 13) and only one conducted in Brazil (11), being that all were published in English. Most studies are recent, i.e. they were published in the last five years, being the oldest published in 2001.

The University of Queensland, along with The Royal Brisbane and Women's Hospital stood out as headquarters institutions for being the matrix of seven of the fifteen articles analyzed (2, 5, 6, 7, 9, 10, 13).

All publications analyzed belong to the Speech Therapy field. Among the 15 selected articles, 12 were tele-education articles (1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 13 and 14), 2 in tele-education (4 and 7) and one review of both techniques (15). As for the type of study, 11 were experimental (2, 3, 4, 5, 7, 8, 9, 10, 11, 12 and 13), three literature reviews (1, 6 and 15) and only one (14) case study.

Most researches in the tele-education field aimed to evaluate the effectiveness of training other health professionals at distance by interviews with evaluators and test applications by allied health professionals as a means of measuring knowledge after training. The results were positive, showing that the professionals were able to perform their function after training.

In teleconsultation, studies aimed to determine the viability of dysphagia evaluation by telemedicine and, for that, they used patients with disorders of swallowing evaluated by speech therapists at a distance, comparing the level of agreement with professionals conducting on-site evaluation, or even applying questionnaires to the patient and to the professional, revealing high level of agreement in satisfaction between online and on-site speech pathologists and patients submitted to both modalities.

The study analyzed the samples concerning the selection methods, casuistic and schooling of each participant, as well as the inclusion and exclusion criteria.

Level 2 of evidence was predominant among the articles analyzed, which refers to evidence obtained in individual studies with an experimental

design, thus the level is low, demonstrating the lack of scientific evidence in the area.

Discussion

This study aimed to evaluate the literature evidence about telehealth applied in oropharyngeal dysphagia, addressing the tele-education and teleconsultation. The importance of telehealth in this area is highlighted, considering that there are a significant number of patients who need speech-language evaluation and live in regions where there is no speech therapist available or, even, there is shortage of professionals specialized in oropharyngeal dysphagia.

It is scientifically proven that, by virtue of telehealth and the vast development and use of technology nowadays, there is possibility of successful teleconsultation and education of health professionals. Remote consultations offer health savings opportunities of millions of dollars per year, reduce the likelihood of complications in health care and guarantee a higher quality of care. In addition, when telehealth is used, health professionals have the opportunity for rigorous training and advanced continuing education necessary for the recognition of numerous and subtle symptoms that allow accurate diagnosis and treatment plan.

Fifteen articles were selected only in the PubMed/MEDLINE database, probably because this is an internationally recognized database, which explains why all researches found had been conducted in the United States of America and Australia, and all of which are written in English language. In addition, the database has high feasibility of studies disclosure, once it is guaranteed and substantiated by the US National Library of Medicine, the largest medical library in the world operated by the United States federal government. In the analyzed articles, five authors repeat themselves in more than one publication, appearing as some research leaders in the area.

Among the studies analyzed, the level 2 of evidence was found in the great majority; this factor is clarified due to the hierarchy of evidence-based clinical practice, in which the more complete the study, the more credibility it has. For this to happen, conducting studies becomes complex, requiring cohort studies, case studies, and even expert opinion to make the work meaningful²⁸.

Two studies focusing on tele-education were found, both aimed at training health professionals, with positive results. In speech therapy, a research developed with community health agents in children's audiology area also found effectiveness of interactive tele-education²⁹.

Two articles are literature reviews on both themes and only one case study was analyzed in the present research, demonstrating the need of further publications in the field.

Regarding teleconsultation, ten scientific articles were analyzed, among which four compared results of evaluations made by professionals on-site with the patient and those who were performing the remote care. All of them affirmed that there were acceptable levels of agreement among professionals; however, unfortunately, there are limitations regarding the diagnosis of penetration-aspiration in remote care. Comparatively, in another area of Speech Therapy, a workshop was developed to soften the accent in speakers in the professional voice area³⁰, which demonstrated similarity of results between on-site and distance-based approaches. This highlights the importance of considering the comparison of results obtained for participants at distance with those found for health professionals who participated in on-site training.

Therefore, in the speech therapy area, the scientific productions on telehealth in oropharyngeal dysphagia are recent and with low level of evidence. This may be related to the recent emergence of telehealth, as well as the speech-language domain in the diagnosis and treatment, justifying all analyzed studies found only in the speech therapy field.

It is worth mentioning that the possibility of a new modality of training in cases of swallowing disorders can be considered of great importance in a country with large territorial dimensions as Brazil, where the number of specialists in oropharyngeal dysphagia by region is scarce and heterogeneous. In addition, a remote therapeutic approach requires regulation by the organizations that regulate the profession, establishing ethical and honorary criteria for the different modalities of action, requiring advances in these aspects within the code of ethics of speech therapist professionals.

Therefore, the development of further research especially in the tele-education field is necessary, since most studies found showed promising results. Also, it is important that these surveys include

groups whose actions are carried out on-site, in order to compare the results and thus allow demonstration of the effectiveness of such actions.

Conclusion

It can be concluded that the telehealth literature in the oropharyngeal dysphagia area has predominantly addressed teleconsultation. However, there is a lack of clinical studies about these techniques and the studies present low level of scientific evidence.

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