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The Gugging Swallowing Screen: A contribution to the cultural and linguistic validation for the Portuguese context

Gugging Swallowing Screen: contributo para a validação cultural e linguística para o contexto português

Gugging Swallowing Screen: contribución a la validación cultural y linguística para el contexto portugués

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Abstract

Background: The use of new tools for early screening of dysphagia, which are validated and adapted to the Portuguese context, is imperative for the safety of inpatients. The Gugging Swallowing Screen (GUSS) allows for the accurate assessment of swallowing disorders, the identification of dysphagia severity, and the recommendation of specific interventions.
Objective: To translate and adapt the GUSS to the Portuguese context in acute patients and assess its psychometric properties.
Methodology: Methodological study of translation and assessment of the psychometric properties of the GUSS using a sample of 174 acute patients. Internal consistency was analyzed, as well as interrater agreement, sensitivity, and specificity based on the *Receiver Operating Characteristic (*ROC) curve.
Results: Internal consistency was 0.80 in the direct phase and 0.82 in the indirect phase, interrater agreement ranged from 0.818 to 0.905, sensitivity was 100%, and specificity was 43% and 56% (cutoff at 13.5 and 4.5).
Conclusion: The Portuguese version of the GUSS proved to have excellent psychometric properties and can be applied to patients at the acute stage of disease.

Keywords: deglutition; dysphagia; non-invasive evaluation; nursing; scale

Resumo

Enquadramento: A introdução de novas ferramentas, validadas e adaptadas para o contexto português para triagem precoce da disfagia, assumem um caráter quase imperativo para a segurança do doente internado. A *Gugging Swallowing Screen* (GUSS) permite avaliar com precisão o compromisso da deglutição, distinguir o grau de severidade da disfagia e recomendar intervenções específicas.
Objetivo: Traduzir e adaptar para o contexto português a escala GUSS em doentes agudos e avaliar as suas propriedades psicométricas.
Metodologia: Estudo metodológico de tradução e avaliação das propriedades psicométricas da GUSS numa amostra de 174 doentes agudos. Realizou-se a análise da consistência interna, a concordância interobservadores, sensibilidade e especificidade, através da curva de *Receiver Operating Characteristic* (ROC).
Resultados: A escala apresentou consistência interna de 0,80 na fase direta e de 0,82 na fase indireta. A concordância interobservadores variou entre 0,818 e 0,905. A sensibilidade foi de 100% e especificidade de 43% e 56% (para ponto corte 13,50 e 4,50).
Conclusão: A GUSS versão portuguesa demonstrou propriedades psicométricas excelentes, podendo ser aplicada a doentes em fase aguda da doença.

Palavras-chave: deglutição; disfagia; avaliação não-invasiva; enfermagem; escala

Resumen

Marco contextual: La introducción de nuevas herramientas, validadas y adaptadas al contexto portugués para la detección precoz de la disfagia asume un carácter casi imperativo para la seguridad del paciente hospitalizado. La *Gugging Swallowing Screen* (GUSS) permite evaluar con precisión el problema de la deglución, distinguir el grado de severidad de la disfagia y recomendar intervenciones específicas.
Objetivo: Traducir y adaptar al contexto portugués la escala GUSS en pacientes en fase aguda y evaluar sus propiedades psicométricas.
Metodología: Estudio metodológico de traducción y evaluación de las propiedades psicométricas de la GUSS en una muestra de 174 pacientes en fase aguda. Se realizó el análisis de la consistencia interna, la concordancia interobservadores, la sensibilidad y especificidad a través de la curva de *Receiver Operating Characteristic* (ROC).
Resultados: La escala presentó consistencia interna de 0,80 en la fase directa y de 0,82 en la fase indirecta. La concordancia interobservadores varió entre 0,818 y 0,905. La sensibilidad fue del 100% y la especificidad del 43% y 56% (para el punto corte 13,50 y 4,50).
Conclusión: La versión portuguesa de la GUSS demostró propiedades psicométricas excelentes, y se puede aplicar a los pacientes en la fase aguda de la enfermedad.

Palabras clave: deglución; disfagia; evaluación no invasiva; enfermería; escala

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Introduction

Swallowing disorder/dysphagia is a symptom related to changes in swallowing or inability to swallow in a safe, efficient, and comfortable manner; it can occur in all age groups resulting from various medical and even psychological conditions (McFarland, 2008).

Based on the assessment tools used in the literature, the incidence of dysphagia ranges from 22% to 65%, lasting several months or recurring in association with future comorbidities (Cardoso et al., 2011; Dias, 2015).

In health care settings, the early identification of patients with this disorder can be a difficult task, and its most relevant manifestations are respiratory sequelae.

Aspiration pneumonia is a leading cause of morbidity and mortality among institutionalized older people and is associated with high health care costs. According to Park et al. (2013), its prevention should be a priority. Its incidence is higher at extreme ages (i.e., under 2 years and over 60 years of age). The risk among older people increases six-fold after the age of 75 years, when compared to people aged under 60 years; its prevalence is higher among men aged over 70 years (Tanure, 2008). Therefore, age has been considered to be a key predictor of swallowing disorders, which reinforces the need for earlier patient assessment.

In Portugal, a group of researchers addressed this topic in a study on the occurrence of adverse events in a medicine ward. In addition to a prevalence of aspiration pneumonia of 6.67%, the researchers observed that this condition had been the cause of death in four patients (Pierdevara & Eiras, 2016).

This reality brings new challenges to health care delivery related to ensuring patient safety and care quality. In fact, most cases of swallowing disorders are diagnosed in hospital settings, and their diagnosis and treatment require the use of videofluoroscopy, which is considered the *gold standard* exam for studying dysphagia. However, this exam has disadvantages, such as the waiting time, the fact that the patients are unable to leave inpatient ward, the difficulty in positioning the patients and getting their collaboration during the exam, the risk of aspiration, and the exposure to radiation (Onofri, 2013). Therefore, given these conditioning factors and the need for early detection of dysphagia, the nursing team plays a key role in this domain. Nurses are available 24/7 and participate in and supervise the patient's diet and hydration; hence they can quickly identify any signs and symptoms related to swallowing disorders (Santos, 2014).

In view of the above, it is extremely important to implement working tools for nurses to assess the patient's swallowing ability and implement specific interventions in a timely manner (Dias, 2015). The early identification and monitoring of swallowing disorders can bring multiple benefits to those involved in the rehabilitation process and contribute to the reduction of morbidity and mortality rates (Donovan et al., 2013).

Although there are several scales for screening swallowing ability, most of them are not validated and adapted to the Portuguese context, and are very complex and exhaustive. Therefore, a tool that is validated and adapted to the Portuguese context should be implemented for an easy, quick, and systematic assessment of the swallowing ability of patients at the acute stage of disease. Based on literature reviews, the Gugging Swallowing Screen (GUSS) was considered to be the most appropriate scale for assessing patients admitted to a medicine ward.

Several authors (AbdelHamid & Abo-Hasseba, 2017; Bassiouny, Safinaz, Soliman, & Ahmed, 2017; Trapl, Enderle, Teuschl, Dachenhausen, & Brainin, 2007) argue that GUSS is one of the most efficient tools in for detecting and evaluating dysphagia severity in stroke patients. In addition to the identification of the swallowing ability, it also allows changing patients' daily diet and monitoring the evolution over time. One of its advantages is the fact that it can be applied by any healthcare professional without the need for specialized training.

This study aimed to translate and adapt the GUSS to the Portuguese context in a sample of patients at the acute stage of disease, as well as assess its psychometric properties.

Background

Dysphagia is a common disorder. According to the World Gastroenterology Organization (2014), one in seven people will develop some form of dysphagia in their lifetime, which can be caused by multiple conditions: neoplasm, obstructive lesions, neuromuscular diseases, metabolic disorders, infectious diseases, iatrogenic conditions, anatomical abnormalities, and advanced age (Jotz & Dornelles, 2012). Mourão, Almeida, Lemos, Vicente, and Teixeira (2016) report that incidence of

dysphagia among stroke patients submitted to speech evaluation varies between 43% and 50% in the first 48 hours. Similarly, the World Gastroenterology Organization (2014) reported that 30% to 40% of older inpatients have dysphagia, which is more evident in patients with respiratory infections. In many cases, bronchoaspiration is the leading cause of aspiration pneumonia because it is associated with increased oral secretions that lead to airway obstruction (Cordeiro & Menoita, 2012).

Changes in the swallowing ability can affect the patient's health and lead to aspiration pneumonia, malnutrition, and dehydration due to hemoconcentration, fear of eating and drinking, and emotional changes associated with social deprivation (Dias, 2015; Martins, 2016; Santos, 2014).

In this context, the early identification of swallowing disorders is crucial. To this end, the use of tools for assessing the swallowing function allows to safely adjusting each patient's diet. The assessment of the ability to swallow substances of different consistencies translates into a better approach to the patient's daily eating habits (Cardoso et al., 2011).

Thus, nurses should use valid tools, with high levels of sensitivity and specificity, to early identify the presence of dysphagia, thus improving the quality of care and patient safety. GUSS was designed by Trapl et al. (2007) to identify swallowing disorders in a quick and non-invasive manner. It is a simple method (AbdelHamid & Abo-Hasseba, 2017; Bassiouny et al., 2017; John & Beger, 2015) that allows a graded rating with separate evaluations for non-fluid and fluid nutrition, starting with non-fluid textures.

This assessment not only considers the pathophysiology of voluntary swallowing, but also allows patients to continue their oral feeding routine depending on consistency.

GUSS is a dysphagia screening tool which is composed of two phases: Phase 1 - preliminary investigation/indirect swallowing test; and Phase 2 - direct swallowing test.

The tests must be performed sequentially because the direct test is applied based on the score of the indirect test.

The indirect test consists of three items: vigilance; voluntary cough, and/or throat clearing; and saliva swallow. These sub-items are scored as *physiologic* (1 point) or *pathologic* (0 points). The total score ranges from 1 (worst performance) to 5 (best performance). The direct test can be applied if the subject achieves the maximum score (5). The direct test is composed of four items: deglutition, involuntary cough, drooling, and voice change. These sub-items are scored as *normal-acceptable* (1 point) or *abnormal-not acceptable* (0 points), with the exception of the Deglutition item, which is scored as *pathologic swallowing* (0 point), *delayed swallow* (1 point), and *normal deglutition* (2 points). The direct swallowing test consists of three sequentially performed subsets, starting with semisolid, followed by liquid, and finally solid textures. The total score ranges from 1 (worst performance) to 5 (best performance), where patients must achieve the maximum score (5) to move on to the assessment of the different textures.

The total score indicates the severity of dysphagia, which will allow nurses to implement interventions, including stopping oral feeding; adjusting the diet to oral intake; providing nutritional supplements; and recommend further examination through videofluoroscopy or videoendoscopy.

GUSS can be used in combination with other tools and is currently being disseminated internationally due to its specificity.

Research Question

Is the Portuguese version of GUSS a valid tool for detecting swallowing disorders in the Portuguese population?

Methodology

The study was developed in three phases. In the first phase, GUSS was linguistically and culturally adapted to the Portuguese context. In the second phase, a preliminary test was conducted with the purpose of analyzing the semantic equivalence of GUSS and identifying potential problems to be later adjusted. Finally, in the third phase, a quantitative, observational, cross-sectional study was conducted to assess the reliability and the validity of the Portuguese version of GUSS in a sample of older patients in acute care.

The authors of the original scale were asked for permission to translate and validate the scale to the Portuguese context. The request for authorization to conduct the study was submitted to the Ethics Committee of the University Hospital Center of Algarve (*Centro Hospitalar Universitário do Algarve*, CHUA). All participants signed an informed consent form.

The sample was composed of 174 patients with cardiac, respiratory, neurological, and

cancer diseases who were admitted to a medicine ward of the CHUA.
All inpatients at the acute stage of disease were considered for inclusion in the study. Patients with known swallowing disorders were excluded.

Cultural adaptation
The translation and cultural adaptation of GUSS to European Portuguese was developed in four stages, based on the international guidelines proposed by Beaton et al. (as cited in Vilelas, 2009): translation, synthesis, back-translation, and expert committee review.
Stage I - The translation process started with two translations of the original version of GUSS into European Portuguese. Two independent bilingual translators, whose native language was Portuguese, were chosen (one nurse who knew the test and another one who was not familiar with it).
Stage II – A third researcher draw up a report with a final version (synthesis) taking into account the original version and both previous translations. This report described any discrepancies found in this process. Afterwards, a consensus meeting was held to validate the synthesis version with a Full Professor in Nursing who had research experience in the validation of tools. Since GUSS is a simple tool, there were no significant discrepancies between both translations.
Stage III – Due to the simplicity of this tool and the lack of discrepancies between both independent translations, only the synthesis version was backtranslated by a bilingual translator, whose native language was English. This translator had academic training in the health area, but did not work in the area.
Stage IV - The synthesis version, after reaching a consensus for the Portuguese version, and the original English version were analyzed and compared by a panel composed of six experts to achieve semantic, idiomatic, and conceptual equivalence to the Portuguese context. The expert committee was composed of two nurses from a general medicine ward, a nurse specialist in rehabilitation, a nurse specialist in hospital emergency, a MSc. Professor with management skills, and a Ph.D. Professor in Nursing. The final version of GUSS resulted from the experts' analysis, with a 98% agreement rate.
Subsequently, in order to assess its feasibility and understanding, the draft Portuguese version was presented to the nursing team at the ward, which was composed of 28 nurses. No exclusion criteria were applied. Nurses were asked to provide feedback about content clarity and all answers and optional comments were recorded according to the nurses' level of understanding: *totally understand*, *understand*, *somehow understand,* and *hardly understand*. The analysis of nurses' answers showed that all elements of the Portuguese version of GUSS were clear.
Finally, the scale was applied to a sample of 174 acute patients admitted to a medicine ward.
The reliability of GUSS was assessed on a single patient by comparing the results of its application by three different nurses (one nurse specialist in rehabilitation and two generalist nurses) at different moments.
To this end, the scale was applied to one patient during the three main meals of the first day of hospitalization: breakfast, lunch, and dinner. GUSS was initially applied by the nurse specialist in rehabilitation, followed by the generalist nurses.
Data were recorded and analyzed using IBM SPSS Statistics for Windows, version 22.0.
Interrater agreement was tested using Cohen's kappa. Internal consistency was assessed using Cronbach's alpha coefficient. Both sensitivity and specificity were calculated based on the Receiver Operating Characteristic (ROC) curve, in which the specialist nurse's feedback was considered as the gold standard.

Results

With regard to the psychometric properties of the Portuguese version of GUSS, Cronbach's alpha for internal consistency was 0.80 in the first phase (indirect swallowing test) and 0.82 in the second phase (direct swallowing test), which is excellent for a scale.
Interrater reliability was assessed based on the agreement reached between three raters: (A) nurse specialist in rehabilitation, (B) generalist nurse 1, and (C) generalist nurse 2. The calculation was made based on three pairs of agreement (AB, BC and AC).
The reliability among the three pairs of raters - AB, BC, and AC - showed a Cohen's kappa of 0.905, 0.818 and 0.896, respectively. Statistical significance (p) was lower than 0.001, which confirmed an excellent degree of agreement (Table 1).

Table 1
Degree of agreement among pairs of raters

Pairs of agreement	*Kappa* Index of agreement	*p* - value Significance
AB - Nurse Specialist in Rehabilitation /Generalist Nurse 1	0.905	0.001
BC - Generalist Nurse 1/ Generalist Nurse 2	0.818	0.001
AC - Nurse Specialist in Rehabilitation/ Generalist Nurse 2	0.896	0.001

The sensitivity and the specificity of the Portuguese version of GUSS were calculated based on the analysis of the ROC curve, with several cut-off points (Table 2).

Table 2
Sensitivity and specificity per cut-off points

	Criterion (cut-off point)	Sensitivity	Specificity
Generalist Nurse 1	20	95%	25%
	18.50	100%	29%
	13.50	100%	43%
	9	100%	68%
	4.50	100%	74%
Generalist Nurse 2	20	92%	24%
	18.50	100%	28%
	13.50	100%	54%
	9	100%	68%
	4.50	100%	76%

In relation to the severity of dysphagia, a cut-off point of 20 corresponded to *no dysphagia*, 18.50 to *slight dysphagia*, 13.50 to *moderate dysphagia*, 9 to *severe dysphagia* (patients who moved on to the direct testing phase), and 4.50 to *very severe dysphagia* (patients who did not move on to the indirect testing phase). The Area Under Curve (AUC) in the ROC curve was 0.987 for the generalist nurse 1 and 0.991 for the generalist nurse 2, which shows that the scale had an excellent performance (Figure 1).

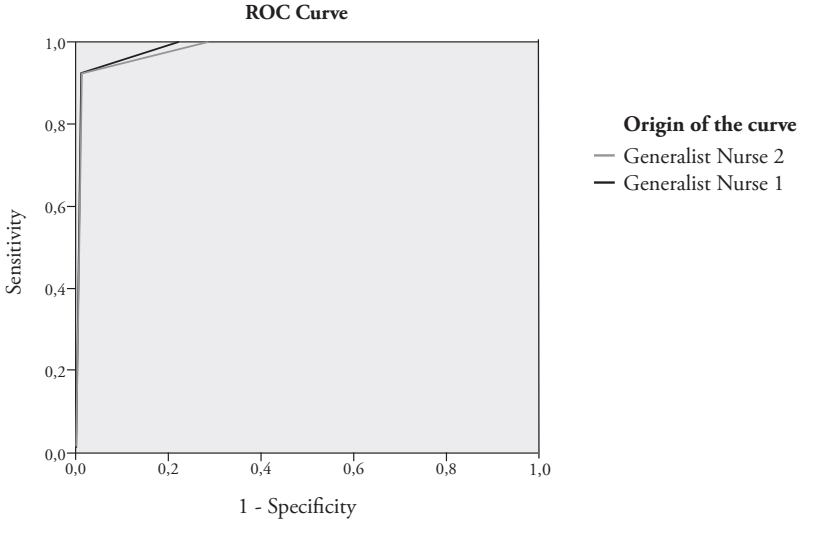

Figure 1. ROC curve - characteristics of the application of GUSS (representative of sensitivity and specificity).

The applicability of the scale was evaluated using a sample of 174 patients. Participants had a mean age of 79.36 years (standard deviation of 10.4 years and mode of 84 years), 50.6% were women, and 49.4% were men.
The results showed that 52.87% of patients had *no dysphagia*, 14.37% had *slight dysphagia*, 17.24% had *moderate dysphagia*, and 15.52% had *severe dysphagia*.
Furthermore, 79.9% of patients were cooperative; 32.2% had neurological diseases; 20.1% had neuromuscular diseases; 2.3% had cancer diseases; 48.9% had respiratory impairment; and 8.6% had motor impairment.

Discussion

This study describes the process of translation and cultural adaptation of the GUSS for the Portuguese context, as well as the assessment of its reliability and validity. In terms of contents, in the phase of translation and adaptation to the Portuguese context, the GUSS was found to be a simple tool that did not require major changes in relation to the original scale. This fact was evident in the consensus between translators, who saw no need to replace terms in order to obtain equivalent versions. In addition, the nurses who assessed the level of understanding and feasibility of the tool reported that the Portuguese version of GUSS was clear, which further confirmed our conclusions.
The incidence of dysphagia was 47.13% during the first 48 hours of hospitalization, which is a lower result than that found by Trapl et al. (2007), who reported a rate ranging from 42% to 67% during the first 72 hours after stroke. It is also lower than the results found in other studies (AbdelHamid & Abo-Hasseba, 2017; Mourão et al., 2016) which reported rates ranging from 71.4% to 50% during the first 72 hours after stroke.
The lower results obtained in this study can be explained by the fact the scale was applied to inpatients with several comorbidities, while the scale was mainly applied to stroke patient in the other studies.
With regard to the psychometric properties of GUSS, it has an excellent internal consistency, as assessed by Cronbach's alpha: 0.80 in the indirect swallowing test and 0.82 in the direct swallowing test. It should be noted that these data cannot be compared across studies because no other studies assessed internal consistency. In fact, this situation is also associated with the lack of studies including validity and reliability assessment (Cardoso et al., 2011).
In addition to the internal consistency, the interrater reliability, the sensitivity, and the specificity of GUSS were also assessed.
GUSS showed an excellent interrater reliability based on the following interrater agreement values: $\kappa = 0.905$; $\kappa = 0.818$; and $\kappa = 0.896$), which are in line with other studies. In Egypt, AbdelHamid & Abo-Hasseba (2017) obtained an excellent agreement between two raters ($\kappa = 0.84$; $\kappa = 0.82$), and, in Austria, Trapl. et al. (2007) also reported an excellent agreement between two raters ($\kappa = 0.773$; $\kappa = 0.900$), with a 95% confidence interval ($p = 0.001$).
The results showed a sensitivity of 100% at all cut-off points (18.50; 13.50; 9 and 4.50), except for the cut-off point of 20, which had a sensitivity of 95% for generalist nurse 1 and 92% for generalist nurse 2. These results suggest that GUSS is able to accurately identify patients at risk. Higher specificity scores were found in *severe dysphagia*, namely 68% at the cut-off point of 4.50, for both generalist nurses, and 74% and 76% at the cut-off point of 9 for generalist nurse 1 and generalist nurse 2, respectively. The specificity obtained at the cut-off point of 13.50 (*moderate dysphagia*) was 43% and 54% for generalist nurse 1 and generalist nurse 2, respectively, with an AUC of 0.987 and 0.991.
These results put into evidence the excellent performance of GUSS. Warnecke et al. (2017) and Trapl et al. (2007) found similar scores at the cut-off point of 14. Warnecke et al. (2017) reported a sensitivity and specificity of 96.5% and 55.8%, respectively, and an AUC of 0.76. Trapl et al. (2007) reported a sensitivity and specificity of 100% and 69%, respectively, and an AUC of 0.93.
Bassiouny et al. (2017) and AbdelHamid and Abo-Hasseba (2017) reported sensitivity values of 93.7% and 93%, respectively; however, they obtained higher specificity values (92.5% and 83%). AbdelHamid and Abo-Hasseba (2017) obtained an area under the ROC curve of 0.92, which means that GUSS has a good predictive ability for identifying patients at risk for dysphagia.
It should be noted that sensitivity and specificity were only assessed at cut-off point 14 in the studies applying this tool, which precludes the comparison of the other cut-off points.
Therefore, despite the discrepancy found in specificity, the literature on its psychometric properties shows that GUSS is a valid tool for the early identification of swallowing disorders and that it may be more appropriate

than other dysphagia screening tools. GUSS is a simple tool and can be quickly applied to screen swallowing disorders. In turn, the early identification of dysphagia severity allows for the implementation of timely, individualized interventions aimed at patients' needs and safety. This study suggests that the use of new tools, which are validated and adapted to the Portuguese context, such as GUSS, for the early identification of swallowing disorders can prevent potential complications and help refer patients to rehabilitation through swallowing reeducation.

This study had some limitations. One of them was the lack of international literature on this topic, which hampered the comparison of the results with other contexts. Another limitation was the fact that most studies focused on the administration of GUSS to stroke patients, although the evidence shows that swallowing disorders are very common in the geriatric population.

Conclusion

This study provided the only version of GUSS that is validated for the Portuguese context. The Portuguese version of GUSS proved to have good psychometric properties, with a high internal consistency and sensitivity, as well as excellent consistency and reliability. GUSS is an easy-to-use, valid, and reliable test for identifying swallowing disorders in a non-invasive way. Since it does not require any specialized training in this area, GUSS can be applied by generalist nurses. The screening of swallowing disorders can reduce the number of complications, namely the incidence of aspiration pneumonia in acute patients, and facilitate the early implementation of rehabilitation interventions which, in turn, will contribute to improve the quality of life of these patients.

In view of the above, it can be concluded that the Portuguese version of GUSS, which underwent a process of translation and adaptation to the Portuguese context, is an important and reliable tool for the rapid screening of dysphagia in acute patients. However, further studies should apply this tool in other clinical settings and other groups of patients other than stroke patients.

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